Requirements of the U.S. Recreation and Tourism Industry for Climate, Weather, and Ocean Information

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“Corporations sensitive to the weather are increasingly spending more to try to find out in advance how the weather will turn out, and retailers and the leisure industry are particularly sensitive.”

*John Speck, 1999*

Acknowledgments

We would like to thank all the expert witnesses who gave their time to answer questions and discuss points raised in this report. In particular to the staff of Starwood Hotels and Resorts who formed the main case study in this sub-sector.
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Prologue

This report, the second in the series of assessments examining the weather, climate, and ocean information needs of major economic sectors of the U.S. economy, focuses on the recreation and tourism industry. This is one of the largest income generating sectors of the economy, impacting virtually every state in the U.S. and its neighbors. Recreation and tourism industry is a very diverse industry in terms of the activities it promotes as well as in the size and resources of individual business units comprising the industry.

The focus of this investigation is on the assessment of current and future requirements of the industry sub-sectors. It identifies specific operational activities where the inclusion of weather, climate, and ocean information would materially benefit the industry. This information may be provided directly or indirectly by government or other sources, free or at a charge, and may be at a variety of spatial and temporal scales. The investigation examines the knowledge management systems, business processes, and related information flows in selected sub-sectors of the industry. The use to which this information is put in a business context, its value added benefits, and the perception of how it may impact, inform, and influence business decision-making are also assessed. Models used to forecast business health and set budgets were examined to evaluate how weather, climate, and ocean information may help to improve the business planning process. The personnel levels within companies that have the responsibility for the utilization of the data are identified, and the consequences of incorrect or misleading information are also considered.

While the investigation is not intended to be an economic assessment of the value of weather, climate, and ocean information in the industry, many of the responses detailed bottom line savings to organizations. The sophisticated models that industry uses to meet planning, compliance, safety, and profit missions are also reviewed. Importantly, the barriers to a wider uptake and institutional use of weather, climate, and ocean considerations in the recreation and tourism industry are also investigated. The information upon which this investigation is based was primarily obtained by expert witness interviews of senior and middle management in a broad spectrum of organizations functioning in the recreation and tourism arena. This was supplemented by an extensive literature assessment.

With the completion of the reports for the energy and recreation and tourism sectors, other sectors scheduled to be included in this series are: the financial services sector, transportation, communications, maritime services, and water industries. Other significant industries such as retail and the service industries are incorporated into the assessment of the mainstream sectors, which they serve. Each report will identify the climate information products being used by selected organizations in the respective sectors, the source of their information products, and the costs to companies of procuring this information. The mechanisms by which weather, climate, and ocean information enhances business forecast models are also an important product of these reports.

The primary purpose of these reports is to provide a summary for the National Oceanic and Atmospheric Administration (NOAA) of an in-depth analysis of the data and information needs of critical sectors of the U.S. economy and the importance of the Agency’s products to society. This will assist the Agency in assessing its own strategic goals and setting priorities for many of its programs in light of the needs of the industries or constituencies that use NOAA’s services.

Mary G. Altalo
Monica Hale
SAIC, 10 May 2002
# Abbreviations and Acronyms

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<th>Abbreviation</th>
<th>Full Form</th>
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<tr>
<td>AAI</td>
<td>Alliance of American Insurers</td>
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<td>ABI</td>
<td>Association of British Insurers</td>
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<tr>
<td>ABA</td>
<td>American Bankers Association</td>
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<td>ATA</td>
<td>Air Transport Association</td>
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<tr>
<td>AHLA</td>
<td>American Hotel and Lodging Association</td>
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<tr>
<td>ASTA</td>
<td>American Society of Travel Agents</td>
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<tr>
<td>BAT</td>
<td>Best Available Technology</td>
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<tr>
<td>BBA</td>
<td>British Bankers Association</td>
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<td>BTU</td>
<td>British thermal unit</td>
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<tr>
<td>CAST</td>
<td>Caribbean Alliance for Sustainable Tourism</td>
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<tr>
<td>CCFP</td>
<td>Collaborative Convection Forecast Product</td>
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<tr>
<td>CERES</td>
<td>Coalition for Environmentally Responsible Economics</td>
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<tr>
<td>CDD</td>
<td>cold degree-days</td>
</tr>
<tr>
<td>CDM</td>
<td>Cleaner Development Mechanism</td>
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<tr>
<td>CIMSS</td>
<td>Cooperative Institute for Meteorological Satellite Studies (University of Wisconsin, Madison)</td>
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<td>CPACC</td>
<td>Caribbean Planning for Adaptation to Global Climate Change</td>
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<td>DMSP</td>
<td>Defense Meteorological Satellite Program</td>
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<td>DMO</td>
<td>Destination Management Organization</td>
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<td>DOC</td>
<td>Department of Commerce</td>
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<td>DTN</td>
<td>Data Transmission Network</td>
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<td>EIA</td>
<td>Environmental Impact Assessment</td>
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<td>ESSA</td>
<td>Environmental Science Services Administration</td>
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<td>EPA</td>
<td>Environmental Protection Agency</td>
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<td>FAA</td>
<td>Federal Aviation Authority</td>
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<td>FACT</td>
<td>Florida Assessment of Coastal Trends</td>
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<td>FCMP</td>
<td>Florida Coastal Management Program</td>
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<td>FEMA</td>
<td>Federal Emergency Management Agency</td>
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<td>GDP</td>
<td>Gross Domestic Product</td>
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<td>GEF</td>
<td>Global Environment Facility</td>
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<td>GHG</td>
<td>Greenhouse Gas</td>
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<td>GOES</td>
<td>Geostationary Operational Environmental Satellite</td>
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<td>GRI</td>
<td>Global Reporting Initiative</td>
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<tr>
<td>HAB</td>
<td>harmful algal bloom</td>
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<td>HDD</td>
<td>hot degree-days</td>
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<td>IATA</td>
<td>International Air Traffic Association</td>
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<td>IAOPA</td>
<td>International Council of Aircraft Owner and Pilot Associations</td>
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<td>IBRD</td>
<td>International Bank for Reconstruction and Development</td>
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<td>ICAO</td>
<td>International Civil Aviation Organization</td>
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<td>ICABV</td>
<td>International Convention and Visitor Bureau</td>
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<td>ICCL</td>
<td>International Council of Cruise Lines</td>
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<td>IPCC</td>
<td>UN - Inter-governmental Panel on Climate Change</td>
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<td>IEDC</td>
<td>International Economic Development Council</td>
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<td>IFC</td>
<td>International Finance Corporation</td>
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<td>IHEI</td>
<td>International Hotels Environment Initiative</td>
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<td>JLLaS</td>
<td>Jones Lang LaSalle</td>
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<td>LEED</td>
<td>Leadership in Energy and Environmental Design</td>
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<td>MLW</td>
<td>Mean Low Water</td>
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<td>MPA</td>
<td>Meetings Planners Association</td>
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<td>NASA</td>
<td>National Aeronautics and Space Administration</td>
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<tr>
<td>NCDC</td>
<td>National Climatic Data Center</td>
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<tr>
<td>NESDIS</td>
<td>National Environmental Satellite Data and Information Service</td>
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<td>NARRP</td>
<td>National Association of Recreation Resource Planners</td>
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<tr>
<td>NCDC</td>
<td>National Climate Data Center</td>
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<tr>
<td>NCLA</td>
<td>Northwest Cruise Line Association</td>
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<td>NGO</td>
<td>Non-Governmental Organization</td>
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<td>NJDEP</td>
<td>New Jersey Department of Environmental Protection</td>
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<tr>
<td>NOAA</td>
<td>National Oceanic and Atmospheric Administration</td>
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<tr>
<td>NOS</td>
<td>National Oceanic Service</td>
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<tr>
<td>NPDES</td>
<td>National Pollutant Discharge Elimination System</td>
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<tr>
<td>NTSB</td>
<td>National Transportation Safety Board</td>
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<tr>
<td>NWS</td>
<td>National Weather Service</td>
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<td>OSHA</td>
<td>Occupational Safety and Health Administration</td>
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<td>OGP</td>
<td>NOAA Office of Global Programs</td>
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<td>OIA</td>
<td>Outdoor Industry Association</td>
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<td>POES</td>
<td>Polar-orbiting Operational Environmental Satellite</td>
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<tr>
<td>PSP</td>
<td>paralytic shellfish poisoning</td>
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<td>PwC</td>
<td>PricewaterhouseCoopers</td>
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<td>SCSPA</td>
<td>South Carolina State Ports Authority</td>
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<td>SOLAS</td>
<td>Safety of Life at Sea Convention</td>
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<td>STR</td>
<td>Smith Travel Research</td>
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<td>TAFs</td>
<td>Terminal Aerodrome Forecasts</td>
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<tr>
<td>TIA</td>
<td>Travel Industries Association</td>
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<tr>
<td>TSA</td>
<td>Transport Security Agency</td>
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<tr>
<td>UMASS</td>
<td>University of Massachusetts</td>
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<tr>
<td>UNFCC</td>
<td>United Nations Convention on Climate Change</td>
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<tr>
<td>UNEP</td>
<td>United Nations Environment Program</td>
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<tr>
<td>UNDP</td>
<td>United Nations Development Program</td>
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<td>USCG</td>
<td>United States Coast Guard</td>
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<tr>
<td>WMO</td>
<td>World Meteorological Organization</td>
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<tr>
<td>WTTC</td>
<td>World Travel and Tourism Council</td>
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<tr>
<td>WTO</td>
<td>World Tourism Organization</td>
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Executive Summary

Overview
The National Oceanic and Atmospheric Administration (NOAA) has in its mission statement the responsibility for the production and distribution of U.S. weather, climate, and ocean information products. It emphasizes that NOAA is “dedicated to enhancing economic security and national safety through the prediction and research of weather and climate-related events and providing environmental stewardship of our nation’s coastal and marine resources.”

NOAA’s success has resulted from its ability to constantly find new ways to improve forecast accuracy through enhanced models and observations. It has identified new channels and further developed existing channels to distribute weather data to the individuals and organizations that need it. Additionally, private consultancy and service organizations have increasingly acted as the customer interface, extending the dissemination, processing or applying NOAA data for customized use to the highly diverse customer base for weather, climate, and ocean information. However, this multiplicity of data distribution channels does create difficulties when trying to analyze the total usage and application of NOAA weather, climate, and ocean information products.

The purpose of this report is to identify and evaluate the business requirements in the recreation and tourism sector for climate, weather, and ocean information. The data currently being utilized, its origins, costs, and the decisions for which it is used are determined. The need for changes in data type, accessibility, presentation, and temporal and spatial resolutions are also assessed. The report takes a broad approach to analyzing the requirements of the industry as a whole and includes consideration of the industry drivers in order to gain a comprehensive assessment of its needs.

A number of assessment methods have been used to obtain an objective view of the needs for weather, climate, and ocean information products in the recreation and tourism sector, including expert witness interviews and extensive research into the business processes and other influences on the industry. An analysis of the parameters derived by these means was used to obtain an accurate “snap-shot” of the way the industry operates, the principal influences acting upon it, and its perceived requirements. The research, discussions, and analysis were focused on the overall needs of the industry for weather, climate, and ocean information products. Some attention was also paid to the fact that information useful to sectors of the recreation and tourism industry was not being used due to a lack of awareness of the industry itself to the benefits of this information. A number of major recreation and tourism trade associations were used as expert witnesses and as a link to establish a network of contacts within the industry.

The report analyzes the scope, trends, and significant economic and other data pertaining to the recreation and tourism industry. The regulatory environment and implications of recent policy changes on the recreation and tourism industry have also been addressed. Understanding the key motivating forces of the industry which dictate how information products are used is central to determining the needs for weather, climate, and ocean information products. Detailed analysis of information flows within individual businesses is critical to assessing the need for weather, climate, and ocean information products in the
private sector and the form in which it should be supplied. Attention has also been paid to the
development history of the recreation and tourism industry as for example siting decisions
may be influenced by weather, climate, and ocean conditions extant at certain locations.

The geographic extent of the study covers the United States, Puerto Rico, Canada, and the
Caribbean. For the purposes of analyzing the industry, it has been sub-divided into:

◆ “Recreation” (concentrating on the more popular leisure activities rather than minority
interests);
◆ “Tourism” sector (reviewed under the standard sub-divisions of:
— Hospitality (accommodation, food service);
— Distribution (destination management organizations, tour operators), etc.;
— Transport; and
— Visitor attractions (theme parks, natural resources, etc.).

For each of these sub-sectors, the operations that are most sensitive to weather, climate, and
other environmental variables are identified from research into the industry and input of
expert witnesses through telephone interviews. For these segments, the specific weather,
climate, and ocean information and data needs have been determined and the mechanisms for
these are factored into operating models and plans and company projections are identified.

In view of the disparate nature of the industry and many recreational activities appealing to
minority interests, only the major sectors of the recreation sub-sector have been be evaluated.

Background
The recreation, travel, and tourism sector is a diverse group of industries, which are an
essential component of the U.S. economy, supplying goods and services, purchased by
leisure, business, and other travelers. These industries include the lodging industry, the
airline industry, travel agents, tour operators, tour guides, car rental companies, meeting and
convention planners, restaurants, resorts, amusement parks, camping and recreation areas,
natural attractions found in parks and forests, and other suppliers of these business sub-
sectors.

Tourism is a leading economic sector worldwide and has boosted international trade and
opened up countries and geographic areas. World tourism grew by an unprecedented 260%
between 1970 and 1990. Tourism is a vehicle for economic progress, generating
employment, foreign exchange, tax revenues and contributing to higher standards of living.
The further development of tourism activities is commonly a component of economic
development objectives. Tourism’s links to other economic sectors are also strong. This
analysis confirms recreation and tourism’s major contribution to the U.S. economy as a
whole.

The structure of the recreation and tourism industry is extremely fragmented, and there are
fewer frames of reference than exist in other industries; consequently the core unit of
information required is generally the “size” of the market. There are so many large and small
players in the accommodation and hospitality marketplace (for instance) so it is difficult to
estimate what the market share of, for example, a particular hotel brand is at any one point in
time. Consequently it is difficult to ascertain supply and demand factors compared to other industries.

There are no standard or universally applied business models in use across the recreation and tourism industry, but the most commonly used model is that of “Yield Management.” Some of the larger hotel groups use their own proprietary forecast models. While it is accepted there is a “seasonal” element influencing some tourist flows, there are no widely applied business forecast models requiring climate or weather data input.

Weather events have major direct and indirect economic impacts on the hotel and recreation component of the U.S. economy. Of the estimated $2.2 trillion revenue lost annually as a result of adverse or severe weather events, the hotel and recreation sector lost approximately $147 billion.

Findings
The unstructured and disparate nature of the industry means that the current and future requirements for weather, climate, and ocean information differ widely across the industry sub-sectors. Unlike most industries it is difficult to estimate the market share individual companies have within the sector as a whole, frustrating efforts to fully analyze industry “drivers” and the degree of importance of weather, climate, and ocean conditions. However, it is apparent that the industry is prone to the influences of global forces, which are felt right across the industry, down to the smallest business unit level.

A summary of the research findings with particular reference to decisions being made in each of the main recreation and tourism industry sub-sectors investigated is detailed below:

DMOs and Industry Organizations
These organizations include destination management organizations (DMOs), convention and visitor bureaus (CVBs), offices of economic development (OEDs), consultants, research centers, chambers of commerce, etc., which play an influential role in the industry as a whole.

CVBs, OEDs, and chambers of commerce promote, market, and encourage businesses to locate in their areas and promote tourist developments. State offices for travel and tourism track visitation but do not actively use weather and climate data for analytical purposes. State offices of economic development are engaged in attracting and keeping business in their local area and maintaining databases that provide economic information and data they consider useful for assisting organizations to make site selection decisions.

◆ CVBs use weather, ocean, and climate data in their marketing and promotional activities as well as being the purveyors of destination environmental information to inquirers.
◆ CVBs include weather and climate data in their bid proposals (such as bids to host the Super Bowl) by making a case that the weather is reliably better than in other “rival” venues and areas. They may use hourly data and compare environmental conditions in other, competitor cities.
◆ Recreation-specific weather and ocean condition information is required for activity oriented visits, sailing, surfing, aerial pursuits (gliding, flying, hang-gliding), fishing, etc.
Hotels, Resorts, and Theme Parks
Weather, climate, and ocean condition information in this sub-sector is underutilized. That which is used routinely was notably more on day-to-day weather rather than on longer-term climate trends (or ocean conditions). This may reflect the short term planning emphasis of business in general in the U.S. and the recreation and tourism industry in particular.

◆ **Investment Decisions**—These are made on the basis of potential profit against risk to equity, and climate may be a significant factor in identifying risks. Environmental parameters are being increasingly factored into the investment decision-making processes but usually as part of post-build revenue costs such as climate impacts on insurance, heating, and cooling costs.

◆ **Finance and Budgeting**—Weather, climate, and ocean condition information is not routinely factored into hotel and accommodation sector business forecasting models or directly accounted for in financial forecasts and budgets. Indirect allowances may have to be made for weather and climatic conditions resulting in the purchasing of materials and resources to prepare for emergencies or to deal with damage after an event. “Seasonality” may be taken into consideration as a climate related variable in the hotel and resort sector’s forward budgeting.

◆ **Siting of Hotel and Resort Development**—Business decisions to locate in a specific place are taken more on “strategic location” considerations from the standpoint of where a hotel group or brand needs representation. Decisions are “location driven” only in that certain places are where business and pleasure travelers want to be and are not directly driven by weather and climate, unless predictions of factors such as sea-level rise will alter the desirability of the destination area.

◆ **Design and Landscaping**—Monthly climatic maxima and minima are of particular interest to architects and builders; the design temperatures are determined in part by local/regional Building Codes.

◆ **Construction and Property Maintenance**—Weather patterns at different times of the year determine the optimal time to build, particularly if exterior developments are taking place at locations where there is a discernable “wet season” (e.g., the average number of days rainfall is expected may be included in estimated build completion times). Additionally, property maintenance is an important factor in increasing resilience to storms and weather induced stress on the fabric of buildings. Coastal storms, wave damage, and beach erosion are factored into the weather induced events.

◆ **Engineering**—Weather and climate forecasts help building engineers to forecast fuel usage and loads on boilers and other plants, and help in scheduling maintenance functions. Climate trends play a role in energy conservation, with data being used in Comparative Forecasting Models. Many of the larger hotels use computer-based programs to track their power consumption. Weather data in degree-days are used, and more sophisticated use of such data will be made to increase the accuracy of tracking energy use per square foot per occupied room in the future.

◆ **Risk Assessment**—Severe weather events, the impact of climate change, and rising sea levels pose significant risks. There are a number of strategies to manage and mitigate risk in business, including risk reduction strategies, risk avoidance measures and effective risk management, and preparedness. Obtaining insurance spreads the risk. Emergency plans produced by larger organizations are procedurally based and include guidance to
withstand potential risks (e.g., hurricanes, floods, earthquakes, blizzards, etc.) and contain pre- and post-event checklists and action plans.

◆ **Public Relations/Marketing/Communications**—Climate information is not a major feature of marketing or sales as they depend primarily on DMOs to “market” destinations. One function found to be using weather, climate, and ocean information in this operational sector was to counter public misconceptions of adverse weather conditions at resorts.

◆ **Specialist Resorts and Pursuits**—Weather conditions are critical to certain recreation activities such as winter sports. Two areas relevant to winter sports were cited:
  — *Operations*—to make decisions about snowmaking, snow grooming, staffing, etc. Resorts usually check weather up to 2 weeks in advance to plan based on estimated expected snow levels.
  — *Marketing*—information (snow conditions, skiing information, weather information, etc.) is made available directly to the public as part of the marketing of skiing conditions directly and via journalists. Good weather and snow conditions are favorable for business, and as the skiing season is short, conditions are widely publicized to encourage business.

◆ **Regulatory Compliance**—A raft of regulations impact the recreation and tourism industry. Health and safety and environmental regulations often require affirmative action. Theme parks, for example, cover many acres of land and have to comply with EPA regulations to monitor specific conditions such as run-off, hence they have a reporting requirement to detail run-off conditions after heavy rain.

**Sports Facilities**

Weather affects the condition of pitches and sports fields and determines maintenance activities.

◆ The weather determines field/grounds management activities such as: watering, fertilizer and pesticide application, seeding, aircification, grass cutting, as well as decisions on staffing levels.

◆ Relative humidity, ambient air temperature, and sunlight are critical factors in field/grounds/course management. The number of hours of direct sunlight per day affect conditions and will vary at different times of year. Weather information is used in the application of anti-dew agents to keep fields dry and is also used in disease management and use of chemicals.

**Recreation and Tourism Facility Insurers and Brokers**

All recreation and tourism activities carry a level of risk: the extent and sources of risk vary within economic activity sub-sectors. The insurance sector plays a key role in helping to spread the inherent risks to which the industry is exposed and by stipulating standards of construction and maintenance for facilities as well as operating practices for recreation and tourism activities. Insurance companies’ requirements to some extent dictate standards with the threat of denial of cover. In the recreation and tourism industry where companies are dealing with issues of public health and safety, service providers have to be adequately insured.
Some examples of the requirements and uses of the information are:

◆ Insurers collect weather, climate, and ocean data on (for example) storm damage, from which they may specify their own structural requirements. Items such as window units, glazing requirements, and attachments may be stipulated by insurers depending on the risks identified. (Underwriters analyze data of weather risks and hazards for every property.)

◆ Many hotels and resorts are sited on coastal areas and on beaches, and these properties are more exposed to weather hazards, which are reflected in the conditions of insurance.

◆ Some insurance brokers issue “alerts,” warning of impending severe weather conditions.

◆ Insurance carriers set a premium rate based on the probability of claims occurring and the potential financial extent of associated losses. Claims are often weather, climate and natural hazard related: for instance there is an increased likelihood of losses on properties situated on coasts. (Insurance companies have meteorologists to advise on the risk of exposure to loss due to severe weather.)

◆ Insurance premiums are partly set on the basis of past experience of losses. Insurance providers generally sub-divide individual states into “territories.” Trends are established by assessing data over 3 to 5 years for basic losses and for catastrophe data over a longer time period. Mathematical models are used to analyze catastrophic losses. This determines what the rating structure should cover. Generally this is projected 18 months ahead. Underlying experience and past events and trends are the key factors determining the insurance premium (and deductible).

**Marine Transportation, Cruise Lines, and Aviation (Private and Commercial)**

Essential elements of the infrastructure of the recreational cruising, sailing, and boating sector are the ports and marinas which provide safe mooring, re-fueling facilities, embarkation, and disembarkation facilities, provisions, and pilot services and act as a focal and meeting point (e.g., through sailing clubs).

Both the aviation (commercial and private) and cruise industries are more weather sensitive than most other sub-sectors in the recreation and tourism industry: weather is a key determinant for critical operational and safety decisions. However, weather, climate, and ocean conditions are underutilized by the marine transportation, cruise lines, or aviation business planning as business forecasts are usually planned 2 years in advance. This part of the industry needs environmental predictions in the multiyear range.

In commercial aviation every airline has a meteorology department as the weather is a crucial variable in the aviation industry and weather and climate data are a key input into revenue modeling. There are direct economic repercussions for the travel and tourism industry from high altitude weather patterns. Thus, there are certain times of the year when tour operating companies and airlines will not oversell tickets, for example, at times of year when there are strong headwinds.

Selected examples of information needs are:

◆ Ship deployment schedules are seasonally determined (e.g., in winter most of the cruise lines concentrate on Caribbean cruises and in the summer cruise Alaska). Seasonal to
annual forecasts of weather and ocean conditions in home as well as destination port and along the cruise track are needed.

- Routing decisions or routing alterations are made in response to weather conditions. Route planning criteria are different for passenger ships as opposed to cargo ships (e.g., fuel economy is a priority to cargo ships, whereas passenger comfort and safety are key considerations on cruise ships).

- Cruise lines do not routinely factor in weather, climate, and ocean information into their business planning as accurate long range weather forecasts that cover the planning horizon are of insufficient temporal and spatial resolution for their purposes. Therefore, enhanced multiyear forecasting at port areas is essential.

- Weather and climate data are used to calculate the weight and balance of an aircraft. It is essentially an engineering model, which is a function of temperature and wind speed and is a function of the “zero dynamics” of an aircraft. Greater accuracy (6 hours) in the weather forecasting would result in more accurate estimation of aircraft load capability.

- Business forecasts are usually constructed for at least a whole year. Some trends are predictable as in the case of summer season travel where the probability of good weather is better and families tend to take vacations during school holidays. Therefore, projections of summer extended weather and ocean conditions are of particular use to this planning function of the industry.

- Carriers, in deciding on new airports as “hubs,” will assess how many days they are usable from a climatological assessment. Site specific environmental conditions on the time scale of years to decades is necessary here.

- Temperature is one of the most important factors for trimming the plane for takeoff. At very high temperatures, the fuel is more volatile and safety issues restrict operations. Therefore, more accurate forecasting of temperatures over 120°F, 6 hours in advance is required.

- In addition, the airlines stress that wind profiles (particularly associated with storms) 6 hours in advance to 35,000 ft. as well as lightning prediction is essential in the vicinity of airports in high tourist destination areas.

- When the weather conditions are below an optimum level airline expenses rise considerably, so a percentage cost is built in to the price of tickets to cover the added costs of poor weather conditions. Airlines are not insured against weather conditions. They hedge these risks through the pricing mechanism which factors in weather prediction.

- Less than optimal flight weather conditions are a statistical cost that cannot be predicted one year in advance in order to model the additional costs accurately for business planning purposes. From one to three percent additional costs are usually attributable to weather conditions.

- Conditions in the upper atmosphere especially convection conditions and thunderstorms are a prime concern of airlines and private pilots and may lead to re-routing decisions.

- Fog is the main factor of concern in ports. Statistical data such as the percentage of days per year it is foggy is relevant as well as how many days per year are there high winds. Ports rely to some extent on their own observations as well as on available historical data.

- Port Operations Departments work closely with the Coast Guard on emergency preparedness and management.
**Emergency Management**

Vulnerability to severe weather, climate and ocean conditions which may lead to catastrophic loss, affect the recreation and tourism industry in particular as a significant proportion of the industry is located in coastal areas and in inherently environmentally unstable locations. Local Offices of Emergency Management (OEM) work closely with other emergency services and with all economic sectors including the recreation and tourism industry. The role of Offices of Emergency Management include:

- Carrying out preliminary and subsequent detailed damage assessments;
- Building disaster awareness in local communities by informing the public about emergency preparedness, in particular against severe weather events;
- Working with ports and marinas to ensure all recreation boats are out of the water in the event of severe weather being expected (e.g., hurricanes); and
- Issuing warnings at times of imminent danger to hotels and other industries, if severe weather may endanger property and/or lives (many offices are now working towards installing better on-line information systems directly through to properties).

**Conclusions**

The research has shown that there are both direct and indirect influences of weather, climate and ocean conditions on the industry. For example, golf resorts may claim that the weather has little affect on their business (golfers will play rain or shine, hot or cold), but the weather significantly influences decisions concerning the golf course maintenance regime. This includes decisions on watering regimes, fertilizer application, pesticide/weed killer application, seeding programs, staff management, etc. Despite the fact that it is difficult to draw any generalized conclusions from such a diverse industry, it was possible to identify certain trends, which are detailed in the following.

The implicit and explicit influences of weather, climate and ocean conditions operating on decision-making processes were identified through the expert witness interviews. While some hotels and resorts claimed that weather and climate do not affect their marketing or site selection decisions, the locations of resorts are where it is implicit that the weather will be consistently ‘good’ for specific recreational activities such as sunbathing or skiing.

It is significant that travel patterns are often related to the weather, climate and ocean conditions at the point of visitor origin rather than at the destination (e.g., winter visitors to Arizona escaping the cold winter weather further north). Travel patterns show distinct seasonal variability: most reservations are made at least 6 months in advance on the basis of what the weather will be like based on historic trends. However, there is a customer acceptance of a degree of uncertainty of the actual weather on arrival.

The main factors influencing the location decision-making process include: competitor presence, accessibility and transport services, infrastructure, local ‘attractions’, local labor pool, natural environment, visitor services, etc. Parameters such as insurers requirements, local by-laws, federal regulations, planning zone and building code requirements are superimposed on the primary factors of location. The ‘clustering’ propensity of the hotels sub-sector means that initial developers (i.e., the ‘first movers’), generally establish that an area is economically viable. Once this has been confirmed by high occupancy rates and sales,
other businesses move in on a “copycat” basis rather than as a consequence of any detailed analysis such as environmental characteristics of the location.

The research found that weather, climate and ocean conditions are not sufficiently integrated in business forecasting models. One of the most significant characteristics of the recreation and tourism industry is that the majority of the industry is in the small business category. Not only do these businesses not have the wherewithal to meaningfully incorporate weather, climate and ocean data into their decision-making processes, but they rarely use any formalized business models or forecasting procedures at all. Weather, climate and ocean data are primarily used by the industry for short-term operational activities.

The investigation found limited perception of the financial benefits of operational use of weather, climate and ocean information. In the following operational areas, the financial benefits of weather, climate and ocean information is taken into consideration:

- Resort design;
- Building materials and construction;
- Landscaping and planting;
- Course and pitch maintenance;
- Property energy management; and
- Insurance cover.

In addition, weather, climate and ocean information was perceived influential for functions such as:

- Bids for hosting sports and other events;
- Route planning: marine transport, cruise industry, pleasure boating and aviation;
- Emergency preparedness and management;
- Risk management; and
- Forecasting year-on-year seasonal travel patterns and flows (conditions at source and destination).

There have been no definitive studies carried out to date quantifying the financial benefits of specific temporal or spatial scale weather information but it could be substantial and identifying and quantifying such potential benefits may be a mechanism for increasing the uptake of weather, climate and ocean information. One repeated comment from respondents was that significant financial benefit would accrue from more accurate short-term information (which would help reduce the ‘window of disruption to business’), and accurate long-term predictions which could be factored into business models used by large operators.

It was found that improved prediction and visualization of weather, climate and ocean conditions at periods of 3 to 12 hours would benefit certain activities such as aviation, power supply (load forecasts), energy trading, pest control and construction. Improving the accuracy of longer-range forecasts (e.g., 10 days) would allow enhanced forward planning for specific of activities. Additionally, linking seasonal climate forecasts with quantitative risk management models and strategies would benefit many economic activities.
Requirements of the U.S. Recreation & Tourism Industry for Climate, Weather, & Ocean Information

Processing climate information into packages targeted at specific niche markets is another potential mechanism for increasing the uptake of data use. It was observed during the research that a number of private companies are already exploiting this opportunity.

The relationships between weather, climate and ocean information and the recreation and tourism sector vary largely according to specific operations. The ‘type’ of weather, climate and ocean data found to be used across the sector varied between:

- Future forecasts/predictions;
- Historical data; and
- Real-time data.

Publicly available or published sources of weather, climate, and ocean data were frequently supplemented by on-site monitoring, the use of tailored subscription services, or individually tailored consultant’s services in a number of instances.

It was found that there is a prominent interest and concern about severe weather conditions and particularly the ‘risks’ to business operations as well as the associated safety hazards. For the present purposes, weather and climate risk is defined as the possibility of injury, damage to property, or financial loss owing to severe or extreme weather events, unusual seasonal variations such as heat waves or droughts, or long-term changes in climate or climate variability. Strategies for mitigating or coping with weather and climate risk are sometimes adopted by business, but climate change is seldom considered significant and factored into business forecast models.

The terrorist attacks of September 11, 2001, severely affected the travel and tourism industry. The most significant impact being that in all business sectors there is a desire to limit all risks (including weather conditions, location decisions, and severe weather mitigating measures). This relates not only to security issues but to minimize the overall business risk to organizations.
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1. Background

“2.2 Trillion dollars of the U.S. economy is affected annually by weather.”

John A. Dutton,
The Pennsylvania State University

1.1 Introduction

The National Oceanic and Atmospheric Administration (NOAA) has in its mission statement the responsibility for the production and distribution of U.S. weather, climate, and ocean information products. It is emphasized that NOAA is “dedicated to enhancing economic security and national safety through the prediction and research of weather and climate-related events and providing environmental stewardship of our nation’s coastal and marine resources.” NOAA’s success has resulted from its ability to constantly identify new ways to improve forecast accuracy through enhanced models and observations and through interpretation of historical data sets.

The Agency has hitherto primarily judged the value of its environmental information products on their robustness in delivery and the accuracy of the predictions. The products range from raw data to those structured to meet the needs of specific information users, including aviation, maritime, defense, farming, and the media. The way forward for NOAA, together with its industry partners, to maximize its potential to benefit the U.S. economy is to further develop the products to include the needs of different industry sectors. This will require a better understanding of the needs of existing weather, climate, and ocean information users and the identification of users who have yet to exploit the potential value of NOAA information.

If NOAA is to successfully develop new business models and products it must monitor them on an ongoing basis to assess their value to prioritize work and ensure that products continue to meet the changing needs of their users both internal to NOAA and outside. However, as NOAA is often one step removed from its users, it is sometimes difficult to assess how users react to the information product they receive or, indeed, whether potential users are fully aware of all the products that NOAA supplies that may be of use to them.

“Stakeholder” meetings, user groups, and active teaming with the value-added community for product development are all part of NOAA’s interactions with its users. Nevertheless, because the user base of NOAA products is distributed widely among many sectors and industry groups, it is still problematic to assess the overall benefits of the information provided.

A complication for NOAA is the diversification of sources of weather, climate, and ocean data and information (often accessible through the World Wide Web). These sources may be using NOAA data or may use other information sources as a basis for their value-added products and services. Many such sites are run by special interest groups or industry organizations and may be posting secondary data on their sites.
1.1.1 The Purpose of This Report

The overall purpose of this report is to ascertain the requirements of business operations in the recreation and tourism sector for environmental information, in particular for climate, weather, and ocean data. As part of this process the data currently being utilized, its origins, its potential costs, and the decisions for which it are used will be summarized. The requirement for improved data and information will be assessed. The report seeks to encompass the broadest interests of the industry to gain a comprehensive assessment of its particular needs.

1.1.2 Definition of Terms

‘Leisure activities’ may be defined as the sum of tourist activities and recreational activities undertaken by the public.

‘Tourism’ refers to recreational activities by participants who travel at least 50 miles from home or spend at least one night away from home.

‘Recreation’ describes activities close to the participant’s home. Although it is not commonly thought of as a leisure activity, business travel is often included in this sector as it is usually considered part of tourism1.

In order to identify the various activities that comprise the recreation sector a list of activities and interests has been compiled in Appendix F. Many of those listed comprise minor activities, which will not be considered in detail in this study.

1.1.3 Scope of This Study

The geographic extent of the study covers the United States, Puerto Rico, Canada, and the Caribbean. For the purposes of the analysis of the industry, it has been sub-divided into ‘recreation’ (concentrating on the more popular leisure activities rather than minority interests), while the ‘tourism’ sector is reviewed under the standard sub-divisions of:

◆ Hospitality (accommodation, food service);
◆ Distribution (destination management organizations, tour operators, etc);
◆ Transport;
◆ Visitor attractions (theme parks, natural resources, etc.); and
◆ Host city infrastructure.

For each of these sub-sectors, the operations that are most sensitive to weather, climate, and other environmental variables are identified as determined by research into the industry and from input of experts in the field. For these segments the specific environmental information and data needs have been determined and the mechanisms these are factored into (operating models, plans, and company projections) identified.

In view of the disparate nature of the industry and many recreation activities appealing to a small segment of users, only the major sectors of the recreation sub-sector have been evaluated.

1.1.4 Approach and Methods
A number of approaches were used to obtain an objective view of the needs for environmental information products in the recreation and tourism sector including expert witness interviews and extensive research into the business processes and influences on the industry. An analysis of the derived parameters was used to obtain an accurate ‘snap-shot’ of the way the industry operates, the principal influences acting upon it, and its perceived needs. The research, discussions, and analysis were focused on the overall needs of the industry for weather, climate, and other environmental information products. A number of major recreation and tourism trade associations were used as expert witnesses and as a link to establish a network of contacts within the industry.

The first section of this report analyzes the scope, trends, and significant economic and other data pertaining to the recreation and tourism industry. A list of the major companies, associations, and research bodies that need to be included when assessing the needs of the industry has also been compiled. The regulatory environment and implications of recent policy changes on the recreation and tourism industry has also been addressed. Understanding the key motivating forces of the industry is central to determining the needs for environmental products and ultimately dictates how the products are used. This detailed analysis as to how information flows within individual businesses is critical to assessing the value of any environmental information product to the private sector.

Expert witness interviews were conducted over a four-month period between November 2001 and February 2002. The results of the interviews are compiled in tabular form.

Attention has been paid to the development of the recreation and tourism industry as reasons for certain locational decisions may be influenced by weather, climate, and ocean conditions extant at certain locations.

The above approach sets the context for the investigation and influenced the approach and methodologies employed in the research scheme. This provided the basis of a framework in which to organize the issues and needs identified as an outcome of the research.

A case study was made of one of the largest hotel and resort groups to gain an understanding of the functional divisions of departments and to gain insight into the specific considerations and procedures adopted in each operational area. Two contrasting states where income from tourism represents a high proportion of the SDP (State Domestic Product) have been focused on: Florida, prone to severe weather events (hurricanes and tropical storms), and the other, Arizona, regarded as ‘safe’ from weather or climate hazards.

The case study approach provides an in-depth understanding of selected sectors and functions within the sectors, which may or may not be weather and climate-dependent or weather and climate-influenced. These included a hotel and resort group.
1.2 Background and Description of the Recreation and Tourism Industry

1.2.1 The Global Context
Tourism has emerged as a leading economic sector worldwide and has boosted international trade and opened up countries and geographic areas. Tourism is a significant vehicle for economic progress that generates employment, foreign exchange, tax revenues, and contributes to higher standards of living. The further development of tourism activities is commonly a component of economic development objectives. Tourism’s links to other economic sectors are also strong. World tourism grew by 260% between 1970 and 1990.

The World Travel and Tourism Council (WTTC) highlights the following global condition of the broadly defined travel and tourism industry, which includes both leisure travel and business travel:\(^2\):

- GDP output was $3.5 trillion in 1999;
- Accounts for 11 percent of all international consumer expenditures, 11.3% of all capital investment, 6.7% of all government spending;
- Is the world’s largest tax contributor with an estimated $800 billion contribution in personal and corporate taxes for 1999;
- Accounts for over 25% of the world’s trade in services;
- Is the world’s fastest growing industry, expected to become the largest industry (outside of agriculture) by 2010; and
- Is the world’s largest employer next to agriculture, providing direct or indirect employment for 200 million people or one out of every 12 workers\(^3\).

The WTTC includes in travel and tourism:

1. Personal consumption of transportation, accommodations, catering/retail, recreation/cultural services;
2. Capital investment made by travel and tourism companies;
3. Government operating and capital expenditures that make travel and tourism possible; and
4. Business travel expenditures by companies and governments.

1.2.2 The United States
The recreation, travel, and tourism sector is a diverse group of industries comprising an essential component of the US economy supplying goods and services purchased by leisure, business, and other travelers. These industries include the lodging industry, the airline industry, travel agents, tour operators, tour guides, car rental companies, meeting and convention planners, restaurants, resorts, amusement parks, camping and recreation areas, natural attractions found in parks and forests, and other suppliers of all these businesses\(^4\).

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\(^{2}\) World Travel and Tourism Council, Travel and Tourism’s Economic Impact, March 1999.

\(^{3}\) Tourism provides employment directly (hotels, airlines, tour operations) and indirectly (hotel construction, restaurant supply). The hotel sector is very labor intensive.

\(^{4}\) Department of Commerce (DOC).
The sector has significant environmental and socio-economic implications. These are not directly related to the mainstream of this report but provide important background information; a brief summary of these areas is therefore appended to this report at Appendix F.

The structure of the recreation and tourism industry is very fragmented, and there are fewer frames of reference than exist in other industries; consequently, the core unit of information required is generally the ‘size’ of the market. There are so many large and small players in the accommodation and hospitality marketplace (for instance) that it is very difficult to estimate what the market share of a particular hotel brand is at any one point in time. Consequently, it is difficult to ascertain supply and demand in the same way as other industries.

The company and branding structure of the hospitality industry in the U.S. marketplace is quite different from other areas in the world: in the U.S. 75% is branded properties (e.g., Marriott, Sheraton, etc.) whereas outside the U.S. this accounts for only 25%. In other areas of the world hotels are often owned by tour agencies (e.g., Air Tours Ltd.), but in the U.S. tour operators reserve travel arrangements, and the accommodation at the destination will be in one of the large branded properties. However, it is a perceptible trend in Europe that consolidation is occurring.

1.2.3 The Caribbean Region
1.2.3.1 Recreation and Tourism

Tourism is one of the most important economic activities in the Caribbean, contributing to over half of Gross Domestic Product (GDP) in many countries. Tourism represents 31.1 percent of the overall GDP of the Caribbean region and provides nearly 3 million jobs. The share of tourism in GDP ranges from a third to a half for most countries and is 60 percent or more in the Bahamas, the Cayman Islands, the U.S. Virgin Islands, and St. Lucia. Moreover, tourism continues to grow, in most cases at a higher rate than GDP as a whole.

Caribbean countries rely directly on their natural environment and climate for economic growth and development and as the main impetus for attracting visitors, both land based and cruise ships. The essential draw of the Caribbean is the three S’s: sun, sea, and sand. The importance tourism plays in the aggregate economies of Caribbean states has resulted in agriculture ranking as third in the economies of most islands, and the manufacturing sector is small.

While the U.S. and Europe dominate the list of the 15 most important tourism destinations in terms of total receipts (9 out of 15 destinations), if tourism is considered on a per capita basis, the countries of the Caribbean constitute a significant portion of the market. Table 1 shows that when tourism is listed in terms of receipts as a share of GNP or exports, and on a per capita basis, the countries of the Caribbean occupy 9 of the top 15 spots (Dominica is number 16) in terms of share of GNP, and 10 of the top 15 in terms of tourism’s share of exports. Tourism is thus an important economic business and the environment, on which much of it depends, an important economic asset. Tourism and the environment are crucial as

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5 Andersen Consulting, pers. comm.
6 Ibid.
generators of GNP (both nationally and per capita) and as an export industry. The latter is particularly important in the Caribbean where tourism receipts pay for much of what is imported, both to service the industry itself and also to pay for the imported commodities consumed by the populations of each country\textsuperscript{8}.

<table>
<thead>
<tr>
<th>Country</th>
<th>% GNP</th>
<th>Country</th>
<th>% Exports</th>
<th>Country</th>
<th>Per Capita (US$)</th>
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<td>St. Vincent &amp; Grenadines</td>
<td>495</td>
</tr>
<tr>
<td>Dominican Republic</td>
<td>13.9</td>
<td>Gambia, The</td>
<td>24.0</td>
<td>Ireland</td>
<td>463</td>
</tr>
</tbody>
</table>

Source: IFC/World Bank/MIGA, 2000

Table 1. Tourism Receipts as Percent GNP and Exports, and Per Capita

1.2.3.2 Threats to the Environment of the Caribbean

Threats to the natural environment of the Caribbean arising from the pressure of high tourist numbers have been well documented. Congestion, pollution, and erosion are environmental problems exacerbated by high tourist numbers. In some locations coral reefs are an important part of the resources used by the tourist sector, for uses including snorkeling, fishing, and diving. Reefs are an important factor in ameliorating the impact of storms on the coastline, and overuse can severely damage reefs and reduce these benefits. Environmental legislation is almost non-existent in most Caribbean states, and current laws are often overlooked in the name of development\textsuperscript{9}.

A particular problem is ship-generated waste. Difficulties have arisen attempting to get a coordinated response as this problem is not confined to one country in the region. The ‘Wider

\textsuperscript{8} Ibid.
\textsuperscript{9} Caribbean Alliance for Sustainable Tourism (CAST), pers. comm.
Caribbean Initiative for Ship Generated Solid Wastes Project is an example of how such a problem can be addressed. Financed by the GEF, it has provided incentives and a framework for the various players and cruise lines to work together. Almost all ship-generated waste is currently discharged at sea, polluting international waters and coastal zones and in some areas threatening the tourist trade. The high volume of cruise and commercial ship traffic in the Caribbean and the dependence of the region on its coastal areas for income and employment make it particularly vulnerable to this problem. In 1991 the Wider Caribbean Sea was designated a “Special Area” under Annex V, on ship-generated waste, of the MARPOL 73/78 Convention.

The Wider Caribbean Initiative for Ship Generated Solid Wastes Project is designed to redress and prevent further pollution of international waterways in the area. To be effective, port reception and waste facilities need to be established throughout the Caribbean region, and a regulatory framework must be in effect throughout the region, otherwise pollution will travel with the currents.

1.2.4 Structure of the Recreation and Tourism Industry

The recreation and tourism industry is a large and highly diverse industry. It includes many sub-sectors catering for an enormous range of leisure interests and travel requirements. A brief description of the recreation sub-sector is given in Section 8 and of the tourism sub-sector in Section 4 of this report. The travel and tourism sector is usually broken down into five standard sub-sectors:

1. Hospitality
   - Food service
   - Accommodation
2. Distribution
   - Travel Agents
   - Tour operators
3. Transport
4. Visitor Attractions
   - Man-made (theme parks, marinas, golf courses)
   - Natural (e.g., natural parks, coast, lakes)
5. Host city/infrastructure

A high level of interaction occurs between each of the sub-sectors. Figure 1 below shows the main economic areas of the recreation and tourism industry.

1.2.5 Trade Associations

There are a number of trade associations that look after the interests of main sub-sectors in the recreation and tourism industry. For many of the smaller businesses in the industry, the trade associations are the conduit for up-to-date information; provide a range of support services; and act to lobby for the interests of various sub-sectors in the industry. The representative organizations are both large and small; a description of a selection of these organizations is summarized in Appendix H.
Figure 1. Main Structural Components of the Recreation and Tourism Industry
Federal & State Planners, Regulators, International

State Recreation Plans
Building Codes, Tax Rules

Commercial Resort & Recreation Planners, Architects, Landscape Architects, Designers

Funders, Investors, Owners, Shareholders, Developers, Finance Developments, Design Facilities, Building & Construction Financing

Builders, Construction Companies, Port Developers

Accommodation, Hotel Managers, Franchises, “Chain” Operators, Restaurants, Cruise Lines, Resort Managers

Support & Subsidiary Organizations, DMOs, Retailers, Services (e.g., Laundry), Business Consultants, Trainers, Research Organizations, Industry Organizations, Trade Associations, NGOs

Figure 2. Environmental Information in Policy and Planning of the Tourism Industry
1.2.6 Metrics Used in the Accommodation Sector

Business forecasting for the industry is usually at macro-level—it is a broad-based industry assessment. There is unlikely to be any general business models that would be helpful to determine the effects of weather, climate, and ocean conditions on the industry\(^\text{10}\).

Appendix G shows the in-bound movement of visitors to individual states. A number of different metrics, which are commonly used to measure the ‘health’ of the recreation and tourism industry are shown in table 2 below:

<table>
<thead>
<tr>
<th>Industry Metrics</th>
<th>Applied to</th>
<th>Organizations Producing Metrics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Revenue per available room (RevPar)</td>
<td>Accommodation sector</td>
<td>PwC, STR</td>
</tr>
<tr>
<td>Occupancy rates</td>
<td>Accommodation sector</td>
<td>STR</td>
</tr>
<tr>
<td>Occupancy percentage</td>
<td>Accommodation sector</td>
<td>STR</td>
</tr>
<tr>
<td>Average Daily Rates (ADR)</td>
<td>Accommodation sector</td>
<td>STR</td>
</tr>
<tr>
<td>Comparative Operating Rates (COR)</td>
<td>Accommodation sector</td>
<td>JLLaS</td>
</tr>
<tr>
<td>Gross Operating Profit (% before fees)</td>
<td>Applied across the industry</td>
<td>IFC</td>
</tr>
<tr>
<td>International arrivals(^\text{11})</td>
<td>Travel sector</td>
<td>WTTC</td>
</tr>
<tr>
<td>Journeys made</td>
<td>Travel sector</td>
<td></td>
</tr>
</tbody>
</table>

Key to abbreviations above:
- PwC: PricewaterhouseCoopers
- STR: Smith Travel Research
- JLLaS: Jones Lang LaSalle–Hotel
- IFC: International Finance Corporation
- WTTC: World Travel and Tourism Council

Table 2. Recreation and Tourism Industry Metrics

Following the standard supply and demand rules, when occupancy rates fall, average room prices tend to fall as well, leading to economic stress on the industry.

There are a number of business models developed for the industry by academic research organizations and others, but these are not widely used in the industry. This is primarily because few people know about them\(^\text{12}\).

1.2.7 Travel Trends and Forecasts

With increases in disposable income and leisure time over the past two to three decades, travel and recreation has become a high profit and high growth industry. While industry research and representative organizations such as the Travel Industries Association of

\(^{10}\) TIA, pers. comm.

\(^{11}\) The World Tourism Council (WTO) statistics indicate between 1950 and 1999 international tourist arrivals worldwide (U.S. included) grew by almost 7%, from 25 million to 663 million. Growth is forecast at about 4% per annum for the next decade (approximately 1 billion international arrivals are projected for 2010). International tourism receipts have grown 10% p.a. from $2 billion in 1950 to $453 billion in 1999. This amount is exclusive of domestic tourism spending, which in many countries accounts for the bulk of the spending.

\(^{12}\) IACVB, pers. comm.
America (TIA) produce a wealth of statistics and trends analyses about the leisure and tourism industry, they do not pay any attention to the weather in a formal sense as a determinant of leisure or travel trends. However, the TIA does produce ‘seasonal forecast data’.

TIA’s travel forecasts include both domestic and international visitation, travel price inflation, and travel expenditures. The modeling system is a combination of national time series models and regional models, estimated with cross-sectional time series data by major categories of person-trips. Historical time-series data from TIA’s TravelScope® consumer travel survey (Travel Price Index and Travel Economic Impact Models) are linked to forecasts of macroeconomic indicators from DRI-WEFA’s U.S. Economic Service and Regional Information Service. Person-trip forecasts are benchmarked to the TravelScope® time-series. The forecasts are updated in May and October each year.

Travel Forecast Summary (Complimentary Report): A summary table including 2000-2003 annual estimates of travel volume, travel expenditures, and travel price index, as well as GDP and other macroeconomic indicators.

Annual Travel Forecast (Available to TIA Members Only): 2000-2003 annual estimates with domestic person-trips by purpose of trip, mode of transportation, and type of the lodging.

Detailed Travel Forecast (Subscribers Only): A searchable database containing annual and quarterly estimates of domestic person-trips by census region and travel characteristics, including purpose of trip, mode of transportation, and type of lodging. The database covers 2001-2002 quarterly and 2000-2003 annual estimates.

Seasonal Travel Forecasts estimates U.S. resident domestic pleasure travel volumes by season (fall, winter, spring, and summer). The forecasts are based on TIA’s U.S. travel forecasting model, historical TravelScope® consumer travel survey data, and a survey of U.S. adults’ intentions to travel in the upcoming season.

1.2.7.1 Long-Term Growth

The customer base of recreation, travel, and tourism is extending to include both younger and older customers. Additionally, the customer base is becoming more sophisticated and is demanding a wider range of products, many of which are specialized.

Developed countries are undergoing major demographic changes that will directly influence the future trends and patterns of recreation and tourism. More employers are extending holiday allocations, and more of this time is being used for travel. Two income households generally have more disposable income but often have difficulties arranging long vacations, which encourages a distinct trend toward shorter, more frequent vacations. The increasing population of physically healthy, mobile, and affluent older people is also having a major impact on the industry.

These trends and others are leading to the development of new and specialized products. Additionally, continued deregulation of the airline industry is likely to result in cheaper and more frequent travel on an extended choice of air routes (assuming the effects of 9/11 are temporary).
As the travel industry expands, users of services are becoming more discerning and sophisticated and are demanding higher quality and increased value. The homogeneous mass-market is being supplanted by a multitude of niche markets where nature, education, cultural interaction, and healthful pursuits are gaining in importance. Mass-markets will continue to cater for the young, budget conscious, and specific sectors, such as: the all-inclusive vacation, gaming, mega-theme parks, and the cruise business\textsuperscript{13}.

An increasing trend is for ‘life-style’ vacations, i.e., activity focused, which may attract a smaller specialist clientele.

1.2.7.2 Short-Term Effects
The travel, recreation, and tourism industry is vulnerable to adverse and extreme weather conditions, which result in variable profits and episodic and unpredictable damage costs. Clearly there is scope for ameliorating these problems by applying climate data to facilitate damage preventative measures and reduce the “window of disruption” caused by severe conditions.

The leisure and recreation industry in the United States is also highly vulnerable to security issues. Instances of U.S. citizens’ sensitivity to security issues include international travel/vacation rate falls, including:

- The events of 11 September 2001;
- Terrorists massacred tourists in Egypt;
- U.S. tourists kidnapped in the Philippines during 1998-2001;
- Plague in Western India in the mid 1990’s;
- IRA bombings in London;
- The foot and mouth epidemic in the UK; and
- The BSE outbreak in the UK.

The reluctance of Americans to travel even internally within the U.S. after the events of September 2001 has resulted in a sudden and unforeseen impact on leisure, tourism, business, and conference travel industries. Some of the economic impacts on the industry of the recent terrorist attacks may be temporary, but there may be long lasting effects: it is envisioned that business travel will be reduced with greater use being made of video-conferencing. Such changes may be financially and environmentally beneficial so companies may adopt these changed businesses practices on a more permanent basis.

The influence of weather, climate, and ocean conditions must therefore be assessed in the context of other influences and risks to which the industry is vulnerable. Extreme weather conditions have an analogous impact to the events described above, but there are subtler but just as financially important (in the long term) impacts from short-term weather conditions to long-term global warming.

\textsuperscript{13} IFC, pers. comm.
1.2.7.3  **Seasonal Tourism and Visitor Trends**

The majority of tourist movements are ‘seasonal’, and therefore climatically driven to a large extent. However, this is not a clear-cut relationship; for example, the highest tourist movements are in the summer when families are more dominated by school vacation breaks than strictly by the ‘weather’ *per se*.

1.2.7.4  **Accommodation**

Hotels/motels/B&Bs are used for over half (56%) of overnight trips in the US. This translates to 260 million overnight trips per annum, including a hotel/motel or B&B stay. Travel involving hotel/motel/B&B trips is more likely to be taken for business reasons (45% vs. 22%). Such travel is also more likely than average to be taken by air (34% vs. 18%). The average duration of a hotel/motel/B&B stay is 4.0 nights. One in six (17%) hotel/motel/B&B stays includes children.*

The main Hotel and Accommodation groups are listed in Appendix I.

1.2.7.5  **Travel Market Segments**

The Travel Industries Association of America (TIA) has identified specific travel patterns associated with sectors of the population. This is significant for the industry because when planning a resort for recreational activities, generally planners cater to particular market segments. There does not appear to have been any research into whether specific cohorts of the population are more or less sensitive to weather issues or conditions *per se*.

According to TIA research, weekend travel is increasing in popularity, with over half of all U.S. adults, nearly 103 million, taking at least one weekend trip per year. Compared to five years ago, day trips and weekend trips appear to be more popular today than trips lasting about one week or longer. Interest in longer trips lasting more than one week seems to be declining—43% of weekend travelers claim they are taking fewer trips than they did five years ago. It is important to note that most weekend travelers (42%) make last minute plans and select their destination within two weeks of their trip. Cities (33%) and small towns (26%) are favored destinations for weekend travelers, followed by beaches (16%), mountain areas (10%), lake areas (4%), state or national parks (3%), and theme or amusement parks (3%).

Vacation leave is usually favored for travel. Over one-fourth of employed travelers (28%) use all of their vacation time traveling to points at least 100 miles from their home, and two-thirds of employed travelers (65%) spend at least one-half of their vacation time traveling. On average, employed travelers spent 56% of their 1997 vacation traveling. If weekends are excluded, this translates to travelers spending about 8 days out of 14 vacation days ‘on the road’.

The TIA also found that business travel volume fell to 212.9 million person-trips in 2000, a 2.4 percent decline from 1999. This represents 34.2 million business travelers, about one in five (17%) of U.S. adults. Overall, business travel comprises 22 percent of total U.S. domestic person-trips. Over half (51%) of all business person-trips are taken for general business purposes (meetings, presentations, consulting, sales, etc.). About one-tenth (13%) of

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business person-trips are taken for the primary purpose of attending a convention or seminar. More than one-third (36%) of business person-trips are made by those traveling for combined business and pleasure purposes. Thirty-six percent of business person-trips include air transportation. Among overnight business trips, 85 percent include a stay at hotels, motels, or bed and breakfast establishments. About one in five (18%) business trips includes multiple adults from the same household; seven percent include children.

The learning/educational aspect of travel is important to U.S. travelers, with about one-fifth (30.2 million adults) having taken an educational trip to learn or improve a skill, sport, or hobby in the past three years according to the TIA. Eighteen percent of travelers in the past year said that taking such a trip was the main purpose of their travel. Overall, educational travelers are more likely than total U.S. travelers to be male (56%), younger (average 39 years), college graduates (49%), have a professional or managerial occupation (38%), have children in the household (51%), have a higher annual household income ($75,000 average [mean] annual household income), and are less likely to be married.

1.2.8 Representative Government Agencies Concerned with Tourism and Recreation

Federal agencies and organizations with an interest in the recreation and tourism industry and its effects on the economy and the environment include agencies within the Department of Commerce (DOC) such as the National Oceanic and Atmospheric Administration (NOAA), including the National Ocean Service (NOS), National Weather Service (NWS), National Marine Fisheries and National Environmental Satellite Data and Information Service (NESDIS). The Environmental Protection Agency (EPA) and the Department of the Interior’s National Forest Service have also commissioned studies on various aspects of the recreation and tourism industry.

U.S. Department of Commerce has a direct interest in recreation and tourism through the Tourism Industries International Trade Administration (ITA). The DOC also gathers economic data and reports on the condition and status of a wide range of activities and conditions. This baseline data reflects the state of the nation and its overall economic health. NOAA’s National Climate Data Center (NCDC) ‘Climate Indices for the Economy’ program aims to enhance the understanding of the effects of weather and climate on socioeconomic sectors in the U.S. The Indices program will be further developed to include sectors such as Tourism and Transportation and will be a useful measure of the influence weather and climate have on the economy as a whole.

The Tourism Policy Council (TPC) is an interagency committee established by law to ensure U.S. tourism interests are considered in Federal decision-making. Coordination of Federal activities and policies affecting tourism development need to remain steady and effective to maintain and grow the U.S. market share and fulfill tourism’s economic potential that will further community development, economic empowerment, welfare-to-work, and global competitiveness.

In 1995, the TPC defined a revised role for the Federal government in tourism development, emphasizing coordination among Federal agencies. The Strategy set out 52 recommendations, developed by the TPC with input from the U.S. travel and tourism industries. The discussion leading to those recommendations, and many of the recommendations themselves, contributed to the discussions of and priorities set by the 1995 White House Conference on Travel and Tourism.
The White House Conference on Travel and Tourism (WHCTT) comprised representatives primarily from industry personnel of President Clinton’s Cabinet, the Senate, the House, and state and local governments. They identified 10 top priorities for the U.S. in tourism development. There were also many other supporting recommendations. This National Strategy, entitled *National Travel and Tourism Strategy of the White House Conference on Travel and Tourism*, set out the goal of a public/private partnership that would draw on the strengths of both sectors in business, international commerce, employment, and revenue-generation\(^{15}\).

TPC member organizations have made efforts to implement the WHCTT recommendations of TPC agencies working individually, with each other, and with the private sector. A summary report outlines progress and accomplishments towards this end from October 1995 to February 1998\(^{16}\).

The EPA’s mission is primarily to protect human health and to safeguard the natural environment (air, water, and land). For 30 years, EPA has been working to promote a cleaner, healthier environment. The Agency is the first point of reference for U.S. environmental science, research, education, and environmental assessment. EPA works closely with other federal agencies, state and local governments, and Indian tribes to develop and enforce regulations under existing environmental laws. The Agency is responsible for researching and setting national standards for a variety of environmental programs and delegates to states and tribes with responsibility for issuing permits and monitoring and enforcing compliance. Where national standards are not met, EPA can issue sanctions and take other steps to assist the states and tribes in reaching the desired levels of environmental quality. The Agency also works with industries and all levels of government in a wide variety of voluntary pollution prevention programs and energy conservation efforts.

The EPA, as well as having an interest in the impacts of business and industry on the environment, also encourages environmentally sustainable business practices. The EPA recognizes that while business and industry can affect weather, climate, and ocean conditions, business and industry are, at the same time, largely dependent on weather, climate, and ocean conditions for their well-being. The EPA has also undertaken research into the recreation and tourism industry and its effects on the environment and worked to promote ‘ecotourism’ under its ‘Being a Responsible Traveler’ scheme.

### 1.2.9 Local Authority and State Agencies

State and local authority agencies concerned with recreation and tourism include economic development councils, chambers of commerce, tourist agencies, and local convention and visitor bureaus. Appendix K lists the State/Local Tourism Councils in the U.S.

The tourism sector is one of the economic areas in which the U.S. has a balance of trade surplus, literally “tourists bring in money”. Some States are more aware of the economic benefits of tourism than others. The State of Illinois has (unusually) a $45 million budget, mostly for advertising and promotion of tourism in the State, and this is considered as making a return on the investment; Illinois does not regard expenditure on recreation and tourism as “corporate welfare” as many states do. It is almost impossible to account

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\(^{15}\) DOC.

\(^{16}\) Summary of Federal Activities and Accomplishments in Travel and Tourism (October 1995–February 1998), Department of Commerce.
accurately for the economic benefits tourists bring in; for example, not all restaurant sales in a ‘tourist’ area are attributable to travel and tourism as only a percentage of sales may be tourist-based. In the U.S. tourism is a $580 billion industry in direct spending, plus indirect jobs (“people grow potatoes, which are used in hotel meals”\(^{17}\)). If these fringe aspects are taken into account, then the industry is worth trillions of dollars.

1.2.10 Coastal Tourism Resources

Coastal tourism and recreation in the United States comprise the largest and fastest-growing sector of the U.S. service industry, accounting for 85% of all tourism-related revenues. Coastal communities depend on healthy coastal ecosystems and clean coastal waters for their survival. However, rapidly growing coastal populations, increasing numbers of visitors (180 million annually), and unsustainable coastal development are resulting in the degradation of water quality and destruction of the habitats that are the main attractions of coastal areas. Although tourism and recreation-related development are major factors determining the use and management of U.S. ocean and coastal resources, this sector has not been the focus of policy, management, planning, and resource allocation\(^{18}\). Beaches are dynamic landscapes which respond and change with every tide, swell, and season.

1.2.10.1 Coral Reefs

The intergovernmental U.S. Coral Reef Task Force completed a national plan to comprehensively and aggressively address the most pressing challenges facing reefs today. As members of the U.S. Coral Reef Task Force, NOAA, the U.S. Department of the Interior, and other federal agencies worked with coastal states and territories in a cooperative effort to conserve reef habitats. Coral reef ecosystems are under increasing pressure, and the threats are primarily from human interactions. Specific pressures include:

- The overexploitation of reef resources (fish stocks have declined significantly in many reef areas, especially near centers of human population);
- Excessive domestic and agricultural pollution; and
- Poor land use practices that increase sedimentation\(^{19}\).

Tourism and recreation use of reefs on a large-scale are recent developments. Numerous figures are available describing tourist revenue from coral reefs, but these are not clearly defined or comparable. The coral reefs of Florida alone have been estimated to generate about US $1.6 billion annually from recreation uses. Figures for developing world countries are better expressed in other ways; for many Caribbean countries tourism is now the key economic sector, often providing over 50 percent of GNP, and growing rapidly. In 1990, Caribbean tourism earned US $8.9 billion and employed over 350,000 people. Divers and other special-interest tourists account for over one-fifth or more of this total. A 1981 Island Resources Foundation cost benefit study of the Virgin Islands National Park found that benefits (US $23.3 million, of which US $20 million were indirect) were more than ten times

\(^{17}\) TIA, pers. comm.
\(^{19}\) NOAA OGP ‘State of the Reefs—Global Perspective’ (undated).
larger than costs (US $2.1 million), which illustrates the economic benefits of marine protected areas (Dixon, 1993)\(^{20}\).

In the United States alone, coral reefs support millions of jobs. Every year, they contribute billions of dollars in U.S. economic activity from tourism, fisheries, and recreation.

U.S. coral reef ecosystems support billions of dollars in tourism annually, over $1.2 billion each year in the Florida Keys alone. Diving tours, fishing trips, hotels, restaurants, and other businesses close to the reefs provide millions of jobs and support many regional economies in the U.S. and developing countries. In Hawaii, gross revenues generated from just a single, half square mile coral reef reserve are estimated to be over $8.6 million each year.

Fifty percent of all federally managed U.S. fisheries species depend on coral reefs and associated seagrass and mangrove habitats for part of their life cycle. The annual dockside value of commercial U.S. fisheries from coral reefs is over $100 million. The annual value of reef-dependent recreational fisheries probably exceeds $100 million per year.

Coastal protection is a key value. Coral reefs buffer adjacent shorelines from wave action and thereby prevent erosion, property damage, and loss of life. They further protect the highly productive mangrove fisheries and wetlands along the coast, as well as ports and harbors and the economies they support. Globally, about half a billion people live within 60 miles of a coral reef and benefit from its production and protection\(^{21}\).

Tourism can be an environmentally friendly way of generating income from coral reef ecosystems but only when resort development and operation are carefully controlled. Unlimited collecting, sport fishing, and accidental damage by waders, swimmers, and boat anchors can all degrade the reefs that earn tourist dollars. Allowing sewage and other wastes from tourist facilities to pollute reefs, or siting resorts so that beach erosion increases, can be even more degrading to the health of the reef than the direct damage caused by visitors. There is increasing concern about rising sea levels having very serious consequences for nations situated on low, coral reef archipelagos.

The International Coral Reef Symposium (ICRS) was held in Panama in 1996. A project which is specifically designed to provide centralized access to information from these and other coral reef programs is ReefBase: the International Database on Coral Reefs. This project of the International Center for Living Aquatic Resources Management (ICLARM) seeks to gather a broad range of information about the status of the world’s reefs from papers, reports, and inputs from monitoring projects. The project includes an activity of the World Conservation Monitoring Center to digitize maps of coral reefs and to make them available through the database. The ReefBase project serves as a medium of information exchange for scientists and as a conduit of useful information to coastal planners and managers.

Degradation of coral reef ecosystems would have significant impact on world food sources, long-term negative economic impacts on fishery and tourist industries, and a devastating


\(^{21}\) The Coral Reef Crisis & Groundbreaking Coral Reef Task Force Actions NOAA News, (undated).
effect on millions of people around the world for whom coral reefs represent the primary source of livelihood (IUCN 1993).\textsuperscript{22}

The development and implementation of integrated coastal zone management strategies to effectively manage coral reef ecosystems are necessary. These strategies should address human activities in the coastal watershed and marine areas and involve combinations of a number of integrated actions. These include public education (including education in the use of traditional forms of reef tenure and management and education on sustainable use practices); community development; economic incentives and alternative income generation; global or regional legal instruments used in an efficient manner as well as strengthened for the conservation and sustainable use of coral reef ecosystems; management of tourism and recreational activities (e.g., education programs, installation of mooring buoys); management of land-based activities and coastal development, e.g., using environmental impact assessments (EIA), wise siting of facilities; and coral reef ecosystem monitoring, mapping, database creation, and restoration.

Combining these management techniques is critical for success. If used alone, these techniques tend to be ineffective over the long term. They must be strongly supported at scales ranging from the village to nation, and often at the regional scale as well. They must be oriented toward long-term sustainability of reef resources and designed to be adaptive to different cultures/governments and changing situations without compromising effectiveness.

**1.2.10.2 ‘Red Tides’**

Throughout the world’s coastal oceans, observations of harmful algal blooms (HABs), such as accumulations of microscopic species of algae or the larger, multicellular species, are being reported with increasing frequency. Often, these events are accompanied by severe impacts to coastal resources, local economies, and public health. Some species recur in the same geographic regions each year, while others are episodic, leading to the unexpected deaths of local fish, shellfish, mammals, and birds. Only about 50 of the thousands of known algal species actually produce toxins. Some of these toxins have direct and deleterious effects on local plants and animals; others have indirect effects on organisms by changing local environmental conditions.\textsuperscript{23}

All HABs were once referred to as “red tides” because of the color imparted by algae suspended in the water, but the description has since become a misnomer because not all HABs are red (some may be brown, yellow, or green), and some may not discolor the water at all. Accumulations can be so high as to cover the bottom of a region, excluding other biota as well as creating an environment in which high oxygen consumption and the associated anoxic conditions accompany decomposition of the accumulated or displaced biomass. The detrimental effects of a harmful algal bloom can range from cell and tissue damage to organism mortality and can be caused by a number of mechanisms, including toxin production, predation, particle irritation, induced starvation, and localized anoxic conditions. As a result, a bloom may affect many living organisms of the coastal ecosystem, from zooplankton to fish larvae to people. Understanding the ecology and oceanography of these species and how they affect other organisms, including people, continues to be a challenge.

\textsuperscript{22} IUCN. 1993. \textit{Reefs at Risk: A program for action}. Rue Mauverney 28, CH-1196, Gland, Switzerland.

for researchers. In 1995, a federal interagency program known as ECOHAB (Ecology and Oceanography of HABs) was initiated to support HAB research in the United States.\(^{24}\) NOAA has research grants to study the causes and consequences of harmful algal blooms, including outbreaks of toxic \textit{Pfiesteria} and similar organisms in mid-Atlantic coastal waters. The grants are part of NOAA’s coordination of a national interagency response to increased incidents of these blooms.

The increasing frequency, duration, and geographical distribution cannot be explained entirely by improved monitoring or attention from the scientific community.

In the past HABs have had adverse economic impacts on the aquaculture industry, human health, coastal economies, and subsistence shellfish harvesters. The threat of paralytic shellfish poisoning (PSP) or “red tide” has prompted routine closures of both commercial and recreational shellfish harvesting as well as finfish aquaculture operations in some coastal states. Past closures have resulted in large-scale losses for the industry and bankruptcies in some cases. HAB occurrences also affect consumer perceptions of the safety of \textit{uncontaminated} shellfish and finfish. This reduces the demand for shellfish in general and affects the fishing industry even in areas where there is no algal contamination. HABs may have significant impacts on coastal economies. The uncertainty associated with the potential of toxic algal outbreaks has adversely affected investment in coastal aquaculture. Bans on recreational harvests affect local economies that depend on recreational shellfish harvesters for at least some of their income.

The direct revenue loss to the shellfish industry associated with specific outbreaks of HAB has been estimated by a number of studies. For example:

- A PSP outbreak in the state of Maine in 1980 was estimated to cost $7 million.
- Detection of PSP in shellfish beds in Georges Bank in 1989 resulted in closure of the Georges bank surf clam industry for 5 consecutive years, at an estimated direct cost of $3 million per year.
- In 1987-88, the entire coast of North Carolina was closed to shellfish harvesting due to an outbreak of neurotoxic shellfish poisoning (NSP). The direct cost of this closure was estimated at $25 million.
- The direct cost of lost scallop revenue associated with persistent brown tide in the Peconic Estuarine System off the coast of Long Island was an average of $1.1 million per year over a 7-year period.

In addition, the social costs of HABs, their impact on coastal economies and their effect on consumer perceptions are considerable and could underestimate the total cost associated with HABs.

Wessells \textit{et. al} (1995) estimated that domoic acid contamination of mussels from Prince Edward Island had a significant impact on reducing the demand for uncontaminated mussels\(^{25}\). These results point to the need for accurate public information on the nature and


extent of algal contamination to ensure that public perception of the risks associated with shellfish is accurate (misperceptions lead to considerable economic losses). Greater investment in monitoring and testing efforts and improved communication of these monitoring data to the public could help bolster public confidence in the safety of the shellfish supply.

The incidence of HABs along the North American coast is greater than in other shellfish-producing regions of the world. Frequent closures of U.S. aquaculture operations due to the threat of HABs create uncertain product flow and hamper the ability of U.S. producers to compete in a global market. Competitive disadvantage of U.S. producers can result from a reduction in the supply of both shellfish and farmed finfish, a reduction in the demand for U.S. shellfish products, or both. Both consumers and producers of shellfish incur economic losses. The cost to the aquaculture industry is measured by the annual reduction in producer surplus attributable to HABs. This estimate reflects two economic impacts of HABs: a supply effect and a demand effect.

Although fisheries closures have a large negative impact on coastal economies, and on communities that depend on these fisheries for subsistence fishing, there are substitution effects, which, if ignored, may result in an overestimation of the impact of HABs on the economy of a state or region. As Laxminarayan observed, recreational shellfish harvesting may have many other substitutes. People may choose to go on a hike in the mountains (or to another uncontaminated beach) instead of going on a recreational trip to a HAB-contaminated beach. To the extent that there are substitutes available for shellfish harvesting as a recreational activity, the overall impact of these closures on the state’s economy may be small. However, coastal regions bear a disproportionately large burden of the loss while other regions of each state may stand to gain from beach closures. Also, while harvesting bans in any one year may affect the shellfish industry in that year, they provide an opportunity for the ecosystem to regenerate. Typically, years in which shellfishing is prohibited are followed by years of record harvest of shellfish. Any economic assessment of the cost of harvesting bans must also take into account their benefits in terms of increasing the stock of shellfish in succeeding years.

The Pacific region is the most economically important fishery region in the United States, both in terms of landed seafood and also dollar value. It leads all other regions in both the number of seafood processing plants (27% of all seafood plants) and also in the number of people employed (about 33% of all people employed) in the seafood industry. Alaska has the largest, most productive fishery in the United States, contributing 54% to the total U.S. landings. With an annual revenue of approximately $3 billion, commercial fishing is second only to oil as Alaska’s most important industry. The fishing industry is Alaska’s largest employer supplying over 10% of Alaska’s jobs, while seafood processing supplies 63% of the employment to the manufacturing sector. Although the finfish and crab fisheries are enormous, PSP hinders expansion into underutilized shellfish fisheries. Even in regions of the state where PSP does not generally occur, regulatory requirements for testing increase the costs and financial risks of investing in new fisheries and prevent maximization of income

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from existing shellfish harvest. Estimates of Alaska’s sustained annual harvest of bivalve shellfish are over 50 million pounds. The magnitude of the economic impacts caused by PSP varies for each shellfish fishery based on remoteness, dispersion of the fishery, history of PSP toxicity in the region, and the value of the final product. Similar effects of PSP blooms are felt in other quarters of the fishing industry, such as in the harvesting of oysters and crabs, with similar economic consequences.

Global warming and other climate change events are also believed to be associated with extreme weather events that have had a significant effect on HAB by dramatically altering the flow of nutrients in the marine ecosystem. HABs constitute a negative marine side effect associated with human activities in both agricultural and industrial activities.

NOAA Fisheries receives its ocean stewardship responsibilities under many federal laws in addition to the Magnuson Stevens Fishery Conservation and Management Act. Most important are the Endangered Species Act, which protects species determined to be threatened or endangered; the Marine Mammal Protection Act, which regulates interactions with marine mammals; the Lacey Act, which prohibits fish or wildlife transactions and activities that violate state, federal, and native American tribal or foreign laws; the Fish and Wildlife Coordination Act, which authorizes NOAA Fisheries to collect fisheries data on environmental decisions which affect living marine resources; and the Federal Powers Act, which allows NOAA Fisheries to minimize effects of dam operations on anadromous fish, such as prescribing fish passageways that bypass dams. Many other statutes, international conventions, and treaties also guide NOAA Fisheries activities.

1.2.10.3 Surfing and Beach Quality Indicators

Surfers use weather maps, wave buoys, tide tables, and other tools to get an understanding of what the conditions are like now and what they might be like in the future. ‘The State of the Beach’ (2000) report by the ‘Surfrider Foundation’ provides an account of the condition of U.S. beaches, beach access, surf zone water quality, beach erosion, beach nourishment, shoreline structures, and surfing areas. The report used ‘beach health indicators’. Each state was evaluated on the public availability of the information in the areas of beach access, surf zone water quality, the extent of shoreline armoring, erosion response, and surfing areas was included.

Environmental indicators as a means to evaluate environmental health, determine program effectiveness, and guide decision-making are also used for beach assessments and monitoring in several states. Some states, including Florida and New Jersey, have recognized the importance of establishing indicators. Some of these programs include:

◆ The Heinz Center ‘Coastal Zone Management: Performance Indicators and Measures Study’. Developing a set of measurable outcomes for coastal programs that can be linked to annual budget allocations and that can be part of a broader effort to foster ‘results-based management’ is a high priority at all levels of government. The goal of this study is to identify shared national and state coastal resource goals, based on the objectives of the Coastal Zone Management Act, and to develop a framework for results-based management utilizing performance. This framework will be used as a tool to provide information on local, regional, and national trends or issues affecting the coast; assist
coastal managers in improving internal management of their programs; and showcase accomplishments and potential needs of specific state programs. (The final framework is expected to be completed December 2002.)


◆ This U.S. Ecosystems report uses indicators to describe the use and condition of the U.S. coasts and oceans. Many studies consider a much broader “coastal zone”, which includes areas with significant populations that affect the coast or from which drainage flows to the coast. This report focuses on the narrow strip of land that borders these waters: http://www.us-ecosystems.org/coasts_oceans/measures.html http://www.us-ecosystems.org/coasts_oceans/index.html

◆ The EPA has produced a National Coastal Condition Report, an environmental report card on the condition of the nation’s coastal waters. The report primarily evaluates estuaries. The report was developed in collaboration with the National Oceanic and Atmospheric Administration, U.S. Geological Survey, and the U.S. Fish and Wildlife Service. It will allow EPA to monitor the progress of ongoing coastal water quality protection programs, analyze trends, and identify data gaps. The report is available at: http://www.epa.gov/owow/oceans/nccr/

◆ The ‘Indicator Concepts Sites and Reports’ web page from Florida State University. http://www.pepps.fsu.edu/EPIC/Concepts.html. References on this site include:

◆ Environmental Defense Fund, Indicators of Progress, 2000. A quick guide to understanding basic concepts of environmental sustainability indicators and benchmarks and why and how they can be applied.

◆ Environmental Outcome-Based Management: Using Environmental Goals and Measures in the Chesapeake Bay Program, 1999. The Chesapeake Bay Program’s site is considered a model of a results oriented indicator derived management systems.

◆ Several publications are available online via the FCMP web site, including the 150 page Florida Assessment of Coastal Trends (FACT) 2000 report. http://www.dca.state.fl.us/ffcm/FCMP/pubs/FACT2000.pdf This document is a great source of information on beach health indicators in Florida. It describes and reports on what are actually referred to as a series of ‘INDICATORS’ in areas, including biodiversity and natural areas, coastal access, coastal hazards, and community stewardship. It is filled with facts and figures that paint a picture of the state of the beach in Florida.

◆ The NJDEP’s web site is ‘your environmental indicators/about my environment’ page http://www.state.nj.us/dep/citizen_mynj.html This site provides a link to indicator measures in the areas of beach water quality and land acquisition, among others. It provides a link to ‘our goals’, which identifies goals and milestones to measure progress.


◆ The January 2002 Issue 17 of Coastlines from UMASS Boston, Urban Harbors Institute, 100 Morrissey Blvd., Boston MA 02125-3393 has an article on indicators titled ‘Measuring the Health of the Delaware Estuary’.
Surf zone water quality is considered a significant measure of the health of beaches as it affects the health of people who use beaches and the organisms living in the ocean. Standard measuring criteria used to evaluate state surf zone water quality include:
- Water quality monitoring programs;
- Beach closures;
- Storm drain information;
- Sewage outfall information;
- Perception of causes; and
- Public education program.

1.3 The Regulatory Environment

1.3.1 Introduction

Complex Regulatory Context
Perhaps the most important consideration in understanding the regulatory environment is that there is no single area of law that adequately addresses the tourism or recreation sectors. An added level of complexity to the regulatory context arises from the fact that the tourism and recreation industries are themselves quite diverse. As a result, the regulatory environment involves a combination of often overlapping areas of law that include both laws and regulations that are “typical” for any business or industry, such as land use and zoning law; property law; construction law; environmental, health, and safety law; tax and bankruptcy law; insurance law; or employment and labor law. Other regulations address tourism and recreation more directly, though in areas that are categorized separately in the law, such as transportation and travel law; public lands law; customs and immigration law; sports and entertainment law; or a variety of others. While the majority of regulatory issues that affect the tourism and recreation industries do so directly, some laws and policy actions do consider the industries directly, including, for example, tourism and economic development policy; industry classification policy; regulation of lodging rates; or special regulation of travel agents and operators.

Laws Relating to Weather and Climate. Of the various laws that affect tourism and recreation industries, a number directly or indirectly involve climate and weather-related issues. Examples of such regulations include zoning and development planning for resorts along coastal areas; compliance with building code specifications for adverse weather and local environmental conditions; regulation of stormwater runoff; safety regulation for the cruise ship industry; etc. Following a summary of industry-specific regulation and an overview of general regulations affecting the tourism and recreation industries, this section will describe laws relating directly and indirectly to weather and climate that affect the recreation and tourism industries.

Who is Regulated. In general, the regulated community in the tourism and recreation industries includes:

- Developers and planners;
- Transportation services, including airlines, car rental companies, rail services, urban mass transit, etc.;
- Hospitality industries, both lodging and restaurants;
- Community attractions;
◆ Parks and public lands;
◆ Amusement parks and theme parks;
◆ Winter resorts;
◆ Beach resorts;
◆ Cruise ships and boating;
◆ Professional and amateur sports organizations, including sports facilities;
◆ Travel Agents; and
◆ Destination management organizations (DMOs).

Federal Government Authority. The “tourism” and “recreation” industries are treated somewhat separately in the Federal Government. Federal authority over “recreation” generally involves the National Park Service, the U.S. Forest Service, Bureau of Land Management, the Coast Guard, and the Smithsonian Institution. A large degree of government authority over or involvement in recreation sits with the National Park Service division of the U.S. Department of the Interior. The National Park System encompasses approximately 83.6 million acres and includes national parks, national monuments, national preserves, national historic sites, national seashores, national recreation areas, national trails, and a variety of other facilities. The U.S. Forest Service, part of the U.S. Department of Agriculture, and the Bureau of Land Management (BLM), part of the Department of the Interior, also contribute significant resources and administer vast land areas used for recreational purposes throughout the United States. The U.S. Coast Guard provides extensive oversight over recreation-related activities along the U.S. coastline and adjacent inland waterways. In addition to outdoor recreation activities, the Smithsonian Institution is an independent trust instrumentality of the United States, holding more than 140 million artifacts and specimens in its trust for “the increase and diffusion of knowledge”. Every State in the U.S. has many similar government institutions to administer state lands, museums, and other facilities.

Viewed primarily as a “private sector” industry, tourism has been addressed at the Federal level through a succession of bodies promoting policy coordination and development. Today, the Tourism Policy Council (TPC) is the one such body remaining at the forefront of the issue at the Federal level. Originally established in 1981, the TPC is an interagency committee established by law for the purpose of ensuring that the nation’s tourism interests are considered in Federal decision-making. Its major function is to coordinate national policies and programs relating to international travel and tourism, recreation, and national heritage resources that involve Federal agencies. The TPC was re-authorized by the U.S. National Tourism Organization Act of 1996 (22 U.S.C. 2124). That Act authorized the Secretary of Commerce to continue the Federal functions of collecting and disseminating international traveler research, providing forecasts, assessing economic impact, overseeing the policy functions, representing travel and tourism interests inter-governmentally, and offering technical assistance for expanding exports of travel and tourism. These are all performed through the current Department of Commerce Tourism Industries office. The TPC

http://www.si.edu/.
recently met after about four years of inactivity to address the impacts of September 11th on the American travel and tourism industry.\(^{29}\)

**State Authority.** In addition to the broad Federal regulatory issues affecting the tourism and recreation industry, most businesses supporting tourism and recreation are also affected by a range of State and local laws, many of which closely parallel Federal laws. Like Federal laws, a number of State and local laws also relate closely to the role of weather and climate in tourism and recreation activities, both directly and indirectly. Such laws include, for example, land use, zoning, and planning laws; building codes; and environmental, health, and safety codes.

**Tourism Policy in Neighboring Countries.** Other countries in the North American region possess a similar range of policy instruments that affect the tourism and recreation industries. Like the United States, most countries including Canada, Mexico, and those in Central America and the Caribbean have each established government tourism authorities, which are mostly dedicated to promoting tourism itself and facilitating investment by or in the tourism industry. Many smaller countries, in fact, operate a Ministry of Tourism solely dedicated to tourism industry development and support. Most neighboring countries likewise have various levels of national, state, and local authorities dedicated to supporting recreation activities in national, state, and local parks, forests, and natural preserves, for example, and other amenities.

Most North American neighbors have an important tradition, largely following that of the United States, of establishing national parks and protected areas. This is particularly noteworthy in a number of countries in the Central American and Caribbean regions, where natural areas are widely seen as economic assets to lure American “eco-tourists.” Costa Rica, for example, has a number of aggressive national policies promoting sustainable development and protection of natural resources not only as a means of achieving economic prosperity and well being but as a means of sustaining the local tourism economy.

While many of these countries have adopted laws, policies, and regulations that largely mirror those that indirectly affect the tourism and recreation industries in the U.S., a number have introduced specific policy instruments that directly address the industries. These policies, along with description of relevant governmental authorities, are discussed at the end of this section.

**Presentation of Section.** For the purposes of this report, laws and regulations affecting the recreation and tourism industries are discussed separately in two groups: (1) regulations directly addressing the tourism and recreation industries; and (2) regulations indirectly addressing the tourism and recreation industries, including many which relate to climate and weather considerations.

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1.3.2 Direct Regulation of the Tourism and Recreation Industries

1.3.2.1 Tourism Industry Economic Development Policy

Prior to September 11, 2001, when the economy began showing signs of cooling, members of Congress had already begun to recognize the need for an economic stimulus package. However, following the terrorist attack, the tourism and recreation industry has paid even more careful attention to the actions in Congress relating to economic stimulus for the industry. The National Business Travel Association (NBTA) has estimated that over $18 billion and 2 million jobs would be lost within the travel industry as a result of the September 11 attacks. The Bush Administration proposed a $60-$75 billion stimulus package comprised mostly of tax cuts, and the House considered a bill called The Economic Security and Recovery Act of 2001 (HR 3090), which closely followed what the Bush Administration wanted and would reduce federal revenue by $99.5 billion in Fiscal Year 2002 and by $159.4 billion over the next ten years (FY2002-2011). No package was adopted, however, when Congress recessed in December 2001.30

In October 2001, Congress also introduced the Travel America Act, a law that would provide a $500 travel tax credit for individuals and $1,000 for couples to offset travel costs incurred from the time of the bill’s successful trip through Congress through December 31, 2001, and would restore the 100% business meal tax deduction. Such expenses include everything from plane, bus, and train fare to hotel, restaurant, and entertainment accommodations to travel agency and tour fees as well as all applicable taxes.31

1.3.2.2 Tourism Industry Classification and Research Policy

Tourism industries have long complained that the U.S. Standard Industrial Classification (SIC) system and newer North American Industry Classification System (NAICS) have not provided adequate categories to describe tourism, travel, recreation, or leisure industries for classification purposes. Tourism industries are now seeking more specific classification in the new NAICS.32

An important option for improving industry classification comes under the U.S. Travel and Tourism Satellite Accounts (TTSA), which provide a useful structure for analyzing information on specific economic activities outside the structure of the traditional accounting systems. The Travel and Tourism Satellite Account (TTSA) is an economic tool to more accurately measure the impact of the travel and tourism industries on the U.S. economy. It also measures job creation and provides industry comparability by using the U.S. System of National Accounts, which is the basis for configuring the GDP. The program, started in October 1997, is conducted in conjunction with the Bureau of Economic Analysis (BEA) in the Department of Commerce.33 The satellite accounting standards use the Standard Industrial Classification of Tourist Activity (SICTA) to account for the numerous sectors supplying the industry.34

32 Summary of Federal Activities and Accomplishments in Travel and Tourism.
34 EPA, 2000, p. 6.
1.3.2.3 Travel and Transportation Law and Policy

Comprehensive Transportation Legislation. The federal government addresses national transportation issues primarily through the Aviation Investment and Reform Act for the 21st Century (AIR 21), Public Law 106-181, passed April 5, 2000, and the Transportation Equity Act for the 21st Century (TEA-21), Public Law 105-178, passed June 9, 1998. These laws have direct bearing on the tourism and recreation industries in a number of direct and indirect ways.

TEA-21 authorized the Federal surface transportation programs for highways, highway safety, and transit for the six-year period 1998-2003. TEA-21 builds on the initiatives established in the Intermodal Surface Transportation Efficiency Act of 1991 (ISTEA), which was the last major authorizing legislation for surface transportation. The Act was meant to combine the continuation and improvement of ongoing programs with new initiatives to meet the challenges of improving safety as traffic continues to increase at record levels, protecting and enhancing communities and the natural environment while providing transportation and advancing America’s economic growth and competitiveness domestically and internationally through efficient and flexible transportation.

Facilitation of Tourism-Related Road Transportation Within the U.S. Several aspects of ISTEA and TEA-21 directly address tourism and recreation and are of importance to the industry. For example, the National Scenic Byways Program provides for the recognition of scenic highways that are outstanding examples of scenic, historic, recreation, cultural, archeological, and/or natural qualities by designating them as either National Scenic Byways or All-American Roads. TEA-21 provides special funding for the preservation and rehabilitation of historic covered bridges, establishes educational and research programs on covered bridge history, and conducts research on techniques to protect historic covered bridges. TEA-21 also, for example, continues and expands improvements to facilities and safety for bicycles and pedestrians, improves the safe and efficient movements of people and goods across the U.S. borders with Canada and Mexico, and provides emergency relief for repairing serious damage to Federal-aid and Federal Lands highways resulting from natural disasters or catastrophic failures.

Facilitation of Tourism-Related Rail Transportation Within the U.S. TEA-21 also provides for a number of improvements to the U.S. rail system that may impact the tourism and recreation industries. For example, funding and management issues of Amtrak, America’s national rail system, continue to play a role in tourism policy. In the past year, the Senate has considered a wide range of issues concerning Amtrak, including Amtrak Reform Council’s Second Annual Report issued March 2001; the possibility of breaking up and/or privatizing Amtrak; and the findings of the General Accounting Office on pending legislation to authorize Amtrak to issue bonds to generate up to $12 billion for high speed rail infrastructure investment. Related initiatives include development of the Magnetic Levitation Transportation Technology Deployment Program (MAGLEV) that will serve to

demonstrate the feasibility and safety of transportation systems employing magnetic levitation, as well as a series of light density rail line pilot projects for urban areas. TEA-21 also authorized grants for capital rehabilitation and improvements to passenger services of the Alaska Railroad.40

Facilitation of International and Domestic Air Travel. A number of key issues have been raised in the aviation industry in the past year that have significant effects on the travel and tourism industries, particularly since the September 11 attacks. These include airport security, aviation and airport capacity, and international aviation agreements. In the wake of the terrorist attacks of September 11, travel first stopped all together and then slowly resumed in low volumes. As a result, Congress and a number of Federal agencies responded to reform security in airports and on airplanes. In September, NBTA called on the Department of Transportation (DOT), the Federal Aviation Administration (FAA), and the DOT Security Task Force to implement the following: federalizing airport security; imposing uniform security procedures among airports and airlines; imposing a single standard that defines the maximum size of carry-on baggage; and instituting new technology to better manage the passenger screening process. Congress recently passed legislation to federalize screeners.41

A number of issues had been raised in Congress to expand the nation’s aviation capacity even before September 11, such as by building additional runways and airport terminals.42 This had been an ongoing concern to the travel and tourism industry.43 While this issue no longer remains critical in light of significantly reduced travel, it is likely to return with improvements in airport security and the national and world economy. The call for increased aviation capacity and airport development has, in part, been a result of congestion arising out of weather delays, combined with growth in air travel demand. A number of Congressional hearings in fact have considered how weather-related delays in a single airport caused serious “ripple” effects throughout the system.44 Another hearing statement cites that the number of weather and ATC delays for United Airlines had “increased 65% since 1995. The increases in these uncontrolled delays are more stark when compared with controlled delays such as crews, maintenance and other operational irregularities. United’s controlled delays, weather and ATC related delays, have decreased by 24% since 1995.”45

One of the ways being used to fund expansion of aviation capacity has been through airline passenger taxes and user fees. Effective October 1, 1998, Passenger Facility Charges (PFCs) were added to each segment of a flight. Passenger Facility Charge revenues are added to the Aviation Trust Fund and used for airport improvements and expansion. Denver International Airport, for example, was one of the first airports to benefit from PFC funding during its

construction. In 2002, for example, an airline passenger pays $3.00 per trip segment on top of the price of the ticket, and in following years the charge will be adjusted for inflation.46

“Open skies” agreements are bilateral aviation agreements that allow airlines to fly routes and set fares based on market demand, to form cooperative arrangements such as “code sharing” with other carriers, and to offer improved services to passengers. As of February 1998, the United States had “open skies” agreements with 29 aviation partners and now has 53 open skies partners worldwide. These include western European partners, like Germany, Austria, Switzerland, the Benelux and Scandinavian countries; a number of East Asian economies, like Singapore, Taiwan, Malaysia, and New Zealand; and six of our Central American partners.47

Facilitation of Entry Through U.S. Customs. The issue of entry of tourists and travelers to the United States from other countries has been an important issue for the travel and tourism industry and has become even more serious an issue since September 11. Many of the changes resulting from September 11 changes focus primarily on the way U.S. Customs Service and the Immigration and Naturalization Service (INS) allow entry for international travelers into the U.S.

Measures to facilitate travel through international ports of entry and airports through INS and U.S. Customs have been a major interest of the travel industry over the past decade. In the wake of the events of September 11, many travel and tourism industry representatives are seeking to continue to support the broadening of the implementation of INS Passenger Accelerated Service System (INSPASS) across more international airports. INSPASS uses technology to help a traveler bypass an immigration line.48 The U.S. Customs Service and INS, in cooperation with the airline community, have also expanded the use of electronically transmitted passenger information to expedite the clearance of international passengers.49

Similarly, the Visa Waiver Pilot Program (VWPP) facilitates international travelers’ entry into the United States while maintaining border security and containing costs to the government for processing visas. The INS and the Department of State implement the program in cooperation with international airlines to improve visitor access to the U.S. by facilitating entry that is compatible with Federal government responsibilities for border security.50 The VWPP permits visitors from 29 low-risk countries (see list at the end of this section) to enter the U.S. visa-free for up to 90 days. This program promotes and facilitates international travel to the U.S. and allows the Department of State to shift resources to high-risk countries to screen individuals wanting to travel to the U.S. Because of the reciprocal nature of the program, outbound U.S. travelers also enjoy visa-free travel to these same 29 countries (Andorra, Argentina, Australia, Austria, Belgium, Brunei, Denmark, Finland, France, Germany, Iceland, Ireland, Italy, Japan, Liechtenstein, Luxembourg, Monaco, Netherlands, New Zealand, Norway, Portugal, San Marino, Singapore, Slovenia, Spain, Sweden, Switzerland, United Kingdom, and Uruguay). The 107th Congress has discussed

49 Summary of Federal Activities and Accomplishments in Travel and Tourism.
50 Ibid.
possible expansion of the Visa Waiver Program. In addition to the VWPP program, the Department of State has also taken steps to facilitate legitimate travel to the United States from non-VWPP countries.

The Immigration and Naturalization Service (INS) and U.S. Customs operate a limited number of overseas pre-clearance facilities at international airports in Canada and Aruba, as well as pre-inspection operations in both Dublin and Shannon airports in Ireland. By taking advantage of natural wait time at departing airports, travelers coming into the U.S. can go through INS inspection and Customs clearance procedures prior to boarding at one of these airports. Upon arrival in the U.S., travelers deplane and are free to enter the terminal as though they had taken a domestic flight. This process helps reduce long waits for inbound international visitors and returning American travelers. Some effort has been made to expand this program to a limited number of major overseas airports, as was recommended by the 1995 White House Conference on Travel and Tourism.

In addition to specific programs to improve entry to the U.S., new Federal guidance and programs seek to make improvements to government agencies themselves. For example, the travel and tourism industry has sought to improve the resources available for customer service training for front-line INS inspectors who have primary contact with inbound travelers to the U.S. Other reforms include new information kiosks at 13 international airports, improved Internet resources for travelers, and improved access to travel and tourism-related facilities for international travelers and disabled travelers.

1.3.2.4 Regulation of the Tourism Industry

Regulation of the tourism industry involves laws and regulations that both directly address industry activities and that generally affect all private businesses (i.e., whether or not they are involved in tourism and recreation activity). Laws directly addressing the tourism, recreation, and travel industry include, for example, regulations on travel agent commissions, regulation of lodging fees and rates, regulation of industry marketing and sales, and regulation of industry-specific activities, such as laws dealing with airline safety or cruise ship pollution or safety issues. Several of these laws are discussed in this section, while those dealing with climate and weather issues will be discussed below.

Regulation of Tourism Agencies and Operators. In general, there is surprisingly little regulation of travel agents, but States are becoming increasingly more aggressive in their regulation of travel sellers. Currently, eleven states have laws that are aimed specifically at travel agents and tour operators, including California, Florida, Hawaii, Illinois, Iowa, New York, Ohio, Oregon, Rhode Island, Virginia, and Washington. (Jarvis, 84; Jarvis, 94) One of the most contentious issues arising in travel agent regulation involves the commissions or “overrides” travel agents receive from suppliers, primarily the airline industry, in return for meeting specified sales quotas. (Jarvis, 98) Override payments are in addition to the base commissions agents receive as set percentages of ticket prices. Overrides are not currently regulated, but the conflicts they have caused between travel agents and airlines may compel
the Federal government to consider replacing them with set fees. Greater public disclosure about overrides is another concern of regulators.\textsuperscript{56}

\textit{Regulation of Lodging Rates and Fees.} Currently, companies that work under contracts with the Federal government (cost-reimbursable contractors) have difficulty securing the same per diem rates as the government traveler. The NBTA, in conjunction with the Government Contractor’s committee, has been working with the General Service Administration (GSA) and hotel industry to ensure more access to these government per diem rates. The GSA has recently launched the Premier Lodging Program for its travelers. The Premier Lodging Program locks in government rates at certain hotel properties in major cities. Currently, Boston is hosting the pilot program, and several other cities will be moved into the program throughout the next two years.\textsuperscript{57}

1.3.2.5 Regulation of Public Lands

Public lands provide a tremendous recreation and tourism resource in the United States and involve a wide range of regulatory issues related to their management and use. These relate not only to the government agencies that oversee and operate national parks and various other public areas but also tourists and recreators, as well as commercial interests using the lands in some business-oriented capacity. Major categories of public land used for recreation purposes include the following:

- National parks and monuments, as well as national recreation areas and national seashores, governed by the National Park Service (NPS);
- Natural resource or rangelands, governed by the Bureau of Land Management (BLM);
- National forests, administered by the U.S. Forest Service (USFS);
- National wildlife refuges, administered by the U.S. Fish and Wildlife Service (USFWS);
- Wild and scenic rivers, administered by each of the above agencies;
- Wilderness areas designated within other public lands; and
- A significant number of State and local parks and conservation areas.

Public lands are established through a number of legislative actions and under various authorities. For example, Congress creates National Parks separately under individual legislation for each park and authorizes the NPS to administer the park according to the goals set forth in that specific legislation. Firearms and hunting are prohibited in most parks, but private enterprises are allowed to contract with the government for concessions to provide food, lodging, and some recreational services\textsuperscript{58}. On the other hand, under the Antiquities Act of 1906, 16 U.S.C. §431, and the Historic Sites, Buildings and Antiquities Act of 1935, 16 U.S.C. §§461-467, Congress has authorized the President to designate National Monuments, which are also administered by the NPS and are established for their scenic and natural significance and for historical, cultural, or scientific purposes. In addition to such public areas, the National Historic Preservation Act of 1966 (NHPA) established a National Register of Historic Places for sites with significant cultural or historical value. (CEC

\textsuperscript{56} National Business Travel Association, \url{http://www.nbta.org/benefits/leg_agenda.htm}.
\textsuperscript{57} Ibid.
website; see National Historic Preservation Act of 1966 (NHPA), as amended, 16 U.S.C. sec. 470)

Access to and Use of Public Lands. Public access to and use of public lands is a key issue relating to the regulation of public lands. As described below, principal regulatory issues that have been raised regarding public access involve recreation fees, access to cruise ships near sensitive marine ecosystems, bans on snowmobiles, national park traffic congestion, and development of recreational trails:

◆ Recreation Fees at Federal Sites—The Federal government has charged various fees for use of public recreation facilities since the early days of the national park system. Today, the National Park Service and the Forest Service collects over $100 million in recreation fees, mostly through entrance fees, camping fees, ski area permit fees, and assorted other recreation fees and concessions. Much of the philosophical and legal basis for recreation fees is outlined in the 1964 Land and Water Conservation Fund Act. The framework for a new recreation fee strategy was outlined in the 1987 report of the President’s Commission on Americans Outdoors. The report noted that Americans spend over $300 billion annually on recreation activities, and that figure is growing.\(^59\) In 1996, Congress authorized the Recreation Fee Demonstration Program for the USFS, NPS, BLM, and USWFS in order to test entrance and user fees that are reinvested in federal lands where people recreate to maintain and improve the natural resource, recreation facilities, and services. Each agency may charge fees at up to 100 projects.\(^60\)

◆ Snowmobile Ban—Following a series of studies by the NPS of the pollution effects of snowmobiles in national parks, the Federal government recently phased-in a ban of snowmobile use in Yellowstone and Grand Teton National Parks.\(^61\)

◆ National Park Traffic Congestion—As National Parks continue to host more visitors, traffic within the parks has become a more serious problem. Many park superintendents have looked to transit systems to help alleviate traffic congestion. In several instances, shuttle bus service has successfully been introduced, reducing the annual number of vehicle trips.\(^62\)

1.3.2.6 General Business Regulation

In addition to various industry-specific regulations, the travel, tourism, and recreation industries must comply with a variety of standard laws and regulations relating to business practices. These include:

◆ Regulation of Marketing and Sales—for example, the Federal Trade Commission (FTC) Act, as well as a number of similar State-level acts, prohibit “deceptive” business practices, as well as “unfair methods of competition”;

◆ Public Relations Regulation—such as advertising marketing, sales, and governmental affairs/lobbying;

◆ Employment and Labor Law—for example, the Federal Occupational Safety and Health Act (OSHA) requires employees to maintain a safe and healthy workplace free of recognized hazards likely to cause death or serious injury. 29 U.S.C. secs. 651-678; 29

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\(^{59}\) American Recreation Coalition, [http://www.funoutdoors.com/policy.html](http://www.funoutdoors.com/policy.html).


\(^{62}\) Ibid.
C.F.R. pts. 1900 to 1990. Each employer has a general obligation to provide “employment and a place of employment which are free from recognized hazards that are causing or are likely to cause death or serious physical harm.” 29 U.S.C. sec. 654(a)(1). (CEC website)

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- Licensing and Registration of Sales Personnel;
- Civil Rights Laws;
- Land Use Planning and Zoning Laws;
- Property and Real Estate Law, and Property Management and Financing Regulations— for example, this includes special regulation of resort and membership campgrounds, condominium hotels (“Condotels”), cooperative housing, and proprietary resorts;
- Tax Regulation;
- Insurance Law;
- Bankruptcy Law;
- Antitrust and Trade Regulations; and
- Financial and Securities Regulations.

Each of these subjects would require extensive coverage on its own. For the purposes of this report, it is sufficient to note the tourism and recreation industries are covered by as many regulations as most other businesses.

In addition to the business regulations listed here, the tourism and recreation industries are also regulated in a myriad of other common areas, including development planning, construction, and building regulation; environmental law; and health and safety regulation. As many of these laws more directly target tourism and recreation activities and more frequently involve some consideration of weather and climate impacts on tourism and recreation activity, they are discussed in greater detail below.

### 1.3.3 Laws and Regulations Indirectly Addressing Tourism and Recreation and Relating to Weather and Climate

While very few federal, state, or local laws directly address the role of climate and weather as they affect the tourism and recreation industries, a number of laws address both areas indirectly. These laws primarily include the following: (1) development planning, construction law, and building codes; (2) environmental laws; (3) and health and safety regulations.

#### 1.3.3.1 Development Planning, Construction Law, and Building Codes

**General Regulation.** All activities related to building and infrastructure construction generally involve a myriad of Federal and, primarily, State and local regulations. States are given the reserve authority under the 10th Amendment to the U.S. constitution, known as the “police powers” in the name of protecting the public health, safety, and welfare. (See Cameron, 3.01) Under that authority, States have enacted statewide building codes or passed enabling legislation for local bodies to do the same. (See Cameron, 3.02)

There are about 13,000 building codes currently in force across the U.S. “Building codes” themselves are usually a collection of several laws or ordinances, or both, and it is not unusual to find a different building code in each of several jurisdictions within the same state, or even within the same county. (Cameron, 3.02) Once construction has begun, officials must
periodically inspect all construction undertaken pursuant to one or more building permits to ensure the construction meets the requirements of the permit and is compliant with applicable building codes and related laws and ordinances. The last step in the permitting process for new constructions is usually the application for certificate of occupancy. (Cameron, 3.03)

**Regulations Related to Climate and Weather.** Climate and weather affect how building construction is regulated in a number of ways, primarily with respect to project feasibility (reducing or denying feasibility), project cost, and through design guidelines and requirements provided in building codes. (See Yatt, 85) Roof design and building enclosure are fundamental issues in weather-related design. Snow, wind, and the weight of the roof itself are the typical considerations in designing a roof. (Yatt, 146) Keeping out the elements—temperature, precipitation, wind, and sun—are fundamental issues in most building codes. (Yatt, 156) Codes address a building’s ability to resist aging effects of ultraviolet rays and erosion from gravel ballast blown by strong winds, and require special rules for possible exposure to hurricane conditions with 90 to 100 mph winds or more. (Yatt, 159-160)

**Snow Loads.** Depending on the location and altitude, rules applying in specific snow belts generally determine the loads for which structural systems will need to be designed. Increases in design loading can, for example, improve project feasibility. In the continental U.S., design loads go as high as 100 pounds per square foot, particularly through much of New England and the northernmost Midwestern States. Alaska has design values ranging from 25 to 300 pounds per square foot. (Yatt, 86)

**Wind.** Codes addressing wind conditions generally apply to winds reaching 55-year storm speeds measured at a height of 33 feet above ground level. Wind speed requirements are categorized into four levels, Exposures A through D. More stringent requirements are places on higher portions of buildings that consider both wind pressure and gusting. The windiest areas in the continental U.S. are along the “hurricane coast”—the southeast coast from Texas to North Carolina—as well as in all but central Alaska, localized areas in Central Appalachia and the Rocky Mountains, most of the Great Lakes Shoreline, and all U.S. islands including Hawaii, the Aleutians, and Puerto Rico. Special design requirements addressing wind apply in hurricane regions. (Yatt, 86-87)

**Floodplains.** Floodplain development is regulated by the Federal government under a number of rules, including Executive Order 11988 on Flood Plain Management (May 24, 1987). Federal law excludes new projects constructed in designated floodplains from receiving aid or assistance through federal flood relief programs, and many zoning ordinances prohibit new construction or reconstruction in floodplains. (Yatt, 112) DOE requirements for “Compliance with Floodplains/Wetlands Environmental Review Requirements” also requires a floodplain assessment for any development activity inside a floodplain. (10 CFR 1022; see Yatt, 285) Floodplains are generally identified on Flood Hazard Boundary Maps (FHBMs) in engineering reports and maps prepared by the Federal Insurance Administrator. The maps designate levels of hazard to each flood-prone zones based on frequency, flooding rapidity (e.g., from hurricane-driven waves), or drainage requirements. It is very important to note that many involved in development are beginning to recognize the potential that global climate change over the past few decades may be changing weather patterns sufficiently to require adjustments to flood frequency measures and flood boundary areas. (See Yatt, 113)
1.3.3.2 Environmental Laws

It is notable that many in the tourism and recreation industry are starting to consider “global warming” as an important factor in planning and promoting tourism and recreation activities. The resort industry, for example, recognizes that it shares many common concerns with public officials and environmental groups, particularly in response to the possibility that increased carbon dioxide levels raising ocean levels by even a few feet would be devastating to coastal properties in Florida, California, the Caribbean, and elsewhere. Others have long considered the impact of acid rain from sulfur dioxide and other pollutants on lakes and rivers used for sport fishing and wildlife conservation, boating, swimming, and water-skiing. (See Henze, 4-14.4)

The operation of resorts, cruise ships, national parks, restaurants, hotels, sporting events, and so on can have a significant range of impacts on the environment. Like other industries, tourism and recreation businesses must comply with a variety of environmental laws. For example, resort developers, designers, lenders, property managers, and even marketers will consider environmental impacts in all phases of resort design, development, and operation. (See Henze, 4-14.1; see also Rockwell, ABA, 99) In turn, many environmental laws have led to increased protection of valuable natural resources, which provide an important basis for recreation and tourism activities. Federal, State, and local environmental laws affecting the recreation and tourism industries include the following:

◆ Pollution control laws relating to water and air quality;
◆ Wetlands permitting and regulation;
◆ Coastal zone development regulation;
◆ Protection of marine resources;
◆ Water conservation;
◆ Stormwater runoff regulation;
◆ Management of natural resources;
◆ Protection of endangered species;
◆ Marine pollution regulation;
◆ Solid waste management and recycling laws;
◆ Hazardous waste management;
◆ Energy use and conservation;
◆ Noise pollution; and
◆ Environmental impact assessment under the National Environmental Policy Act and related State laws\(^63\)

While most of these laws apply more or less evenly to all commercial activities, several are more relevant to tourism and recreation, while others relate more or less directly to climate and weather. For example, a developer will need to consider coastal zone management (CZM) considerations in planning a seaside resort and, furthermore, may need to consider how weather impacts, such as hurricanes, not only affect the resort itself but affect compliance with CZM regulations.

Coastal Zone Management and Protection of Marine Resources

General Regulation Affecting the Industry. A number of laws and regulations addressing coastal zone management (CZM) and development have a direct relationship with climate and weather because of the impact precipitation and rainwater runoff has on coastal resource conditions and because of the sensitivity of certain coastal ecosystems.

Regulation of coastal areas has a long history under the common law through Federal and State common law doctrine establishing public trusts in navigable waterways and coastlines; riparian and littoral rights to private individuals in water bodies, sea beds, and riverbeds; and beach access laws. For example, the public trust doctrine may place a limit on the ability of states to privatize certain waters, whereas in some states the public trust doctrine preserves certain public rights, such as to navigation or to fish in the water.64 Implied Federal reserved water rights may likewise be attached to national parks, wilderness areas, and tribal reservations.65 Similarly, any private water rights that a coastal or riverside tourism operator possesses could be subject to navigation servitudes that give the public inherent rights to passage on navigable waters.

Several common law traditions have evolved into statutory laws. The Coastal Zone Management Act (CZMA) of 1972, 16 U.S.C. §§1451-1464, is the primary federal statute for protecting the nation’s coastal areas from pollution and development pressures through authorities granted to states to protect coastal zones and tidelands and was re-authorized in 1990 and 1996. Under the 1990 amendments, Congress conditioned federal funding to states and territories with approved CZM programs with the requirement to develop Coastal Non-point Pollution Control Programs. Under a state CZM program, a state or territory describes how it will implement non-point source pollution controls, known as management measures.66

For example, under the Virgin Islands Coastal Zone Management Act, the coastal zone management committee was required to consider environmental impacts and possible mitigation measures before granting a permit to a developer to build a hotel and marina. The developer was required to submit the necessary studies and plans for the committee to consider, and the committee could not issue a permit conditioned on the developer’s future generation of this information.67 Similarly, the California Coastal Act grants authority to the California Coastal Commission over development occurring within 1,000 yards from the mean high tide line of the sea. The Act authorizes local governments to prepare local coastal programs, including land use plans, zoning ordinances, and district maps. (Cal. Pub. Res. Code §§30500-30525) In pursuing coastal development, resort and club developers are now required to seek special permits not only for structural development of coastal property but also for any changes in its use in some circumstances. (Rockwell, ABA, 104)

Marine Pollution Regulation and Voluntary Standards for Cruise Ships

General Regulation Affecting the Industry. The tourism and recreation industries, particularly cruise ship operators, are also affected by a number of laws relating to the discharge of pollution into marine and coastal areas. For example, Clean Water Act §312 authorizes States to establish standards for marine sanitation devices and designates no-discharge zones in marine and freshwater coastal areas. The Act to Prevent Pollution from Ships, 33 U.S.C. §§1901-1912, is the primary law governing pollution from marine vessels. The Act implements the 1973 International Convention for the Prevention of Pollution from Ships—the most relevant provision of which for the cruise ship industry is Annex V, relating to garbage discharges—and the 1978 Protocol to the Convention (known as the MARPOL Protocol).

Violations of some of these laws by operators in the cruise ship industry, and the negative media attention those violations has drawn, has compelled the industry to take the further steps of adopting a series of voluntary measures. Under a recently adopted policy, cruise lines wishing to remain members of the International Council of Cruise Lines (ICCL) must meet new guidelines for recycling and waste discharge. ICCL members unanimously adopted mandatory environmental standards for all of their cruise ships, marking such effort to adopt mandatory waste management practices by an association of international passenger vessel operators. Covered discharges include graywater and blackwater discharge; hazardous chemical waste such as photo processing fluid and dry-cleaning chemicals; unused and outdated pharmaceuticals; used batteries; and burned out fluorescent and mercury vapor lamps.68

The ICCL practice comes on the heels of a law passed by the Alaska state legislature that mandates cleanup standards for cruise ship discharges.69 That legislation provides for a verification program for sampling, testing, and reporting wastewater and air discharges from the industry, enforceable standards for cruise ship discharges into Alaska waters, and payment by the cruise ship industry for the costs of the program. The State of Florida recently passed similar legislation addressing cruise ships operating in its coastal waters.70

Water Quality and Use, Non-point Source Pollution, and Stormwater Runoff

General Regulation Affecting the Industry. The tourism and recreation industries are affected by regulations addressing water quality, non-point source pollution of water bodies, and stormwater runoff. Broadly speaking, the Clean Water Act (CWA) provides a range of requirements imposing pollution discharge limits, emissions standards, permit requirements, water quality-based standards, or technology-based standards. All states regulate water pollution, in conjunction with varying levels of coordination with Federal programs.71

Regulations Related to Climate and Weather. While water pollution control or prevention laws are not particularly unique to the tourism and recreation industries, these industries must be particularly responsive to the way precipitation patterns affect their ability to comply with the regulatory requirements, depending on the facility being regulated. For example, CWA

71 33 U.S.C. §1251 et seq.
§319 establishes a state-implemented Non-point Source Management Program to address water pollution from multiple, non-point sources. The program addresses 22 surface water programs, many of which relate to water bodies used for recreation and tourism purposes.

One important provision under the CWA’s National Pollutant Discharge Elimination System (NPDES) permitting requirements involves efforts to stem non-point pollution from stormwater runoff. As defined by the CWA regulations, stormwater includes “storm water runoff, snow melt runoff, and surface runoff and drainage.”72

Under the CWA’s NPDES permitting program, municipal and commercial bodies must obtain permits that include provisions for stormwater discharges. Resorts, theme parks, amusement parks, and other recreation and tourism entities, for example, may be subject to NPDES permitting requirements of the Act due to runoff from construction sites or “industrial activities” that feed directly into surface waters.73

Laws requiring water conservation could also impact tourism and recreation industries. For example, water-rationing regulations in areas experiencing severe drought could affect the way resorts or others manage the use of pools, ponds, fountains, lawns, or other amenities. (See Rockwell, ABA, 106)

Wetlands

**General Regulation Affecting the Industry.** Another area of significant regulation related to tourism and recreation and the conservation of water resources is the regulation of “wetlands”, defined as:

> those areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs and similar areas.74

Wetlands are not limited to low-lying or coastal lands but may occur anywhere, including mountains, which may have bogs. (Henze, 4-14.2) As a result of the broad coverage of the wetlands protection provisions under CWA Section 404, developers have been significantly restricted in the location and nature of new developments, which could include anything from golf courses to ski trails. The EPA and the Army Corps of Engineers jointly administer the Federal wetlands program.

Section 404 of the Clean Water Act regulates the discharge of dredged and fill material into waters of the United States, including wetlands. Specific activities that are restricted include fills for development, water resource projects (such as dams and levees), infrastructure development (such as highways and airports), and conversion of wetlands to uplands for farming and forestry. The basic premise of the program is that no discharge of dredged or fill material can be permitted if a practicable alternative exists that is less damaging to the aquatic environment or if the nation’s waters would be significantly degraded. When a business applies for a wetlands permit, it must show that it has achieved the following:

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72 40 CFR §122.26(b).
74 40 CFR 230.3(t).
1. Taken steps to avoid wetland impacts, where practicable;
2. Minimized potential impacts to wetlands; and
3. Provided compensation for any remaining, unavoidable impacts through activities to restore or create wetlands.

A single permit is usually required for potentially significant impacts, although as a means to expedite the permitting process, the Army Corps of Engineers can grant general permits on a nationwide, regional, or state basis for most discharges that will have only minimal adverse effects.75

Falling within the scope of wetlands regulation can create enormous impacts on the tourism and recreation industries. Recent Army Corps of Engineers and EPA opposition to the destruction of mangrove trees in South Florida forced one developer to downsize by more than half a waterfront project with a golf club and luxury homes. It is important to note that the need for one permit may trigger other permits and legal requirements, such as an Environmental Impact Statement under NEPA or provisions to protect an endangered species. (Henze, 4-14.2)

One of the most significant Federal activities addressing wetlands is the recently launched Florida Everglades Restoration Project, a $7.8 billion 30-year project to rehabilitate the Florida everglades after over a century of agricultural and urban development. The plan envisions the largest ecosystem restoration project ever undertaken.76

Fish and Wildlife, and Endangered Species

*General Regulation Affecting the Industry.* While endangered species and wildlife management and conservation laws generally affect a great many interests, such laws are of particular importance to those recreation and tourism industries that are involved in outdoor recreation activities such as fishing, hunting, hiking, bird-watching, eco-tourism, etc. Depending on the activity in question, such laws may be seen as helping or hindering the industry. Key laws relating to fish and wildlife management and protection include the Endangered Species Act of 1973; the National Wildlife Refuge System Administration Act of 1966; the Migratory Birds Treaty Act of 1918; the Marine Mammal Protection Act of 1972; the Fish and Wildlife Coordination Act of 1958; the Wild Free-Roaming Horses and Burros Act of 1971; and the Bald Eagle Protection Act of 1940. These laws are also considered very important for tourism developers and planners, who may need to meet specific requirements that limit or change the nature of a proposed development. (See Rockwell, ABA, 114)

Many States have passed similar laws to protect endangered species and wildlife. Every state has its own detailed hunting and fishing regulations, which typically require the purchase of hunting and fishing licenses or permits on an annual basis. These regulations typically detail restrictions on the seasons and locations in which specific activities can occur, size and number of wildlife or fish that can be taken in a single season or day, equipment restrictions, and reporting requirements for certain species. State conservation officers and game wardens enforce wildlife laws with essentially the same range of authority as police officers. (See CEC website)

1.3.3.3 Health and Safety Regulation

General Regulation Affecting the Industry. Recent cases have elaborated a number of traditional common law requirements for tourism operators to ensure the safety of travelers and tourists. Under the common law, while an innkeeper has no explicit duty to protect against naturally occurring unsafe conditions or unsafe conditions created by the guest, one does have the duty to exercise reasonable care for the safety of guests that it either has created or allowed to create. As stated in a 1928 case brought against an amusement park, “One who collected a large number of people for gain or profit must be vigilant to protect them.”

One event somewhat related to weather and climate conditions involved the sudden illness of 221 people and the death of 34 at a hotel in July 1976 as a result of contracting “Legionnaire’s Disease.” It was discovered that those staying at the Bellevue-Stafford Hotel in Philadelphia had become infected from a previously-unknown type of bacterium that thrives in warm water and had spread throughout the hotel’s air conditioning system. While the famous hotel in that case suffered no legal liability (as the disease had no precedent), the negative reputation forced it to close. However, the occurrence of the single worst outbreak in recent times of Legionnaire’s Disease took place on the cruise ship M/V Horizon in 1994. In that case, the plaintiff argued that, unlike the Bellevue-Stratford, the cruise line was on notice of the risks associated with failing to clean pipes and ducts that could harbor the disease.

Cruise Ship Safety Regulation and Voluntary Standards. Cruise ship operational safety is regulated under a range of special regulations at the federal and state levels and largely administered by the U.S. Coast Guard. Adverse weather and high sea state are important drivers in determining ship safety and are thus reflected in all relevant safety guidelines and rules.

Ocean-going cruise ships of U.S. registry must meet a comprehensive set of Coast Guard safety regulations and be inspected annually by the Coast Guard to check for compliance. The safety regulations cover such things as hull structure; watertight integrity; structural requirements to minimize fire hazards; equipment requirements for lifesaving, fire-fighting, and vessel control; and requirements pertaining to the safe navigation of the ship.

It is the policy of the International Council of Cruise Lines (ICCL) to require members to pledge a commitment to the safe operation of all cruise vessels in their fleets. Under the policy, the cruise industry must comply with all International Maritime Organization (IMO) standards governing the design, construction, and operation of cruise vessels worldwide. These internationally mandated standards are codified in the Safety of Life at Sea (SOLAS) Convention and its amendments and have been adopted by the U.S. government. Other IMO safety standards which have been adopted internationally include Convention on the Standards of Training, Certification, and Watch-keeping (STCW), which deals with crew training as it relates to safety; the International Convention in Load Lines; and the IMO’s International Safety Management (ISM) Code, which relates to mandatory codes of practice. To ensure compliance with SOLAS, the Coast Guard examines each new cruise vessel when

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it first enters service at a U.S. port and follows with quarterly inspections thereafter. The examinations emphasize structural fire safety and proper life saving equipment and involve the Coast Guard witnessing fire and abandon ship drills conducted by the ship’s crew and operational tests made on key equipment such as steering systems, fire pumps, and bilge pumps. The Coast Guard also closely examines the vessels and their operation for compliance with both international and U.S. environmental laws and regulations. The Coast Guard maintains the authority to require correction of any deficiencies before allowing a ship to take on passengers at any U.S. port.80

1.3.4 Tourism Policy in Neighboring Countries

1.3.4.1 Tourism Policy in Canada and Mexico
Like the United States, Canada and Mexico each have quite sophisticated regulatory systems that affect the tourism and recreation industries, both directly and indirectly, with respect to economic development, parks management, environmental protection, land use planning and zoning, and so on. Also like the United States, Canada and Mexico each have various levels of Federal, State/Provincial, and local regulatory systems in place. While the differences in basic legal structures between Canada, the United States, and Mexico are somewhat minimal, as discussed below, there are some differences from the U.S. in the way the national governments of Canada and Mexico each promote the tourism industry.

Canada. Most of the Canadian Government’s efforts to address tourism issues are coordinated through the Canadian Tourism Commission (CTC), a consortium of Canadian public and private sector partners representing provincial and regional tourism associations, government agencies, hotel operators, tour operators, airlines, and attractions managers. The CTC was created in 1995 to promote Canadian tourism by “marketing Canada as desirable travel destination; and providing timely and accurate information to the Canadian tourism industry to assist in its decision making.”81 The Government of Canada contributes approximately $65 million annually to the Canadian Tourism Commission, and private sector partners have consistently matched or exceeded this contribution.

One important area in which the CTC has become involved is finding ways to improve the balance between increased security following September 11 and allowing free movement of travelers between Canada and the U.S.82

Mexico. [information not currently available]

1.3.4.2 Tourism Policy in Central America and the Caribbean
In addition to providing many of the same regulations over business practices, public lands, environmental protection, land use planning and zoning, and other issues as elsewhere in North America, relevant policy initiatives of the countries of Central America and the Caribbean to a large extent deal with developing and promoting the tourism industry and tourism investment, as well as creating protected areas and parks (where valuable ecosystems are seen as a lure to tourist dollars).

82 Ibid.
Some examples of countries with recent regulatory and policy developments affecting the tourism and recreation industries are provided as follows.

**The Bahamas.** Tourism policy in The Bahamas is dictated by the size of the tourism industry in the country’s economy (40% of the total gross domestic product) and contribution of over 70% to the nation’s tax base. The proximity of The Bahamas to the eastern United States and Canada, bringing an estimated 80% of all visitors from North America, also influences the country’s policy and regulatory initiatives. Since 1992, the government has promoted a market-friendly approach to facilitate the economic benefits derived from the tourism industry and to diversify the country’s economic base.

One important government effort in recent years has been to encourage privatization of government-owned hotels. Since 1992, when the government owned approximately 20% of all hotels in the island nation, most government-owned hotels have been privatized, many of which have been purchased and refurbished by international investors. Today, government hotel ownership has dropped to about 5% of the country’s hotel room inventory.

New regulations have also been put in place to exempt the hotel and resort developers and investors from property tax and customs duty. This policy has generated significant growth in the country’s tourism industry and redevelopment of a number of key resorts and other tourism operations. The Hotels Encouragement Act provides incentives the allow duty-free entry of approved construction materials, furnishings, and fixtures for hotel development. Recent amendments to the Act have reduced the number of rooms required for new hotels to use the incentive to five rooms for hotels in the Family Islands—a policy move that is expected to stimulate an expansion in small, “eco-sensitive” hotels and guest houses. Another important aspect of the government’s policy it that The Bahamas is considered one of the world’s most significant tax shelters. Companies that locate in The Bahamas are required to pay no taxes on personal or corporate income, capital gains, dividends, interest, royalties, sales, estate, inheritance, or payrolls.

New government investment programs have also encouraged development and improvement of public parks and natural areas; major roadways, harbors, and water systems; international airports; electrification; marine docking facilities; and communications.83

**Belize.** Tourism remains the leading sector of Belize’s economy, and like other countries in the region, Belize has adopted a strong, environmentally conscious national policy for tourism industry development. Developed under the guidance of the Belize Ministry of Tourism, Belize’s tourism strategy plan incorporates the goals of stimulating economic growth while protecting the country’s environmental and heritage resources and ensuring benefits to the local people.84

The Key-executing agency for the Government of Belize is the Belize Tourism Board. The Board is a statutory board within the Ministry which functions as a strategic partnership between government and the private sector to develop, market, and implement tourism programs that will fulfill the emerging needs of our local industries and the international

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84 [http://www.belizetourism.org/policy.html](http://www.belizetourism.org/policy.html).
tourism market place for the benefit of Belize and Belizeans.\textsuperscript{85} Under the Belize Tourism Board Act, adopted in 2000, the Board is authorized to adopt the necessary regulations for a variety of basic tourism industry issues, such as hotel registration, hotel classification, assessment, and management of tourism statistical data; training, certifying, and regulating various tourism sub-sectors; and imposing appropriate taxes and fees.\textsuperscript{86} As established under the National Tourism Council Act, the Belize National Tourism Council works in coordination with the Tourism Board and is responsible for establishing the broader policy and legislative base for tourism industry development and support in the country. In particular, the Council is responsible for developing and implementing the Belize National Tourism Policy Plan.\textsuperscript{87}

\textit{Costa Rica.} The Costa Rica Tourist Board (ICT) is the governmental institution overseeing tourism activity in Costa Rica. Created under Law Number 1917 in 1955, the main objectives of the law include encouraging and retaining the presence of foreign visitors in the country; promoting construction and maintenance of infrastructure for tourists; promoting Costa Rica to international audiences as a recognized tourist destination; and promoting and overseeing tourism activities of the private sector. The ICT’s authority extends to regulation of the activities of hotels, travel agencies, car rental companies, and other tourism operators licensed by the ICT. In implementing its mandate, the ICT seeks to improve the conservation of natural attractions of the country such as beaches, national parks, flora, fauna, and related tourism and recreation amenities in Costa Rica.\textsuperscript{88}

\textit{Jamaica.} Jamaica is a party of a tax treaty with the United States that extends tax-deductible status to delegates attending meetings and conventions held in Jamaica. Under the treaty, all ordinary and necessary business expenses that are incurred by Americans attending meetings and conventions in Jamaica are covered, including accommodations, meals, printed material, audio-visual equipment rentals, as well as ground transportation to and from the meeting site.\textsuperscript{89}

\textit{Nicaragua.} Nicaragua recently passed a law to encourage tourism investment in the country. Law 306 provides special incentives for investment in the tourism industry in the country, consistent with the policy of promoting sustainable development and protection of the environment and cultural heritage. The Nicaragua Institute of Tourism law is authorized to implement the incentive program under Law 306. Benefits to private tourism investors include special promotion, certification, and marketing; special income tax, real estate tax, and import tax exemptions; and concessions for development of public lands. The law applies to both natural and legal persons involved in tourism economic activities and those persons providing financial support to the tourism industry. Activities covered under the law include lodging services; investments in protected areas with tourism and ecological value; air travel; water transportation; tourism-related ground transportation and rental services; food, drink, and entertainment services; motion picture filming; tourism infrastructure investments; and development of Nicaraguan folk crafts, traditional industries, and traditional

\textsuperscript{85} http://www.belize.gov.bz/belize/tourism.html.
\textsuperscript{86} Belize Tourism Board Act, Chapter 275, Revised Edition 2000 (31 December 2000).
\textsuperscript{87} Belize National Tourism Council Act, Chapter 276, Revised Edition 2000 (31 December 2000).
\textsuperscript{89} http://www.jamaicatravel.com/business/index.html.
music and dance. While the law applies to activities in any location within Nicaragua, special tourism planning and development zones (ZEPDT) have been established with added incentives for investment. Minimal investments, depending on the nature of the activity, are generally higher in the Managua metropolitan area than elsewhere in Nicaragua.\textsuperscript{90}

1.4 The Tourism Industry

1.4.1 General Background

1.4.1.1 Benchmarking in the Hotel and Accommodation Sector

Benchmarking is the process of identifying key indicators to enable meaningful comparisons to be made between business operations, usually in the same economic field. The indicators depend on the benchmarking objectives, for instance, RevPar is an important indicator when comparing the financial efficiency of hotel chains. Benchmarking is beginning to be used to assess the environmental performance of hotels and indicators such as energy and water use per customer. Environmental benchmarking both identifies areas for improvement in resource usage (which improves the “bottom line”) and can be used as a differentiator to competitors (advertisements can claim to be environmentally friendly).

Benchmarking is an important activity in the travel and tourism industry, with a number of standard providers of this information across the sector. There are numerous definitions of benchmarking, but essentially it involves learning, sharing information, and adopting best practices to bring about step changes in performance. Benchmarking is a means of improving performance by learning from others. Most organizations tailor definitions of benchmarking to suit their own strategies and objectives. The European Benchmarking Code of Conduct states,

\begin{quote}
ˈbenchmarking is simply about making comparisons with other organizations and then learning the lessons that those comparisons throw upˈ.
\end{quote}

Used appropriately, benchmarking has proved to be one of the most effective tools for bringing about significant improvements in performance. Benchmarking provides:

\begin{itemize}
  \item An effective ‘wake-up call’ and helps to make a strong case for change;
  \item Practical ways in which step changes in performance can be achieved by learning from others who have already undertaken comparable changes;
  \item The impetus for seeking new ways of doing things and promotes a culture that is receptive to fresh approaches and ideas; and
  \item Opportunities for staff to learn new skills and be involved in the transformation process from the outset\textsuperscript{91}.
\end{itemize}

The Andersen Hotel Industry Benchmark Survey (\url{http://www.hotelbenchmark.com}) was launched in 1996 and was the first to meet the need for international monthly hotel performance data. Monitoring key performance indicators—rate, occupancy, and RevPar (revenue per available room)—the survey now encompasses data from 5,000 hotels

\textsuperscript{90} \url{http://www.intur.gob.ni/}.

\textsuperscript{91} The Public Sector Benchmarking Service (PSBS), \url{http://www.benchmarking.gov.uk/about_bench/whyuseit.asp}.
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representing some 1,000,000 rooms in more than 300 markets. Four regional reports are produced on a monthly basis, which include the Caribbean and Latin America, although the primary focus is on Europe and Asia.

Smith Travel Research (STR) provides performance tracking, benchmarking, and occupancy forecasting services to the lodging industry in North America. In 1998, STR launched its “daySTAR” Program in the U.S., which is a competitive benchmarking and industry performance tracking program. It is now one of the largest ongoing samples of hotel daily performance data. It includes over 16,000 properties, accounting for approximately 2 million rooms reporting daily data on a weekly basis in the U.S. STR also runs a worldwide ‘daySTAR’ program. This will initially focus on collecting and reporting data in Canada and will extend to Europe and Asia Pacific. The daySTAR Canada program has over 60,000 rooms reporting.

In 1999, STR and PricewaterhouseCoopers announced the formation of a worldwide alliance to collect and publish hotel industry performance benchmarking and program for hotel industry research. The Worldwide Smith Travel Accommodations Report (WW*STAR) provides participants customized monthly operating performance reports that include comparative aggregate averages for a property’s selected competitors.

The WW*STAR program is designed to assist companies identify ways to maximize return on investment and identify trends in occupancy, ADR, and RevPar. WW*STAR also facilitates the ability to assess whether hotels are maintaining a competitive share of room occupancy/revenue and to accurately compare hotels against competitors. Hotel benchmarks are used to create target operating budgets and annual business/marketing plans while still maintaining confidential and/or sensitive operating performance data. Other applications of benchmarking include the Department of Energy Environmental Management Benchmarking Clearinghouse.

The above cited benchmark analysis for the hospitality sector does not consider the effects of environmental conditions as a component of business forecasting. However, the International Hotels Environment Initiative (IHEI) has introduced a benchmarking process which examines hotels’ performance according to environmental criteria (see below).

1.4.1.2  ‘Greening’ Hotels

Many hotel operators are looking to rationalize as the industry heads into a downturn. This has resulted in some renewed interest in ‘environmentally-friendly’ operating principles that may result in cost cutting. However, there is no overriding trend toward sustainable practices discernable in the hospitality sector in the U.S., unlike Europe and Asia.

A number of initiatives to encourage the ‘greening’ of hotels are now well established and are gaining additional momentum. One of the most prominent programs is the International Hotels Environment Initiative (IHEI) initiated in 1992. This was established by the industry to provide a “neutral platform” to bring about continuous improvement in environmental

92 Neil Haines, Asia Pacific leader of Hospitality and Leisure for PricewaterhouseCoopers, “PwC and STR have the most comprehensive research tools available to help industry leaders make intelligent, informed decisions that will ultimately improve the bottom line”, PwC/STR News Release, December 6, 1999.
performance of the global hotel industry. Chief Executives from 11 international hotel chains form the Council of the IHEI, with members representing over 68 brands, 11,200 hotels on five continents, and almost two million hotel rooms. IHEI initiatives claim to have raised awareness of responsible business practices among the international hotel industry, tour operators, government bodies, trade and business media, academia, consumers, and suppliers to the hospitality industry.

IHEI claims to have developed “a consistent globally relevant measuring tool” that provides an environmental benchmarking instrument allowing hotels of all sizes to participate (from large luxury to the basic amenity) and in different climatic zones to compare their energy consumption and water usage, as well as other parameters. The pilot for the tool was carried out in the Caribbean. IHEI identified five climatic zones globally but subsequently reduced these to three—tropical, temperate, and Mediterranean—as it is in these zones where the majority of hotels are to be found. A matrix listing the facilities likely to be provided in hotels across the range of accommodation types has been devised, under which individual hotels file their resource usage.

IHEI has not succeeded in stimulating a significant amount of interest in the U.S.94 The U.S. global hotels and resort companies that have become involved with IHEI have been representatives from their international divisions, rather than those responsible for the U.S. marketplace.

Environmental interest per se in the U.S. industry is low, and the benefits of cost savings through more environmentally benign practices are not a strong enough business reason for undertaking environmentally sound operating parameters. The comparatively low cost of energy in the U.S. may be a factor in this. Unlike hospitality markets in Europe and Asia, in the U.S., “the volume of money coming in to a hotel is more important than changing the system to ‘save’ money”95. However, some hotel investment organizations consider “greening hotel rooms” an important way to cut operating costs96.

With the cooperation and active participation of hotels and related organizations around the world, the IHEI initiative provides practical guidance for the industry on how to improve environmental performance and how this contributes to successful business operations.

Building on the experience of its’ member hotels, IHEI is developing guidelines for all hotels to benchmark their environmental performance. In 1997, IHEI piloted a benchmarking program in the Caribbean, based on key environmental indicators that hotels can measure, to:

1. Benchmark their own year-to-year performance; or
2. Work with similar hotels in a single destination to compare performance.

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94 Director, International Hotels Environment Initiative (IHEI), pers. comm.
95 Ibid.
96 Laurence Geller, Chief Executive Officer, Strategic Hotel Capital, a U.S.-based investment group that owns 30 hotels (including some operated by Marriott and Hyatt), considers ‘green’ rooms are one way to save money and that most hotel operators have cooperated with his requests but are wary of compromising on service and standards. “Going ‘Green’ for Survival, Business of Travel”—November 30, 2001, Scheherazade Daneshkhu, Financial Times.
Other environmental initiatives specifically directed to the hotels industry include Green Globe and the Green Hotels Association. A number of publications specialize in this area, such as ‘Green Hotelier’.

Although some evidence indicates hotels in the U.S. are not overly concerned with environmental cost cutting, this may change due to the activities of companies such as American Express Consultancy Services. Services provided to the hospitality sector include consolidating expenses, purchasing travel, and saving money on travel for companies in the sector. American Express consolidates data on travel patterns such as business travel, operational travel, travel to meetings, etc. The competitive pressure on margins these activities generate may increase the impetus to reduce environmentally associated costs in the U.S.

1.4.1.3 Ecotourism

Ecotourism and nature-based tourism need to be placed within the overall context of the tourism industry as a whole. Ecotourism is a subset of the spectrum of tourism types that make up nature-based tourism. Ecotourism is often viewed and promoted as being consistent with conservation objectives as it is small-scale with limited ecological and social impacts. By contrast, nature-based tourism, because of its larger scale, is often used to promote national development objectives rather than conservation objectives. Definitions of ‘ecotourism’ vary, but it typically depends on natural resources and interactions with nature while also minimizing negative impacts on the environment. ‘Alternative’ approaches to vacations, including cultural, rural or adventure travel and ecotourism, are gaining in popularity. Individual ecotourism projects are generally smaller than the average resort development projects and hence generally require less investment.

Ecotourism is seen as more ecologically and culturally sensitive than mass tourism and less likely to bring negative impacts. Balancing business development while at the same time making real contributions to the environment and local communities is challenging for ecotourist developments, with many projects marginally financially viable due to their small size and diseconomies of scale. Projects are sometimes undertaken by environmental specialists who lack an adequate understanding of marketing or other business skills necessary to ensure financial stability. However, this situation is changing as traditional tourism businesses increase their interest in this sector and environmentalists gain a better grasp of commercial viability. The trend is toward private sector developments that have commercial tourism components linked to the conservation and/or sustainable management of global biodiversity associated with projects or sites.

The demand for nature-based tourism and ecotourism has been steadily increasing, a trend that can be expected to continue. The key determinants of what tourists want seems to be determined by their knowledge, the right balance between excitement and predictability, vacation durations that fit in with other holiday arrangements, and cost. This means that there are some limitations to the expansion of ecotourism to “rougher” sites where costs and travel times are high and there is low predictability about the quality of the experience, including elements such as wildlife viewing. Other variable factors include prevailing weather, climate

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98 IFC, pers. comm.
and ocean conditions (e.g., temperature may influence the presence or absence of certain species of wildlife). However, this study found no reference to these environmental factors.

Ecotourism is seen as a potential vehicle to provide environmental, socio-economic, and cultural benefits at both local and national levels. Claims for ecotourism’s potential are generally based on three key assumptions: that ecotourism can:

◆ Provide a source of financing for development or maintenance of natural or culturally important sites;
◆ Serve as a catalyst for local economic development; and
◆ Provide foreign exchange and national level benefits.

A study of the U.S. market indicates that the U.S. nature-oriented tour market may be less than 1% of the outdoor recreation market, or a maximum of about $160 million per year (McKinsey Group, 1991)99.

2002 has been designated the ‘International Year of Ecotourism’, for which the WTO organized a series of regional seminars and conferences in preparation for the ‘year’.

1.4.1.4 The Environmental and Social Impacts of Recreation and Tourism

Tourism and recreational activities are sometimes referred to as the “smokeless” industry as its environmental impact often is less than that of other industries developed on a similar scale. However, the dependence of tourism on the environment makes its impact more conspicuous. Water pollution, ecological disruption, land degradation, and congestion typify environmental damage associated with poorly planned tourism development. Tourism/recreation is frequently an agent of change on the environment but is adversely affected by its own over-development as well as other industrial activities. Tourist interests in the natural or built environment require areas to be protected and appropriately managed. The industry is now increasingly considered an ally of environmental conservation. Ecotourism is one of the fastest growing segments of the industry. Ecotourist lodge managers are often conservationists themselves and actively monitor sensitive ecosystems and national parks.

With the growth in environmental awareness, tourist organizations have made greater efforts to develop facilities in harmony with their surroundings and to avoid over-development. Tour operators who, in the past, concentrated on inexpensive mass tourist destinations with little or no concern for environmental issues, are now encouraged by their clients to identify environmentally friendly destinations. This is influencing the business to be more environmentally conscious. Against a background of overbuilt destinations, local planners and government authorities have recognized that tourism must be planned and developed in a sustainable manner, and the infrastructure capacity must keep pace with development. A destination’s “carrying capacity” which specifies the level of development possible without incurring environmental degradation is now being factored into development plans100.


100 IFC, pers. comm.
Leisure activities commonly take place in the natural environment. Landscape features such as lakes, beaches, mountains, or wilderness areas are often the foundation of local and regional recreation and tourism activities. The overuse and pressure of large numbers of visitors may often place excessive stress on local infrastructure and ecosystems to keep pace with demands placed on the resources and process and associated waste generation. This may lead to environmental degradation if adequate controls and management processes are not enacted. The appropriate safeguards and planning based on the economic and environmental impacts of leisure activities needs to be in place to support development that is both economically as well as environmentally sustainable.

A report recently produced for the EPA investigated the economic and environmental impacts of recreation and tourism with the aim of establishing a methodology and baseline for measuring future impacts. It was suggested that the resultant indicators for each activity could then be compared against each other or compiled to give a broader measure of impacts for specific leisure activities as a whole. The EPA study was on a national scale and assessment limited to ten leisure activities (skiing, fishing, hunting, boating, golfing, casino gambling, amusement/theme parks, historic places and museums, conventions and conferences, and waterside recreation). The environmental impacts of these activities were assessed against nine environmental indicators that included energy use, air pollution, and greenhouse gas emissions. These variables were not set against any weather or climate parameters and did not include any indications of the indirect effects of recreation and tourism (e.g., the impacts of new roads or increased numbers of flights to destinations).

1.4.2 The Economics of Recreation and Tourism

1.4.2.1 Economic Impact Analysis

The economic impact of the recreation and tourism industry is frequently assessed by examining the changes that are occurring (or have occurred) in economic activity within a region and identifying the actions that have precipitated the changes. Several measures of the changes in economic activity can be generated. The most widely used are changes in sales, regional income, and employment. Visitor spending within a local area becomes sales for local businesses or other organizations selling products and services to visitors. Income is the sum of wage and salaries accruing to workers in these businesses and proprietor’s income and profits. Employment is the number of jobs supported by the given level of sales (jobs are generally not reported as full time equivalents as they include part time and seasonal employment). Income or value added (includes income and indirect business taxes) are measures of the contribution of recreation and tourism to a region’s economy.

A region may be a local area, a multi-county region, one or more states, or the entire country. When assessing local economic impacts, the local region is usually defined for recreation/tourism sites to be all counties within a given radius of the destination, usually a 30-60 mile radius. Only spending that takes place within this local area is included as stimulating changes in economic activity. Measures of impacts are then for businesses and households within this local region. The size of the region influences both the amount of spending captured and the multiplier effects.

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101 EPA ‘A Method for Quantifying Environmental Indicators of Selected Leisure Activities in the United States’.
For recreation and tourism, the action for which impacts are estimated may be the opening or closing of a facility or a change in the quantity or quality of facilities or marketing efforts that alters the number of visitors, types of visitors, and spending in the local area. An important first step is to estimate the increase or decrease in visitors that results from a specific action. In many recreation and tourism impact assessments, the action being evaluated is not directly stated. Frequently these studies measure the economic activity associated with a given number of visitors. Visitation and spending are not then attributed to any particular action or condition (such as the weather or climate) that is being evaluated. The impacts in this case can be interpreted as the loss in economic activity to the region if all of these visits and the associated spending did not occur in the region.

Recreation and tourism make major economic contributions to the U.S. economy and impact a number of key economic areas, including generation of government and state revenue, foreign exchange, employment, and property and infrastructure development.

Multiplier effects of tourism spending and employment are significant. Tourism supports the growth of domestic industries such as transport, agriculture, fishing, food processing, construction, furniture making, handicrafts, financial services, etc., creating investment opportunities for small and medium scale enterprises and a variety of employment opportunities. Local residents also benefit from improvements to transportation, power, communication, water and sewage treatment systems, health services, and recreational facilities built primarily for tourists.

1.4.2.2 Overview of the Economics of the U.S. Recreation and Tourism Industry

In 2000, the U.S. travel industry received $584.3 billion, including international passenger fares, from domestic and international travelers. These travel expenditures, in turn, generated 7.8 million jobs for Americans, with $173.7 billion in payroll income and $100 billion tax revenues for federal state and local government, as shown in Table 3.

<table>
<thead>
<tr>
<th>Travel Expenditures*</th>
<th>$584.3 Billion</th>
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</thead>
<tbody>
<tr>
<td>Travel-Generated Payroll</td>
<td>$173.7 Billion</td>
</tr>
<tr>
<td>Travel-Generated Employment</td>
<td>7.8 Million Jobs</td>
</tr>
<tr>
<td>Travel-Generated Tax Revenue</td>
<td>$100 Billion</td>
</tr>
<tr>
<td>Trade Surplus</td>
<td>$14.0 Billion</td>
</tr>
</tbody>
</table>

Source: Travel Industry Association of America, Tourism Industries/International Trade Administration.
Note: * Includes spending by U.S. resident and international travelers in the U.S. on travel related expenses (i.e., transportation, lodging, meals, entertainment and recreation, and incidental items), as well as international passenger fares on U.S. flag air carriers.
P = preliminary

Table 3. Economic Impact of Travel in the U.S., 2000P (Including Both U.S. Resident and International Travel)

Tourism is a relatively young industry, which has undergone unprecedented growth. Florida became a major tourist destination only after World War II. It is now Florida’s biggest industry. The climate attraction of sun, warmth, and good beaches attracts tourists in large numbers throughout the year. Florida’s varied environment means that it caters to those wishing for beach vacations and those who seek the natural environment in the Everglades.

102 IFC, pers. comm.
and Ten Thousand Islands and other non-built up areas. Florida’s reefs contribute $1.6 billion to the economy from tourism alone.\(^{103}\)

The influential role of the weather in the economy as a whole is increasingly being recognized. The recreation and tourism industry plays such a significant role in the economy and is invariably seasonally driven, an economist at Bank America was prompted to remark “global warming has significant implications for economies worldwide” and “statisticians adjust their numbers for seasonal factors but they may have to re-examine many of their assumptions in the future”\(^{104}\).

Leisure activities generate a substantial and growing share of the U.S. economy, although it is not possible to estimate the full economic impact of leisure activities. These activities include engaging in recreational pursuits, traveling to sites, overnight or longer stays, eating out, shopping, etc. In 1995, the travel and tourism industry was estimated to have provided US $746 billion to the U.S. GDP, approximately 10%, making tourism the second largest sector in the economy. Tourism is the largest employer in the U.S., providing 14.4 million jobs annually. Much of the internal and as well as foreign tourism to the U.S. is coastal-motivated: approximately 85% of all U.S. tourist revenues are earned by coastal states\(^ {105}\).

The tourism sector as a whole has achieved a Financial Rate of Return (FRR) and Economic Rate of Return (ERR) exceeding the median for most other investment sectors, although equity return on hotel investments tends not to be strong\(^ {106}\). The ERR for hotel projects tends to be strong due to close links with other parts of the economy and the taxes paid through the tourism sector. The leverage the hotel sector brings to the economy is, therefore, generally high, although FRR may sometimes be low.

Over the past decade, the travel and tourism industry has become an established leader in modern services economies. In the U.S., this has grown from a $26 billion industry in 1986 to a $90 billion one in 1996, with travel and tourism’s export contributions to the U.S. economy growing by almost 250%. Travel and tourism now represents the number one U.S. services export producing a trade surplus every year since 1989\(^ {107}\).

The U.S. Department of Commerce Bureau of Economic Analysis (BEA) has estimated that between $278 and $343 billion (equivalent to 3.3% and 4.1%) of U.S. GDP is derived from tourism expenditure. Business travel in the U.S. contributes a further $115–$119 billion, and local recreational expenditures add between $43 and $50 billion. This amounted to direct spending on U.S. recreation and tourism in 1997 at between $436 and $512 billion. From 1992 to 1997, tourism spending grew at an average annual rate of 6.9%, while the GDP grew


\(^{106}\) IFC, pers. comm.

requirements. At an average annual rate of 5.6%. Spending on leisure activities is expected to continue to grow both in absolute terms and as a proportion of the economy as a whole\textsuperscript{108}.

Just under $21 billion in inbound passenger fare receipts in 1996 was recorded, with visitor trip expenditures injecting almost $70 billion directly into the U.S. economy. Each international visitor to the United States represents an average export value of $1,500, with 28% of their expenditures going to accommodation, 18% to food service, 10% to entertainment, 30% to retail trade, and 13% to local transportation. In 1996, a record 46.5 million international visitors made America their destination of choice, an increase of 7% over 1995\textsuperscript{109}.

The travel and tourism sector is the third largest employer in the U.S., with nearly 7 million employees and with travel-generated payrolls totaling $116 billion. It is the U.S.’s third largest retail sales industry, generating $64 billion in tax revenues, based on $440 billion of expenditures in 1995\textsuperscript{10}.

Tourists’ spending supports many businesses. These businesses pay taxes, purchase materials, and hire employees, who in turn spend money. When these multiplier effects are added to the overall economic equation, it can be concluded that spending on tourism accounts for between $1.2 trillion and $1.4 trillion in the U.S.\textsuperscript{111}.

Travel to the United States is an export just like the sale of agricultural products, automobiles, or consumer goods, and that strength contributes to U.S. GDP. Importantly, inbound tourism has an impact on U.S. job creation, supporting over 1 million jobs in the U.S. in 1996\textsuperscript{112}.

All forecasts for the next decade indicate continued growth. However, the U.S. industry will continue to face growing competition from other countries for the international traveler\textsuperscript{113}.

The Outdoor Industry Association (OIA) (formerly the ORCA) currently (2001) estimates the outdoor industry to be valued at around $17.8 billion. In 1996, ORCA conducted an Outdoor Industry Distribution Study, creating for the first time data on the size of the outdoor recreation industry. A sample of 4,300 outdoor retail businesses, including sporting goods stores, specialty stores, catalogers, and specialty chains, were surveyed. Indicative of the growth in popularity of outdoor recreation activities, retail sales in the outdoor recreation industry were estimated at $4.7 billion, an increase of $400 million from 1995.

Large retailers, mostly chain stores and mail order companies, captured around 67% of the dollar volume (equivalent to $2.9 billion), while specialty independent stores have a market share of 33%, or $1.4 billion in retail sales. Sales trends by product category indicate that sales of footwear ($986 million) and apparel ($1.2 billion) are dominated by large retailers, while independent specialty stores sold a larger dollar share of paddle sports ($162.4 million) and rock/ice climbing ($96 million) equipment. Based on regional sales trends, the South

\textsuperscript{109} Ibid.
\textsuperscript{110} DOC.
\textsuperscript{111} EPA, ‘A Method for Quantifying Environmental Indicators of Selected Leisure Activities in the United States’.
\textsuperscript{112} Tourism’s Role in a Changing Economy, Leslie R. Doggett.
\textsuperscript{113} DOC.
reported the largest gains in sales over 1995. The report does not include estimates of retail sales at the mass merchant level, not does it include the bicycle or ski industries. Retail sales for the ski and snowboard industry were estimated at $2 billion for 1996-97 and the bicycle industry at $5 billion.\(^{114}\)

1.4.2.3 Government and State Revenue

Revenues are generated through taxes (e.g., sales tax, hotel room levies, air traveler charges, aircraft landing taxes, corporate income tax, payroll tax, social security tax, import duties, property tax, etc.). TIA research has shown that travel-related taxes account for a significant portion of most travel purchases. Travelers spend more than $70 billion a year in state, local, and federal taxes.

1.4.2.4 Travelers from Outside the U.S.

The U.S. is the most popular international tourist destination, attracting over 44.5 million arrivals annually.\(^{115}\) Net foreign exchange earnings from tourism vary and can be high relative to other exports of developing countries. In major tourism countries such as Mexico and the Dominican Republic, where tourism facilities are constructed, equipped, and supplied largely from local resources and staffed by local labor, net foreign exchange earnings can exceed 85\% of the gross revenues. This may fall to below 45\% in small under-developed economies such as found in the smaller islands of the Caribbean.

Even though the recreation and tourism industry is not as significant in developed countries as developing ones, it is a growing and important economic area. The impact of September 11 on foreign travel by U.S. citizens has had a devastating impact on the tourism industry in Europe.

More travelers to the U.S. originate from Canada and Mexico than any other foreign nation. About 90\% of the foreign travelers who leave Mexico each year come to the U.S., and over 70\% of the international travelers in Canada visit America. In 2000, 14.6 million Canadians and 10.3 million Mexicans visited the U.S.

1.4.2.5 Employment

Tourism is labor intensive: averages of 1.2-1.5 employees are required per hotel room in developing economies such as in some of the Caribbean islands, dependent on the type of hotel and local skill levels.

Tourism-related jobs offer training and employment in a wide range of skills. Tourism provides numerous employment opportunities for the hard to employ (i.e., lower skilled workers), but many hotel positions require highly skilled professionals in such areas as information technology, marketing, accountancy, hotel management, and building services. Mid-level employees in service-oriented positions may benefit from opportunities to establish their own small businesses, often in food services, maintenance, and supply activities.


\(^{115}\) World Tourist Organization, ‘Top World Destinations, 1996’. 
1.4.2.6 Business Models in the Accommodation and Hospitality Sector

There are no standard or universally applied business models in use across the recreation and tourism industry\(^{116}\), but the most commonly used model is that of ‘Yield Management’. Many of the larger hotel groups use their own proprietary forecast models\(^{117}\). While it is accepted there is a ‘seasonal’ element influencing some tourist flows, there are no widely applied business forecast models requiring climate or weather data input.

The Yield Management (or ‘Revenue Optimization’) business model was originally developed by and for the airline industry and for the past 15-20 years has been used by the accommodation sector, particularly by the large corporations. The model is essentially a business prediction tool that considers a number of factors, such as historical occupancy trends and forthcoming local events, and may also include the weather generally experienced for a given period. This model is also used by the winter sports and skiing industry\(^{118}\).

Business decisions have to be made to ‘maximize yield’ in terms of getting the ‘best rate for the room’. A hotel room is a “perishable product”\(^{119}\) which counts as lost revenue if the room is not sold for the night. The financial models used in the sector usually strive to achieve maximum occupancy.

All hotels aim to gain full RevPar on a daily basis in order to maximize profit, i.e., the highest revenue that can be gained to put on ‘the top line’. To attract more customers, some hotels will discount any remaining rooms after a certain time in the day if they are not fully occupied. However, a lower limit must be calculated based on percentage occupancy at full rate and those at a discount. An illustration of the decision making process in terms of maximizing yield is whether to aim for 100% full occupancy at $75.00/night or 50% occupancy at $200/night. This decision must also be offset against the higher costs of full occupancy, i.e., if all rooms are let and the associated room cleaning, laundry and other on-costs associated with each room let.

Decisions as to whether to accommodate particular conference groups are often based on a fixed room rate plus the amount specific groups are estimated to spend in the bar and/or restaurant and other charged facilities in the hotel. Weather and climate factors are not usually built into these types of revenue models or financial forecasting in the accommodation and hospitality sector\(^{120}\).

If certain sectors of travel that the hotel industry caters to is depressed at any one time, the yield management model assists in re-directing the market focus. Thus, if a hotel’s traditional main market is business travel and this sector is not achieving a maximum income for the hotel, then application of the model will assist re-focusing marketing efforts to boost visitors for (for instance) leisure purposes. Hotel rate trends are monitored over set periods of time to assess the most profitable market focus. A change in market focus may attract not only a different client group but also the distances and means of travel of the clientele: for example,

\(^{116}\) Andersen Consulting; IHEI; Hospitality and Leisure, PricewaterhouseCoopers; George Washington University, pers. comms.
\(^{117}\) George Washington University, pers. comm.
\(^{118}\) Andersen Consulting, pers. comm.
\(^{119}\) Ibid.
\(^{120}\) Ibid.
a shift away from business to leisure travel may imply a change to local market focus rather than an international one. This will, in turn, impact travel operators, airlines, and tour operators\textsuperscript{121}.

The original purpose for which the yield management model was used in the aviation industry still has significance for the tourist industry. Essentially, weather and climate data are used to calculate weight and balance of an aircraft; this is based on the center of gravity of an aircraft and determines how much thrust is required to get the aircraft airborne. It is essentially an engineering model, which relates to different climatic conditions and is a function of the ‘zero dynamics’ of a plane.

The direct economic repercussion for the travel and tourism industry is that for long haul runs (e.g., to Japan), aircraft take a “nose beating” in strong headwinds. So there are certain times of the year when tour operating companies and airlines will not oversell tickets. These occasions of strong headwinds can be predicted, and the data are fed into the model (these conditions generally occur seasonally)\textsuperscript{122}.

1.4.2.7 Investment in the Recreation and Tourism Industry

There is greater accessibility to economic data and analyses for the tourism sub-sector than for ‘recreation’ activities \textit{per se}.

Investment in the accommodation and hospitality sub-sector tends to be through investment companies, an example is “Strategic Hotel Capital”, which is a U.S. based hotel investment group that owns 30 hotels (including some operated by Marriott and Hyatt).

Hotels and resort developments are characterized by high levels of fixed costs, both in terms of the capital required to build a property and ongoing operating costs, and are very sensitive to economic instability which leaves them vulnerable to market fluctuations. Hotel and resort development face a number of risk factors, which often result in volatile revenues and an operating performance below original projections. The major risk factors are itemized in Appendix D.

In order to stimulate the tourist industry, increasing tourist volumes by building additional hotels is often necessary so that a destination may reach a level of critical mass needed to attract airlines to establish routes and tour operators to promote a destination. Hotels are a key factor in this process. A specific volume of hotel rooms and visitors is also required to justify the sometimes large investments required in infrastructure such as airports, roads, ports, marinas, power generation facilities, local transport companies, waste management, landfills, etc. Thus, concentrated and well-planned integrated resort development is generally more successful commercially and a better guardian of the environment than ad hoc developments\textsuperscript{123}.

The International Finance Corporation recently secured Trust Funds to help small hotels in the Caribbean by grouping together several properties into various brands or themes and

\textsuperscript{121} American Express Consultancy Services, pers. comm.
\textsuperscript{122} Daryl Jenkins, Dept. of Aviation, George Washington University, pers. comm. The GWU Dept. of Aviation is investigating the development a model based on the availability of weather forecasts 3-4 hours ahead.
\textsuperscript{123} IFC, pers. comm.
establishing standards so they can be more appropriately marketed. It is expected that this will make a significant contribution to improved financial performance\textsuperscript{124}.

The economic and demographic effects of both a warm climate and the resultant burgeoning tourist industry can be seen in the recent differential population growth rates of individual states. According to the Census Bureau’s first updated population estimates since the April 2000 census, the Sun Belt states such as Nevada, Arizona, and Colorado were the U.S.’s fastest growing states during 2001. As a direct result of the warm climate and tourism industry, Nevada’s population has increased by 5.4 percent to 2.1 million during the 15-month period from April 1, 2000, to July 1, 2001. The weather and more vibrant economies have acted to draw more people to Southern and Western states for decades\textsuperscript{125}.

Tourism and recreation developments usually involve both public and private sector involvement. Local government or state recreation and land-use planners are responsible for locating, zoning, and developing recreation and tourism amenities and, subsequently, the overseeing and running of facilities.

\textbf{1.4.2.8 New Developments}

A number of consultancies advise the industry on new hotel and resort development (e.g., new build). Development decisions vary depending on location: developments in ‘gateway’ cities (such as New York, Los Angeles, Miami, Toronto) attract international visitors, whereas in secondary centers the catchment market is usually national, regional, and often local. Decisions on the siting and development of new build hotels and resorts depend on the following factors:

1. Source markets to the destination;
2. Economic situation of the source markets (e.g., whether they are stable, pending a recession, standard of living, etc.);
3. Infrastructure at the destination and transport to destination (boats/flights); size of the airport (is it large enough to deal with increased tourist flow?); hotel/resort location and existing tourist flows; and
4. Existing local supply/competition.

Weather and climate conditions are not usually factored into these assessment models and are not cited as reasons for development (or not) of a resort or hotel\textsuperscript{126}. This indicates that the models are used to fine tune decisions after climate and weather information have been taken into account. It is not clear what climate information has been used, but it is almost certainly macro-level data such as average rainfall, average sunshine hours, average temperatures, etc.

Currently, most hotel developments are mainly through acquisition (i.e., sales of hotels/businesses) rather than through new build\textsuperscript{127}.

\textsuperscript{124}I\textsc{f}c I\textsc{n}d\textsc{ustry InfoNet}, ‘City and Business Hotel Industry’, 10/03/2000.
\textsuperscript{126}Andersen Consulting, pers. comm.
\textsuperscript{127}J\textsc{o}n\textsc{es L}a\textsc{ng LaSalle Hotel}, pers. comm.
The research showed weather, climate, and ocean conditions do not critically influence site selection decisions when locating new hotels, resorts, or recreational developments. Developers have usually already made up their minds where they are going to construct a recreation or tourist facility prior to contacting economic development councils or examining weather, climate, and ocean information.

The International Economic Development Council (IEDC), in conjunction with site selection consultants, has developed site selection data standards based on the need to be able to perform location and community comparisons on a uniform basis. The data standards consist of community information that is required for site assessment for expansion or relocation decisions. The standards create a system for presenting economic development information and make comparisons of community data comparable. It is evident that the Internet is increasingly impacting the site selection process, making detailed location information easily available. When developers in the recreation and tourism industry are looking to locate and expand facilities in particular areas or regions, they often consult these data. Often the parameters include “Quality of Life” of which ‘Climate’ is one parameter.

The data given under ‘climate’ may include:

- Average daily temperature;
- Average annual temperature;
- January rainfall in inches;
- July rainfall in inches;
- Snowfall in inches;
- Number of heating degree-days (last 30 years);
- Number of cooling degree-days (last 30 years);
- Wind speed in miles per hour (annual average);
- Annual number of days sunny or partly sunny; and
- Elevation (mean feet above sea level).

However, one expert witness from Megacorp (Mesa Office of Economic Development) commented that site selectors (such as hotel developers) have often made their choice prior to consulting these data.

The Mesa 2025 Draft General Plan includes a section on “Parks, Recreation and Open Space”. In this, it states that national standards aim for parks per 1,000 residents. The national and regional standards for recreation and open space are acting as a positive driver for the City of Mesa to search for suitable sites for recreational development to meet national and regional standards. In this case, standardization is acting as a driver. The plan recognizes the importance of connecting existing recreational amenities through trail corridors, canals, utility corridors, and urban multi-use pathways.

1.4.3 The Recession and September 11, 2001

1.4.3.1 Short-Term Impact

While it was forecast that the tourism sector would be on a continuing high growth path, the recent recession, coupled with the events of September 2001, has led to an overall reduction in the expected growth of the industry.
In the weekend following the attack, United Airlines, Continental, American, and Northwest all reduced their schedules by 20% to avoid financial disaster. A sustained cut of 20% in air schedules is equivalent to an 11% decrease in room demand, or 100 million less occupied nights (given that each roundtrip air passenger equals 1.7 room nights demanded). Two weeks after the attacks, passenger numbers started to recover, although airlines were operating at 50% capacity.

The events of September 11, 2001, in particular are widely regarded as the ‘final straw’ in what had been a tough year for hotels, particularly in the U.S. and gateway cities in Europe, which are dependent on transatlantic travel. Occupancy rates in the U.S. and UK had fallen over much of the year but plunged after September 11. In the U.S., average occupancy rates fell 2.2 percent in the first nine months of the year compared with last year but dropped 16 percent in September^{128}.

Weakening demand resulting from companies reducing travel budgets in 2001 has been cited as the main reason for the downturn. Since September 11, many companies have cut spending back even further by banning non-essential travel that can lead to a fall in travel of up to 50 percent. The Hyatt in New Orleans (owned by Strategic Hotel Capital) reported occupancy rates plunged to just 8.5 percent in mid-September 2001^{129}. However, many are expecting the industry to pick-up, with most pundits forecasting recovery, along with improvements in general economic conditions, in mid-to-end 2002.

Various consultancies and trade associations are issuing different predictions for what will happen to the recreation and tourism market after the terrorist attacks of September 2001. One of the difficulties in attempting to gain an accurate estimation is that the consumer interface end (e.g., accommodation demands and hence RevPar) is dependent on a number of external variables. For example, if airlines cease to fly or substantially reduce the number of flights to destinations, then this will negatively impact the accommodation and hospitality industry at the end destination point.

This has, in fact occurred, as airlines have not resumed flights to all the pre-September 2001 destinations to the Caribbean islands. The hotel industry as well as associated businesses has suffered considerable revenue loss as a result. In St. Lucia, prior to September 2001, American Airlines was flying large jetliners on a regular schedule to the island, but subsequent to the terrorist attacks, only small planes of the ‘American Eagle’ fleet are servicing the island. Consequently, instead of hundreds of tourists arriving by each flight, now a trickle of 20-30 tourists disembark from these smaller capacity aircraft. (This has also had an impact on the source markets: many tourists originating from Germany used to travel to St Lucia, so the German and other tour operators are also negatively impacted.)

The terrorist attacks also had consequences for the marine community: ports and marinas were on heightened alert, and leisure craft were scrutinized when entering harbors and ports. The Port of Charleston, for example, witnessed increased activity from U.S. Customs, the Coast Guard, Immigration, Port Police, emergency preparedness teams, and the Department of Agriculture^{130}. Renewed efforts to attract local tourism have also been a consequence of

^{129} Ibid.
^{130} ‘State of the Port Address’, Bernard S Groseclose, Jr., President and CEO, South Carolina Ports, October 25, 2001.
the 9/11 terrorist attacks. This is illustrated by the Port of San Diego’s ‘Big Bay’ program, which recognized the need to promote local tourism. “People are staying closer to home these days”, said John Hawkins, Chairman of the San Diego Convention and Visitors Bureau. A further consequence of September 11 has been that tourists originating in the U.S. are traveling less. This has affected destinations such as London, traditionally a popular destination for cross-Atlantic travel, which has now seen a drop in demand for accommodation by around 25% in some hotels (even 4 months after the attacks) despite fewer reductions in trans-Atlantic flights scheduled by the major airlines.

One of the effects of 9/11 on businesses in all sectors is that they want to limit all risks, not only those related to security, so that once other manageable risks are controlled (such as weather conditions, location decisions, and mitigating measures), they will be concerned about fewer risks overall.

However, sales figures released by the Outdoor Industry Association indicated that sales of outdoor equipment and apparel advanced 3.3% in the month of September despite the tragic events of September 11th. The results are taken from 427 outdoor storefronts nationwide and are based on monthly retail tracking of sales in specialty and chain stores nationwide for the Outdoor Industry Association. Sales figures are recorded at point-of-sale and compared to sales in September 2000.

According to a report released in October 2001 by the Outdoor Industry Association, Americans view national parks and mountain resorts as the safest weekend and vacation destinations in the wake of the September 11th attacks. The report’s poll, between September 21 and October 6, asked about changes in leisure travel plans, activities, and anticipated leisure and sport purchases. The report also shows that nearly 70% of Americans who planned to travel in the next six months maintained their plans, while nearly 30% canceled or postponed them.

1.4.3.2 Long-Term Impact

A crucial issue in the determination of whether the terrorist attacks of September 11, 2001, will have a lasting impact on the travel sector (in particularly air travel) is on how any long-term change in air-travel numbers impacts the cost structure and pricing models of individual airlines. Air travel up to 11 September had enjoyed significant long-term growth due to its improved affordability. If the costs required for new security and safety measures are ongoing, this has the potential to price air travel out of the reach of certain segments of the market, with long-term impacts on the travel and hotel sector. However, without the new security measures, people will not feel safe and will not travel by air. This is a “Catch 22” situation.

Consumer and business sentiment has been significantly damaged by the terrorist attacks of 2001. According to the Conference Board (9/26/01), general consumer confidence has suffered its largest fall since the Gulf War. There has been some recovery, however, with

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131 Andersen Consulting, pers. comm.
132 Office of Economic Development of Mesa, AZ, pers. comm.
many of the conventions and meetings cancelled throughout the post-September period being rescheduled for 2002, which bodes better for hotel demand in 2002.

The revised FY2001 industry trends estimates issued by Smith Travel Research are:
◆ Occupancy down 4.7% to 60.7%;
◆ ADR up 0.5% to $86; and
◆ RevPar down 4.3% to $52.

The market is anticipated to recover to 1998 levels by mid to late 2002, assuming no further economic shocks.

1.4.4 Tourist Flows
1.4.4.1 Climate Induced Seasonal Migration: The Snowbird Phenomenon
Research into the annual ‘snowbird’ migration has not conclusively identified reasons for this well defined seasonal migration. The survey showed that the ‘average’ snowbird population is from the middle annual income range and is capable of uprooting itself from permanent homes in the Midwest and Canada for an average five-month stay in various locations (often RV parks) throughout Arizona. Arizona attracts an estimated 300,000 winter visitors each year. Approximately 155,000, around 50 percent of the total visitors, lived in mobile homes and RV/travel trailer parks throughout Arizona at the height of the 2000-01 winter season.

Spending by seasonal households provides a major stimulus to the economies of many Arizona communities. In an Arizona Republic survey of the Phoenix area, winter residents stayed on average for four months and spent an estimated $1,6000 per month in Arizona during their stay. Overall, national park snowbirds throughout the state spend more than a half billion dollars for local goods and services.

Thus, the climate has a significant economic effect in terms of winter attractiveness resulting in the seasonal ‘snowbird’ migration. However, while this climate association is apparent, no formal studies have been made between this migration and actual weather and climate conditions in any one year. It depends also on the weather conditions and other conditions at visitor source areas.

However, over the past couple of seasons, there have been fewer snowbird households; the reasons for this include fewer Canadians coming due to their depreciated dollar, higher fuel costs, and the transition between the “Bob Hope” generation and younger retirees who are buying condos and houses. In addition, increasing crime rates and congestion in the vicinity of some parks are deterring visitors to various areas.

Arizona, Florida, and California experience increases in visitor numbers during winter. These ‘Snowbirds’ are usually defined as part-time residents: those that spend more than 30 days in the state. They usually come from the mid west, Illinois, Minnesota, Wisconsin, and Canada, getting away from cold winter weather.

136 Ibid.
1.4.5 Recreational Activities

‘Recreation’ covers a large range of activities. An indication of the range of leisure pursuits is illustrated in Appendix F. These range aquatic, aerial to terrestrial, out-of-doors, active to sedentary, and indoor pursuits.

Sports activities, whether participating or spectating, attract millions of people on a regular basis and play an important role in local economies. Many sporting activities are seasonal (football, baseball), although the ‘season’ is often extended, in the case of baseball, by ‘spring training’ events that constitute a multi-million dollar business in states such as Arizona and Florida, and by indoor tennis during cold winter months. Millions of people engage in hunting, shooting, and fishing. These recreational activities are determined by ‘season’ as certain times of year are designated “off season” rather than just determined by the weather and climate.

As the TIA has observed, sports and travel go together. Two out of every five U.S. adults (38%) attended an organized sports event, competition, or tournament as either a spectator or participant while traveling in the past five years. This equates to 75.3 million U.S. adults. A majority of these sports event travelers took their most recent sports trip in the past year (70% or 52.7 million adults). The most popular organized sports events to watch or participate in while traveling is baseball or softball, with 17% of U.S. adults traveling 50 miles or more to see or play in a baseball or softball game in the past five years. This is followed by football (15%), basketball (9%), and auto/truck racing (8%).

Beaches are one of the most popular leisure travel activities according to TIA research findings. One in ten leisure person-trips (12%) includes going to a beach, equating to 87 million domestic leisure person-trips taken in the U.S. On trips of 7 nights or more, beaches are even more popular, with 35% of beach-goers staying a week or longer. Of trips to beaches, 35% include children.

Similarly, biking vacations attracted more than 27 million travelers in the past five years and rank as the third most popular outdoor vacation activity in America (following camping and hiking). People who take biking trips tend to be young and affluent. About half are between the ages of 18 and 34, and one-fourth are from households with an annual income of $75,000 or more. More than 80% of biking travelers took a camping trip in the past five years, and 72% took hiking trips in the past five years.

Camping is the most popular outdoor vacation activity in America. One-third of U.S. adults have gone on a camping vacation in the past five years. Camping vacationers tend to be married with children at home. The average age of travelers who go camping is 37, and their median household income is $43,000. People who go camping also tend to enjoy hiking, biking, and canoeing. Fifty-nine percent of campers traveled with their spouses on their most recent outdoor vacation, and nearly half traveled with their children.

An important recreational resource in the U.S. is the National Forests. These include environments from coasts to mountains and have usage data collected and analyzed. They can, therefore, provide a useful overview of recreational activities in the U.S.
1.4.5.1 Recreation Planning at the State Level

Most states produce a comprehensive Statewide Outdoor Recreation Plan (SCORP). States intending to apply for Federal funding to develop their recreational resources have to produce and submit a SCORP to Federal funding agencies. These review the needs and opportunities for recreational development. Local authority Department of Natural Resources may engage consultants to assist with identifying opportunities, help with baseline analyses, and work with planners to produce the overall plans.

SCORPs outline where the needs are from a recreational standpoint. The Natural Resources Board of Wisconsin, for example, asked their resource planner what she wanted to concentrate on in proposed projects. The 2050 plan outlines for the Department and Wisconsin Natural Resources Board areas of significant land that should be protected over the next 50 years. The plan covers all recreational aspects and activities (including hunting, areas for ATV\(^{137}\), golf courses, etc.). Local committees write outdoor recreation plans, and the Department of Natural Resources use SCORPs as reference material to justify the need for specific developments (e.g., 100 miles designated for cross-country skiing opportunities in the state). When the local authorities look at property for a specific recreational facility or for site planning on an existing property, they have to justify the need for it. It is probable that climatic data would help to justify this.

Comprehensive Outdoor Recreation Plans (CORPs) are community-wide plans. The Virginia plan, produced in 1996, was thought highly of, and acts as a template for other states. This plan includes demographic information, cultural resource data, and information on existing resources as well as a strategy for developing and enhancing recreational opportunities in the state. There is no information on the weather and climate of the state. The Commonwealth of Virginia Department of Natural Resources contracted for the work to be completed, and the plan was then submitted to the Federal government.

Members of the National Association of Recreation Resource Planners (NARRP) are mostly Federal, state, or local government landscape architects and planners. Some consultants and students are members, and some university departments are affiliates. They work mainly on feasibility studies or master plans on new properties or existing ones. NARRP has been active for over 20 years and has a growing membership. Planner members tend to work on policy issues and carry out site planning on properties. They are often responsible for producing feasibility studies leading to plans for specific properties, for example, planning for skiing. Most of these plans do not include any assessment of weather or climate as people who produce the plans as well as the audience live in the state and are well aware what the weather is like generally. Soils and existing cultural resources are described. It is very much up to individual authors and assessors to decide if they are going to include weather and climate information in the report.

1.4.5.2 Recreation in National Parks and National Forests

“Indicative of the growth in the popularity of outdoor recreation activities, retail sales in the outdoor recreation industry were estimated at $4.7 billion, up $400 million from 1995.”

Outdoor Industry Association

\(^{137}\) ATV = All Terrain Vehicles.
The TIA has found that National Parks are one of America’s biggest attractions. Nearly 30 million U.S. adults (20% of travelers or 15% of all U.S. adults) took a trip of 100 miles or more, one-way, to visit a national park during 2001. Residents of the Rocky Mountain region of the U.S. are most likely to visit a national park, with 37% saying they included a park visit while traveling. A large share of these travelers (70%) participated in outdoor activities while visiting the national parks. Among these outdoor activities, hiking (53%) was the most popular, followed by camping (33%) and fishing (19%)

National Forests cover a large area of the U.S. and attract both day visitors and long-stay vacationers. They are a major recreational and tourist attraction. Existing national forest plans and other Forest Service direction mandate visitor use monitoring. Thus, National Forest Visitor Use Monitoring (NVUM) was developed to provide statistically reliable estimates of visitors needed to assist with federal land management planning decisions. The survey also provides important information collected for Congress and external customers such as the states, private industry, and academia.

The NVUM project provides estimates of recreational and other visitor use of National Forests throughout the United States. These results are from a survey of forest visitors at 6,000 recreation sites across 32 National Forests. During the 5,846 sample days, almost 37,000 visitors were interviewed. The survey results are compiled at the forest level, then expanded to provide estimates at the regional and national levels. As NVUM surveys continue through the next 3 years, these estimates will be updated annually.

Nationally, during calendar year 2000, there were 209 million National Forest visits plus or minus 36 million visits (17% error rate) at the 80% confidence level. On the average, each National Forest visitor went to 1.2 recreation sites, thus producing 257 million National Forest site visits. Additionally, another 258 million people viewed National Forest scenery (labeled Viewing Corridors in this survey) from non-Forest Service managed roads and waterways.

**Table 4** summarizes national forest visits and site visits by Region. Note that Viewing Corridors are a special category in the NVUM study intended to measure visitors who view National Forest scenery without using Forest Service facilities. It is important to consider these visitors when land management decisions deal with scenery and tourism strategies. Nationally, the five most popular recreation activities were viewing natural features, sightseeing, hiking, general relaxing, and driving for pleasure. The average forest visitor spends about $3,700 annually on all outdoor recreation.

1.4.5.3 **Theme Parks**

Theme parks, or amusement parks, trace their origins to the fairs and carnivals of medieval Europe. The first amusement park in the United States was Lake Compounce, which opened in 1845 in Bristol, Connecticut. It was limited in what it offered and catered mainly to those who lived in its immediate vicinity. In July 1955, Walt Disney opened what was then a new kind of amusement park in an orange grove in Anaheim, California. “Disneyland” provided eighteen rides built around the cartoon characters created by Disney and his collaborators.

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138 USDA Forest Service Research and Development, “Outdoor Recreation in the United States, Results from the National Survey on Recreation and the Environment (NSRE)”.
### Table 4. National Forest Visit, Site Visit, and Wilderness Visit Estimates by the Nine Forest Service Regions as Well as National Totals (in Millions)

<table>
<thead>
<tr>
<th>Region</th>
<th>NF Visits (Millions)</th>
<th>Error Rate¹ (%)</th>
<th>Site Visits (Millions)</th>
<th>Error Rate (%)</th>
<th>Wilderness Visits (millions) (Included in NFV)</th>
<th>Viewing Corridors²</th>
</tr>
</thead>
<tbody>
<tr>
<td>National Total</td>
<td>209</td>
<td>±17</td>
<td>256.9</td>
<td>±22.9</td>
<td>14.3</td>
<td>258</td>
</tr>
<tr>
<td>Region 1</td>
<td>12.4</td>
<td>±26.4</td>
<td>14.5</td>
<td>±25</td>
<td>.31</td>
<td></td>
</tr>
<tr>
<td>Region 2</td>
<td>38.6</td>
<td>±56.7</td>
<td>48.6</td>
<td>±56.1</td>
<td>2.3</td>
<td></td>
</tr>
<tr>
<td>Region 3</td>
<td>17.3</td>
<td>±38.5</td>
<td>20.9</td>
<td>±36.8</td>
<td>3.4</td>
<td></td>
</tr>
<tr>
<td>Region 4</td>
<td>20.5</td>
<td>±25.3</td>
<td>22.7</td>
<td>±23.9</td>
<td>1.2</td>
<td></td>
</tr>
<tr>
<td>Region 5</td>
<td>20.2</td>
<td>±57.1</td>
<td>24.5</td>
<td>±52.7</td>
<td>.6</td>
<td></td>
</tr>
<tr>
<td>Region 6</td>
<td>34</td>
<td>±57.8</td>
<td>40.1</td>
<td>±52.3</td>
<td>3.6</td>
<td></td>
</tr>
<tr>
<td>Region 8</td>
<td>24.9</td>
<td>±35.3</td>
<td>31.6</td>
<td>±30.1</td>
<td>.72</td>
<td></td>
</tr>
<tr>
<td>Region 9</td>
<td>34.2</td>
<td>±29.4</td>
<td>46.1</td>
<td>±29</td>
<td>1.6</td>
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<tr>
<td>Region 10</td>
<td>7</td>
<td>±23.1</td>
<td>7.8</td>
<td>±21.6</td>
<td>.6</td>
<td></td>
</tr>
</tbody>
</table>

¹ Error rates express the precision of the estimate in percentage terms at the 80% confidence level.
² The sample design for Viewing Corridors was not intended to provide estimates of statistical precision.

In addition to Disneyland, there is also Walt Disney World, opened in central Florida in 1971, as well as Disneyland Tokyo (1983) and Disneyland Paris (1992). The four parks host 74 million visitors per year. In the United States, there are over 300 amusement parks. Collectively, American amusement parks constitute a $4 billion-a-year industry that serves some 90 million visitors.¹³⁹

### 1.4.5.4 Maritime Industry

#### Background

All ocean-going vessels engaged in international commerce must have a country of registry in order to operate in international waters. Most countries, including the U.S., provide these registration services or flags of registry. The predominant countries offering flags of registry for cruise vessels are the United Kingdom, Liberia, Panama, Norway, Netherlands, Bahamas, and the United States. These nations, which provide vessel owners with comprehensive, competitive ship registry services and maritime expertise, are all member states of the International Maritime Organization (IMO).

In the competitive international shipping industry, there are a number of factors that must be met for a valid registry. First, a flag state must be an IMO member nation that has adopted all of the IMO’s maritime safety Resolutions and Conventions. Second, a flag state should have an established maritime organization that is capable of enforcing all international and national regulations. Major flag registries provide comprehensive maritime expertise and administrative services, require annual safety inspections prior to issuance of a passenger vessel certificate, and utilize recognized classification societies to monitor its vessels’ compliance with all international and flag state standards.

Flag states enforce rules and requirements for vessels that fly their flags. Major requirements include crew nationality, crew composition, ship owner citizenship, and ship building...

requirements. The crewing, ship construction, and ownership requirements to flag a vessel in the United States are among the most restrictive of the maritime nations. Current manning regulations for U.S.-flag vessels engaged in coastwise trade mandate that all officers and pilots and 75% of other onboard personnel be U.S. citizens or residents. U.S. flag vessels engaged in coastwise trade must be owned by U.S. citizens and constructed in U.S. shipyards.

Regardless of the flag a vessel flies, compliance with SOLAS (Safety of Life at Sea Convention) standards and both the flag and port states is governed by other internationally recognized conventions. The flag state has the primary responsibility for ensuring that its vessels meet all established international guidelines. The flag state conducts annual ship examinations, which include a thorough inspection of the vessel and its safety systems. A vessel is then certified to be in compliance with all international safety standards. The effort of the flag state is augmented by an additional annual survey conducted by a classification society to certify a vessel’s seaworthiness and structural integrity.

Port states (i.e., those countries at whose ports a vessel calls) also play a role in the regulatory framework. The United States, represented at the IMO by the U.S. Coast Guard, vigorously enforces SOLAS standards. The Coast Guard conducts quarterly inspections on all vessels embarking passengers at U.S. ports.

Because of the restrictions outlined above for U.S. flag registry, nearly 90% of the commercial vessels calling on U.S. ports fly a non-U.S. flag. Vessels with international registries are not unique to the cruise industry; a majority of the major U.S. controlled shipping companies engaged in international commerce operate under flags other than that of the United States.

Although a majority of cruise vessels fly non-U.S. flags, the United States and its ports derive substantial economic benefits from cruise industry operations.

Cruise Lines
Although a majority of cruise vessels fly non-U.S. flags, the United States and its ports derive substantial economic benefits from cruise industry operations. According to a study conducted by Business Research and Economic Advisors and WEFA, Inc. (formerly Wharton Economic Forecasting Associates), the cruise industry contributed $15.5 billion in goods and services to the U.S. economy in 1999 and was projected to rise to $18.8 billion in 2002 (estimated prior to the 9/11/01 terrorist attacks). Cruise lines directly employ 24,000 Americans in their U.S. headquarters offices, in field sales positions, in support and administrative positions worldwide, and onboard ships. During 1999, the cruise industry paid $678 million in wages, salaries, benefits, and wage taxes. Appendix J shows the main cruise lines.

Most cruise industry purchases—from food and beverages served on the ships to crew uniforms—are made in the U.S. The combined direct spending of cruise lines and their passengers on American goods and services in 1999 totaled $8.1 billion. Direct purchases by cruise lines benefited businesses representing virtually every segment of the U.S. economy.

including airlines, travel agencies, ground transportation companies, business services, energy, finance, food and beverage, and ship repair and maintenance. Those purchases supported an estimated 214,900 American jobs, putting the total wages generated by the cruise industry in the U.S. at $7 billion. These jobs and expenditures contribute considerably to the overall U.S. economy. The North American cruise industry invested another $627 million in domestic capital expenditures in 1999, including $498 million in U.S. shipyards for vessel maintenance and repairs\(^\text{141}\).

Three states—Florida, California, and Alaska—were the prime economic beneficiaries from cruise lines purchasing and employment in 1999, but the industry’s impact reached far beyond the shore. In fact, all 50 states benefit from the positive economic contributions of the cruise industry through:

- Cruise lines headquarters and other facilities;
- Ports of embarkation and ports-of-call;
- Place of residence of cruise passengers; and
- Place of business of cruise industry vendors.

The growing popularity of cruising throughout the world has also provided a bonus for U.S. tourism. The number of tourists from other countries who travel to North America for a cruise vacation—and frequently an extended pre- or post-cruise visit—increased by some 50 percent in the last half of the past decade\(^\text{142}\).

The economic impacts were concentrated in ten states, which accounted for more than 75 percent of the U.S. total impacts. Florida, with $3.4 billion in direct spending and more than 101,000 jobs paying $3.0 billion in income, is the center of the cruise industry in the U.S., accounting for more than one-third of the industry’s national economic impacts. In addition, the state of Florida accommodates the corporate or administrative offices of fifteen cruise lines. Similarly, California hosts both cruise line headquarters and ports-of-embarkation. With over 10 percent of the industry’s national impacts, California businesses received over $1 billion in direct industry spending, which then generated just under 27,000 jobs paying $1 billion in wage income. In addition, New York, the state of Washington, and Alaska substantially benefited from the cruise industry. The impacts on other states were primarily generated by cruise passenger spending for air travel and cruise line purchases from vendors located in each of the states\(^\text{143}\).

The Caribbean market (including the Bahamas) is the most popular destination for cruise passengers, accounting for 45.9 percent of the capacity in 2000\(^\text{144}\). Alaska continues to grow in popularity as a cruise destination and now plays a significant role in the economic base of a number of Alaska’s communities: cruise lines, passengers, and crew are estimated to have


\(^{142}\) North West Cruise Ship Association.

\(^{143}\) ‘The Contribution of the North American Cruise Industry to the U.S. Economy in 2000’.

spent a total of $181 million in the four communities of Juneau, Ketchikan, Sitka, and Haines in 1999\textsuperscript{145}. The Alaska travel industry is highly seasonal and exclusively a summer industry, with the majority of visitors in the fall/winter “business only” travelers (44%, or 111,000 individuals), with only 100 arriving by cruise ship at this time\textsuperscript{146}.

According to the Cruise Lines International Association (CLIA), the cruise industry substantially increased its capacity to the North American market during 2000; the cruise fleet increased to 163 vessels with a combined capacity of 158,434 lower berths (these figures include the withdrawal of cruise capacity due to the bankruptcy of three cruise lines during 2000). As a result of increased net capacity, the industry increased the number of passengers it carried by almost 17 percent to 6.9 million. During 2000, 6.6 million U.S. residents took cruise vacations throughout the world and accounted for 82 percent of the industry’s global passengers. U.S. ports handled 5.3 million cruise embarkations during 2000, 66 percent of global embarkations. Florida, whose ports handled 3.8 million embarkations, accounted for 70 percent of U.S. cruise embarkations. The cruise industry plans to add a further 49 cruise ships (worth $15 billion) to the North American fleet by 2005. These ships will increase the capacity of the industry by 50 percent over the five-year period.\textsuperscript{147}

The major economic impacts of the cruise business on other industrial sectors are\textsuperscript{148}:

<table>
<thead>
<tr>
<th>Economic Sector</th>
<th>Impact ($)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Airline transportation</td>
<td>$ 2.1 Billion</td>
</tr>
<tr>
<td>Transportation services</td>
<td>$ 2.0 Billion</td>
</tr>
<tr>
<td>Financial services</td>
<td>$ 1.7 Billion</td>
</tr>
<tr>
<td>Business services</td>
<td>$ 1.3 Billion</td>
</tr>
<tr>
<td>Energy</td>
<td>$ 1.1 Billion</td>
</tr>
<tr>
<td>Food and Beverage</td>
<td>$ 0.9 Billion</td>
</tr>
</tbody>
</table>

Safety and Security at Sea

Overall, the U.S. cruising industry has a high level of safety, with passenger vessels operating out of U.S. ports being among the safest modes of transport available. Not one passenger death due to a vessel casualty has been reported for over a decade. While emphasizing there are many factors to be considered when examining cruise ship safety, a USCG Task Force investigation into cruise ship safety in 1995 regarded the factors of greatest importance to be vessel design and construction standards, the inspection process, safety management, and the human element.

Weather, climate, and ocean conditions were not highlighted as being of sufficient importance to be reviewed in the report. The report concluded that there appears to be no evidence of trends or heightened risks associated with ocean going cruise ships from U.S.


\textsuperscript{147} ‘The Contribution of the North American Cruise Industry to the U.S. Economy in 2000’.

ports\textsuperscript{149}. The only recommendations the Task Force made were in the area of crew training and communications, particularly on vessels employing multinational crews, recommending greater emphasis on contingency planning and exercises and that exercises should be done in partnership with industry, emergency responders, and other associated port entities (all recommendations embraced the Coast Guard’s ‘Prevention Through People’ Initiative).

Immediately following the 9/11 terrorist attacks, the cruise industry implemented Level III security (the highest level), even though it was not ordered by the U.S. Coast Guard. The specific measures required at this level of security are detailed in the ‘Security for Passenger Vessels and Passenger Terminals Regulations’.

1.4.5.5 \textit{Ports and Marinas}

Ports and marinas are an essential part of the infrastructure fabric of the cruise and boating industry. The location, size, and total facilities provided depend on geophysical features (good natural harbors, suitable anchorages) at coastal or navigable riverine locations. Ports, harbors, and marinas are a vital element of local economies. For example, the mission statement of the South Carolina State Ports Authority (SCSPA), which owns and operates seaport facilities in Charleston, Georgetown, and Port Royal, reads:

\begin{quote}
... the SCSPA “is to contribute to the economic development of South Carolina by fostering and stimulating waterborne commerce and shipment of freight. In pursuit of this mission, the Authority seeks to develop and operate efficient marine terminals and attract high-quality steamship services”.
\end{quote}

The Port of Charleston is the largest container port along the Southeast and Gulf coasts and has four main terminals which are closer to the open sea than any of its competitor ports, minimizing sailing time and expediting turn times. In the last ten years, its business has doubled\textsuperscript{150}. The Port takes advantage of its deep, wide natural harbor physiography, and the current deepening project will provide a channel 45 feet mean low water (MLW). The Port has an average tidal range of 6 feet, and currents average 1.5 knots. Harbor pilots (provided by the Charleston Branch Pilots’ association) are required for ships entering Charleston Harbor with more than 8 feet of draft and over 100 gross tons.

According to a recent assessment by Moody’s Investors Service, five of Carolina’s largest cities are experiencing improved credit positions. The report emphasized the specific local economic benefit of the maritime community and the port:

\begin{quote}
“…… Charleston and North Charleston derive direct economic benefit from the Port of Charleston and Charleston further benefits from its sizeable tourism sector.”
\end{quote}

Other positives in the city of Charleston were tourism and economic diversity in the historic section, including centers of higher learning\textsuperscript{151}.


\textsuperscript{150} ‘State of the Port Address’.

\textsuperscript{151} 2002 South Carolina Ports, \url{www.scspa.com/whatsnew/press_room/2000/nr102600.asp}. 
Ports often play a proactive role in trying to boost tourism. On the opposite coast, efforts to revitalize regional tourism in San Diego Bay were launched by the Port of San Diego and local tourism and business officials in January 2002. The campaign, ‘The Big Bay’, is the first ever to market San Diego Bay as a ‘unified destination’. It seeks to raise the profile of San Diego Bay as a major visitor destination for both local residents and visitors. Tourism contributed $5.2 billion to San Diego’s local economy in 2000 with some 15.2 million overnight visitors, making the visitor industry San Diego’s third largest, following manufacturing and the military. The 27 miles of waterfront, 16 marinas, ports, and opportunities for water-oriented pursuits attract visitors to the region.\(^{152}\)

1.4.5.6 Aviation

Weather, climate, and ocean conditions are of crucial importance to cost and safety issues to both commercial and civil aviation. Commercial aviation is an integral component of the travel and tourism industry and is a major industry in its own right. Private recreational aviation is a popular pastime, with 635,472 certified pilots in the U.S. There are numerous large and small airstrips throughout the country with varying levels of weather information services available to support both type of aviation. Aviation meteorologists usually provide Terminal Aerodrome Forecasts (TAFs) three times a day for subscribed sites, with estimates of cloud bases, visibility, winds, and precipitation at airport terminal locations. Special forecasts for most airports are provided by private services such as MxInsight.\(^{153}\)

A number of key operating decisions impacting operating costs and safety are dependent upon weather and climate information. Aircraft fuel loadings are an example; minimizing fuel loading levels reduces operating costs and has environmental benefits but reduces safety margins. Decisions to divert routes or landing destinations, which have considerable cost implications, are also taken on the basis of weather and climate information. Such decisions require climate information at macro and micro levels of granularity. Note that the two examples given are linked; if there is uncertainty about the final destination, additional fuel may be loaded for contingency purposes.\(^{154}\)

Weather data are also necessary to calculate in-flight fuel consumption and configure aircraft for take-off and landing; key factors involved include wind and temperature information. The amount of fuel that aircraft use is largely determined by weather conditions. Impact reduction measures for severe weather rely on accurate predictive information: aircraft may need to be secured in the event of high winds, sheltered from hailstorms, etc. Light aircraft are especially vulnerable to extreme weather conditions, both in-flight and on the ground.

The availability of weather and climate information at the required levels of granularity, the accuracy of current information, and the reliability of predictive information have major cost and safety implication for aviation of all types. Enhanced weather information for the aviation industry would have significant economic and safety benefits.

The important role air transport plays in the travel and tourism sector was well illustrated by a recent study and report by the Port of San Diego into the present and proposed future

\(^{152}\) San Diego Convention and Visitors Bureau.

\(^{153}\) International Council of Aircraft Owner and Pilot Associations (ICAOPA), pers. comm.

\(^{154}\) International Air Transport Association (IATA), pers. comm.
capacity of the region’s air transportation needs. In part, the under capacity of the ports and airports in the region reflects the transformation of the region’s economy from a strong defense-industry base to tourism, technology, foreign trade, and professional services-related industries. The nature of the new economic base needs additional transportation support. The economic impacts of various elements of the economy modeled on the San Diego region are depicted in Figure 3. This generic model equally applies to other similar geographic and economic locations and situations.

<table>
<thead>
<tr>
<th>Direct Impacts</th>
<th>Indirect Impacts</th>
<th>Induced Impacts</th>
<th>Total Economic Impacts</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Airport Operations</td>
<td>Goods and Services Supplied to:</td>
<td>Spending by:</td>
<td>• Gross Regional Product</td>
</tr>
<tr>
<td>• Visitor Spending</td>
<td>• Airport Businesses</td>
<td>• Airport Workers</td>
<td></td>
</tr>
<tr>
<td>• Air Cargo Company Operations</td>
<td>• Visitor Industry</td>
<td>• Visitor Industry Workers</td>
<td></td>
</tr>
<tr>
<td>• Air Export Sales</td>
<td>• Air Exports Mfg.</td>
<td>• Air Export Workers</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Employment</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Personal Income</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Other Measures</td>
</tr>
</tbody>
</table>

Source: Port of San Diego, 2000

Figure 3. Total Economic Impact of Air Transportation

1.4.6 Weather and Climate

Climate is a pervasive factor in social and economic development. Human activity is largely shaped by the climate in which people live and the climate variations that are experienced, both across regions and over time. This close dependence is most obvious in agricultural, forestry, and tourism sectors, while expected returns directly depend on climatic factors. Ultimately, almost all economic activity is affected by climate, including, for example, construction (design of buildings and roads), municipal service provision (water supply), public health (prevalence of diseases), and the financial sector (insurance).

"The better we can adapt to climate conditions, the better the prospects for economic development. A good understanding of climatic phenomena, and the ability to use that information in decision making, are important elements of that adaptation process."  

World Bank, December 2000

Weather and climate can have both favorable and adverse effects on a wide variety of activities. For the present purposes, we define weather and climate risk as the possibility of injury, damage to property, or financial loss owing to severe or extreme weather events.


156 Ibid.


unusual seasonal variations such as heat waves or droughts, or long-term changes in climate or climate variability. Strategies for mitigating or coping with weather and climate risk are usually adopted by business, but climate change is not yet often factored in.

The benefits of accurately predicting climatic events were illustrated at the time of the 1997/98 El Nino/Southern Oscillation (ENSO). This was one of the strongest El Ninos ever recorded, with estimated structural losses of $36 billion, much of it in developing countries. The rapidly growing capacity to forecast El Ninos with increasing accuracy due to a new array of technological instrumentation as well as increases in modeling capacity allow fairly reliable predictions of ENSO. While it is not within the scope of this report to examine the detailed effects of ENSO, it is worth noting that warnings of the severity and climatic consequences of this El Nino demonstrate the practical feasibility of using climate forecasts as a disaster mitigation tool. Projects established before and during the 1997/98 ENSO helped to define the needs of forecast end users in terms of accuracy, timing, and reliability of information required. Importantly, it helped to identify the institutional, technical, and capacity constraints that need to be overcome to realize the full benefits of forecasting climate conditions.159

The benefits to the economy of enhanced weather and climate forecasting include protecting life and property, enhancing economic vitality, maintaining environmental quality, strengthening fundamental understanding, and contributing to national defense160.

1.4.6.1 The Impact of Weather and Climate

Weather events have major direct and indirect economic impacts on the U.S. economy. Of the estimated $2.2 trillion revenue lost annually as a result of adverse or severe weather events, the hotel and recreation sector lost $147 billion. Other economic sector losses accounted for $125 billion in agriculture, forestry, and fishing; $89 billion in energy resource extraction; $2.7 billion in public utilities; $260 billion in finance and insurance; $373 billion in construction; $782 billion in retail trade; and $218 billion in transportation161.

The U.S. sustained 49 major weather-related disasters over the past 21 years, each of which averaged overall damages and costs of $1 billion or more, total damages and costs exceeding $185 billion. Seven natural (weather related) disasters occurred in 1998 alone, and costs estimated over $5 billion are associated with Tropical Storm Allison in June 2001, which makes this the costliest Tropical Storm so far in U.S. history.162

1.4.6.2 Weather and Climate Strategies

The recreation and tourism industry (along with industries such as transportation, public utilities, retail sales, agriculture, and construction) is sensitive to weather and climate. This and other industries have developed various coping strategies that require atmospheric information. For example, climate control mechanisms in recreational and hospitality facilities are strongly dependent on temperature. Cold temperatures lead to greater

159 Ibid.
162 Ibid.
consumption, and warm temperatures reduce the need for heating (although at a critical temperature, air conditioning may be required).

The energy industry is developing a system for using weather information in hedging risk calculations (similar to agriculture), as shown in figure 4 below. The development of this concept into weather derivatives is to ‘hedge’ against weather impacts on business and consequent financial loss (although the pay-out is usually capped to a maximum amount). Forward contracts based on weather or climate variables are a relatively new financial instrument. The value of a weather derivative is essentially derived from a ‘weather variable’ and is primarily based on ‘degree days’ as measures of climate variation. Derivatives based on average temperature and precipitation are already available, and derivatives based on wind statistics will soon be available. This gives an added importance to accurate weather and climatological information.

In a similar way, one hotel group is bearing the ‘cost’ of the risk of adverse weather. Providing a deposit is made on a room, the hotel will refund the deposit if severe weather prevents those who have reserved a room from checking-in. Thus, the hotel carries the additional financial liability of severe weather163.

1.4.6.3 Sources of Weather, Climate, and Ocean Data
Weather, climate, and ocean data can be obtained from a number of both public and private suppliers. Advances in observing and predicting atmospheric events, combined with

163 Clyde Cruise, VP Risk Management, Starwood Hotels, pers. comms.
improvements in disseminating weather and climate information such as the World Wide Web and other electronic media, have led to increased accessibility to improved weather, climate, and ocean data. This presents new opportunities to users of this information.

It has been noted that new demands for weather and climate information rise as the traditional emphasis on weather phenomena that threaten lives and/or property expands to a broader interest in atmospheric information. This information is a key component of more sophisticated approaches to the management of weather and climate risks and associated financial implications\textsuperscript{164}.

The following functional model of the provision and dissemination of weather data has been suggested by Dutton\textsuperscript{165}:

Provision and Dissemination of Weather Data

\begin{itemize}
  \item The Government acquires and analyzes observations and issues forecasts and warnings;
  \item Private sector firms use government data and products as a basis for creating information and special products for the media and clients;
  \item The government and communications media disseminate atmospheric information, forecasts, and warnings to the public while tailored products move through information networks or dedicated channels.
\end{itemize}

Scientists in the academic community, the government, and the private sector advance atmospheric understanding and assist in creating new capabilities for services.

Media Metrix, the most accessed ‘At Home and At Work’ digital media and web audience ratings in the U.S., reported a significant increase in unique visitors to the top 50 weather and news sites from August to September 1999\textsuperscript{166}. This sharp rise in user traffic to the top five weather domains on the web was noted prior to and during the hurricane season, as shown in table 5.

<table>
<thead>
<tr>
<th>Site</th>
<th>Aug. Unique Visitors (in 000s)</th>
<th>Sept. Unique Visitors (in 000s)</th>
<th>Percent Increase</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weather.com</td>
<td>5,573</td>
<td>6,705</td>
<td>20.3%</td>
</tr>
<tr>
<td>Noaa.gov</td>
<td>1,948</td>
<td>2,602</td>
<td>33.6%</td>
</tr>
<tr>
<td>Intelligcast.com</td>
<td>1,707</td>
<td>1,899</td>
<td>11.2%</td>
</tr>
<tr>
<td>Wunderground.com</td>
<td>1,113</td>
<td>1,328</td>
<td>19.3%</td>
</tr>
<tr>
<td>AccuWeather.com</td>
<td>965</td>
<td>1,170</td>
<td>21.2%</td>
</tr>
</tbody>
</table>

Source: Media Metrix, 1999

Note: ‘Unique visitors’ are the actual number of total users who visited the reported web site or online property at least once in the given month. All unique visitors are unduplicated (only counted once) and are in thousands.

Table 5. Top Weather Sites, September 1999, Percent Increase from August to September

A list of the more popular weather and climate web sites is given in Appendix E.

\textsuperscript{164} Professor John A Dutton, ‘Opportunities and Priorities in a New Era for Weather and Climate Services’.

\textsuperscript{165} Ibid.

In addition, during the research undertaken for this report, various secondary sources of weather, climate, and ocean information were quoted as being used, such as ‘engineering society tables’, chambers of commerce, local visitor centers, and utility bills.

A number of private weather forecasting services provide information for use by specific economic sectors. For example, Meteorlogix provides weather forecasts for agriculture, aviation, construction, energy, and transportation sectors. It has case studies of the use of weather information by specific organizations although not for the tourism industry.

Other Internet-based services target generic sectors or activities, such as “DTN Marine Center”, DTN Aviation Center, and AWIS Weather Services, specialize in freeze/frost forecasting for the citrus, vegetable, and nursery industry and have web pages for ‘peanut weather’ and ‘pecan weather’.

Many of the Internet weather-based services provide educational materials to aid the understanding of weather phenomena. These sites raise public awareness of weather and climate.

1.4.6.4 Does Weather Forecasting Have a ‘Bad Reputation’?
An article appearing in USA Today under the heading ‘Bad Weather vs. Bad Forecasting’, questioned whether the time coverage given to weather was “over coverage” and cited a situation whereby a local TV station promised accurate weather forecasting with “its super Doppler radar but doesn’t deliver consistently and responsibly”.

The problem cited was not one of the forecast changing but of an impending weather severity being “hyped in the first place”. It was pointed out that weather is the No. 1 local TV news story. This takes on added importance as stations vie with one another to get the highest ratings.

The public relies on radio and television more than any other media for weather news, so it needs to be reported quickly and accurately without exaggeration as decisions to close schools and government offices are being taken on the basis of the forecasts. The problem lies in the quality of the journalism rather than in the accuracy of the reports.

Where this situation impacts decision-making is that if stations repeatedly send out severe weather warnings “and nothing much happens then viewers may ignore valid warnings about truly dangerous weather conditions”.

1.4.6.5 Climate Change and the Recreation and Tourism Industry
The direct impacts of climate change may influence the tourist decision-making process. Climate has a direct effect on when individuals choose to go on vacation and where they go. Weather and climate influence decisions both at the destination and at the source regions. Some resorts are likely to be less attractive as temperature and humidity increase above ‘comfort levels’; other destinations may become more attractive if they are warmer.

Arguably, the recreation and tourism industry needs to be aware and concerned about climate change. However, only in the Caribbean does the hotel industry seem to be considering climate change seriously.\textsuperscript{168}

A report produced for WWF-UK on the impacts of climate change on a range of international holiday destinations focused on the effects of tourist pressure on particularly vulnerable ecosystems. This study emphasized that the impacts of climate change are likely to manifest themselves in a number of different ways, largely as a result of local conditions determining the degree of stress placed on environmental systems. It was concluded that the most serious impacts will result from the effects of sea-level rise on small island states.

Possible impacts on tourism and recreation of climate change include:

- An increased risk of illness in certain areas (e.g., the range of malaria extending into Europe) could deter visitors;
- The increased occurrence of warmer conditions and reduced cloud-cover, particularly in the Southern USA, could result in conditions of extreme heat;
- Sea level rises may put existing coastal resorts at risk of flooding, and the characteristics of coastal areas may change (e.g., beaches may move);
- A reduction in air quality associated with an increase in the incidence of photochemical smog (caused by chemical reactions between industrial or vehicular pollutants and sunlight), which is already a problem in many metropolitan areas;
- An increase in the frequency of anticyclonic conditions; at current emission levels, concentration of pollutants will increase to dangerous levels decreasing the attractiveness of cities (such as Los Angeles);
- A detrimental impact on natural ecosystems, such as manifest in coral bleaching and forest die-back; and
- Reduced snowfall and shorter winters, resulting in shorter skiing seasons.

The above will be especially significant in areas where commercial ventures are already marginal. However, it is a possibility some areas will benefit from warmer temperatures, and shifts in the destination of tourists may be just as likely to benefit some areas as to be detrimental to others.\textsuperscript{169}

The magnitude and extent of the impact of climatic change largely depend on the importance of tourism to the local economy. In some areas of the United States, climate change may have a large impact on the environment, but tourism accounts for a relatively small percentage of the national GDP. Conversely, in the small island states of the Caribbean, where the economy may be solely dependent on tourism, global climate change will have a devastating effect on the tourist industry. Climatic shifts will also affect areas currently building up their tourist sector.\textsuperscript{170}

Climate change is having a perceptible effect on the Arizona environment; it is hotter in the deserts, and this is commensurate with a decline in visitor numbers. Tourism academics do...
not spend much time looking at the effects of climate change on the industry. They have had two consecutive dry years there. Also, it is associated with a rise in disease. Hunter Virus is carried by deer mice, and in very dry conditions, these increase and leave their droppings, which transmit the virus. There has been an increasing incidence of Hunter Virus on the Navajo Reservation and in more rural areas. In 1996, there was a decline in the numbers of visitors (there was also a national drop in figures) as there was a ‘scare’, and the visitation decline shows a direct correlation to the release of these reports. It would be wise to look at other areas in the U.S. where this weather pattern is repeated and is more severe. NAU works with the local weather people in Flagstaff\textsuperscript{171}.

There are cycles of wet and dry years, and the deserts do seem to be getting drier and less snow falling in the mountains as a result of climate change. These changes in climate are not taken into consideration in marketing plans\textsuperscript{172}.

**Climate Change in the Caribbean**

The Caribbean is particularly susceptible to the predicted effects of global climate change, which is likely to adversely impact the tourist industry on which the region so heavily relies. This represents a serious threat to the economies of the majority of the countries and their peoples in the region.

The concern over climate change has led to the formation of the *Caribbean Planning for Adaptation to Global Climate Change* (CPACC), supported by the Organization of American States, the Global Environment Facility (GEF), and the World Bank. The project’s overall objective is to support Caribbean countries in preparing to cope with the adverse effects of global climate change (GCC), particularly sea-level rise in coastal and marine areas, through vulnerability assessment, adaptation planning, and capacity building linked to adaptation planning.

The project follows a regional approach, being executed through the cooperative effort of all twelve participating countries and through a combination of national pilot/demonstration actions and regional training and technology transfer linked to adaptation planning. This approach strengthens regional cooperation and institutions and provides cost-effective means for adaptation planning, data collection, and sharing of information, skills, and project benefits. The project builds on existing institutions and experiences and liaises with other important regional initiatives and programs underway in the Caribbean. It essentially consists of enabling activities, complemented by selective capacity-building activities, aimed at creating or strengthening endogenous conditions and capabilities necessary to prepare a long-term program for adaptation to GCC. Project execution will take four years involving two components: adaptation planning and capacity building.

The sea level/climate observation network proposed for installation in each of the twelve participating countries includes a standardized set of instruments to measure water level, vertical land motion (which affects the relative relationship between sea surface and land interface), air and sea temperature, wind velocity, precipitation, and other site-specific ancillary variables. The network will eventually be composed of 18 gauges generating

\textsuperscript{171} Arizona Hospitality Research and Resource Center, pers. comm.

\textsuperscript{172} Phoenix Sky Harbor, pers. comms
digitized data available in near real time by satellite telemetry or telephone. In addition, each tide gauge benchmark will be fixed in geocentric coordinates so that the vertical movement of the land can be distinguished from sea level changes (local tide gauges measure a combination of the two).

The U.S. National Ocean Service of the National Oceanic and Atmospheric Administration (NOAA) has been involved in the installation of tidal gauges around the world as part of the Global Sea Level Observing System (GLOSS) and is acting as lead agency in the installation of the proposed network. Each participating country is directly involved in the selection of sites, and designated national agencies, such as the National Weather Service, will manage their individual observatories. The Caribbean Meteorological Institute (CMI) is the lead regional agency and is responsible for overseeing the network after project completion.

Key regional and national institutions are being supported to acquire, analyze, store, and disseminate data on climate change and the impact on natural and manmade systems.

1.4.7 Vulnerability and Emergency Management

One of the recurring themes and concerns of any business is that of ‘financial risk’. The identification and assessment of the possible causes, periodicity, severity, and consequences of hazards and the probability of these occurring define the risk to life and property. On this basis, either the risks are accepted or mitigating and/or management scenarios are devised. Vulnerability is essentially the susceptibility of resources or people to negative impacts from hazard events.

Weather, climate, and ocean conditions are a source of hazards or even disasters in many geographical locations. These include floods after heavy and sustained precipitation, wind damage from tornadoes or hurricanes, seasonal dry conditions leading to ‘fire weather’, lightning strikes, and other forms of severe weather. In order to make efficient use of mitigation resources, it is necessary to assess the likelihood of a particular hazard and when and where an event may strike. It is also necessary to know where specific vulnerabilities are in order to capitalize on pre-disaster planning. All communities are vulnerable to a greater or lesser extent to a number of hazards. Generally, vulnerability assessments guide the development of mitigation strategies and the prioritizing of mitigation projects.

Insurers base their premiums and deductibles on the likelihood of certain catastrophic events occurring. Organizations such as hotels and resorts insure against rare or unknown risks, not the ‘everyday’ type of risks.

The Occupational Safety and Health Administration (OSHA) requires every workplace with 10 or more employees to have an emergency plan in writing. This should include step-by-step actions that will take place as soon as an emergency is identified. The plan also needs to include an ongoing schedule of employee training. The training should provide for individual assignments, as well as general emergency preparation in the form of equipment checks and regular practice for specific weather related and other emergencies.

Starwood Hotels Group, for example, has developed a detailed ‘Emergency Preparedness Best Practice Guidelines’ manual which goes into all of its hotels to guide managers and staff on what to do in times of emergency. This comprises the following elements:
 Managers Guide;
 Questions and Checklists;
 Emergency Plan Worksheets;
 Sample Emergency Fire Plan; and
 Training Recommendations.

The Starwood Manual also includes detailed guidance on what to do at times of “weather Emergencies”, such as tornadoes, hurricanes, flooding, winter storms, and earthquakes, and makes recommendations for staff training and the organization of regular ‘drills’.

A forward-looking approach to disaster management is necessary in which natural hazards are screened, analyzed, and dealt with in an integrated way. Weather, climate, and ocean information and forecasting should become an integral part of comprehensive disaster management and emergency preparedness. There has been considerable progress made in understanding ocean and climate systems and the ability to monitor and forecast weather events over recent decades. Longer-range forecasts of many phenomena can now be produced at a time scale, reliability, and spatial resolution that make them useful for planning purposes.

In the Caribbean region, a Coastal Vulnerability and Risk Assessment activity is being coordinated by the CAPCC. This is a pilot component involving three countries: Barbados, Grenada, and Guyana. This component involves a review of coastal vulnerability assessment models and the application of the IPCC common methodology in the three countries and throughout the region. With the execution of the three vulnerability and risk assessments, there will be technology transfer though training and information dissemination. In addition to a regional workshop presenting the results of the three case studies, manuals are being prepared for the execution of coastal vulnerability and risk assessments.

Local emergency management offices are an essential component in ensuring visitor safety. They coordinate with emergency services such as the Coast Guard, police, and fire departments as well as visitor facilities including hotels, campsites, resorts, marinas, sports facilities, etc. Emergency management staff closely monitor developing weather situations in virtually all areas where major tourist facilities are located in the U.S. and, to a lesser extent, in the Caribbean and neighboring regions. They have strong links with the NWS and utilize private weather information sources (including tailored services) as accurate up-to-date information is essential in the decision-making process concerning the mobilization of emergency teams, the issuance of severe weather warnings, and decisions concerning the evacuation of areas.
2. Findings: Environmental Information Needs of the Recreation and Tourism Industry

“Understanding, monitoring, and predicting weather and climate, and their extremes, are essential to sustainable development.”

World Meteorological Organization, 2001

2.1 Introduction

Before assessing the use and needs of the recreation and tourism industry for climate information, it is essential to understand the dependence the industry has on weather, climate, and ocean conditions, and hence the degree to which forecasts are necessary for the economic optimization of the industry. To achieve this, the research has primarily focused on specific case examples: a hotel group (Starwood Hotels and Resorts); a state vulnerable to severe weather events (Florida); a state regarded as ‘safe’ from severe weather events (Arizona), and recreational activities highly dependent on weather factors (cruise lines and aviation). It is important to understand the nature of the influence that weather and climate exert on the recreation and tourism industry as a whole, and from this, determine which business decisions are largely dependent on weather and climate conditions.

The analysis draws on the evidence of approximately 100 expert witnesses across the recreation and tourism sector (listed in Appendix C), information contained in relevant published and current research, and data provided by industry-specific organizations. The interview log is reproduced in Appendix B.

The preceding section (Section I) showed that the recreation and tourism industry is an economically significant sector and is one of the most highly diverse of all economic sectors. It depends on, and fuels, activity in many other areas of business activity. From a cursory examination it would be natural to assume that weather and climate would have a direct and significant influence on the recreation and tourism industry, but this research has revealed a surprising lack of formalized analysis or regard for weather, climate, and ocean information, except for a general nonformalized, low-level ‘awareness’ of day-to-day conditions.

In the following subsections, recreation and tourism industry activity areas are examined in detail, focusing on selected recreation and tourism subsector applications of weather, climate, and ocean data use, the identification of gaps in data supply, and end-user requirements for information as it affects decision-making processes. The sources of data currently being used are noted, along with the temporal and spatial resolutions of these data. The mechanisms by which the information benefits specific industry subsectors and their financial significance are also noted where they can be identified (e.g., in cost savings through improved energy requirement planning).

Climate is only one of a number of factors impacting recreation and tourism. The tourist industry in Florida, for example, experiences an uncomfortable summer climate yet maintains a year-round tourism-oriented infrastructure. In the summer Florida is too hot, but despite this, business levels are maintained as the marketing and the tourist momentum is well established around a number of specific ‘attractions.’ Florida draws many winter visitors
to attractions such as Disney World, which draws thousands of visitors from the U.S. and from overseas.

However, theme parks such as Disney World may be becoming “dated”--if people have been once, they are less likely to visit again. Tourist surveys show the majority of tourists want to experience ‘new’ things\(^{173}\). Demographic trends also have a large influence. The Generation ‘X’ market is smaller than the ‘Baby Boomers’ market and is different attitudinally, so in years to come Disney may not be the same ‘draw’ to them.

Weather and climate affect the recreation and tourism industry from two obvious standpoints: marketing and operations. Attractions themselves are generally independent of the weather to some extent, but there are many factors influencing the industry, and it is difficult to separate cause and effect with a high degree of confidence. The Travel Industries Association (TIA) considers that the industry tacitly acknowledges that it might be informative to undertake research on the relationship between weather and climate on travel and tourism as a strong correlation between weather and visitations may exist, but no research in this has been undertaken. Certainly the weather acts as a ‘driver’ for tourist flows. Established climate and weather-related tourist migration patterns are discernable in the winter (in particular), as those from northern areas head south to Florida, Arizona, and California\(^{174}\).

2.2 Destination Management Organizations (DMOs)

The number of travel agencies in the U.S. has been falling for the past three years, although during the early part of 2001 overall ticket sales were increasing. As a result, average sales per agency for the survivors were increasing. The U.S. economic slowdown and concerns about flying, especially since the September 11 terrorist attacks, precipitated a drop in travel spending for the third quarter of 2001. Sales in the first half of 2002 fell by 3%, but in the months of May and June sales were down more than 10% when compared with the same months in 2000.

At the same time, commission rates from airlines have continued to decline. Rates were at overall 5.8% in the first half of this year, compared with 6.5% in the same period during 2000. With recent moves by U.S. airlines to further reduce ceilings on commission payments, this looks certain to fall even further: domestic rates have now fallen below 4%. The $20 commission payment on a $500 ticket in the U.S. shows that the travel agency business has become a low unit-revenue/high volume business. The situation has been further exacerbated by new lower commission ceilings by some airlines: maximum commission paid on domestic tickets will be $10 one way, $20 roundtrip. International commission rates are twice as high, although they too have declined. In the first half of 2001, they were at 9.3%, a one-point drop from the 10.9% paid in the first half of 2000.

Some aspects of travel agents’ marketing strategies directed toward the leisure/vacation sector are seasonal to some extent, with promotions to ski resorts during the winter months and to warm climates during the spring. International travel is also partly influenced by U.S. weather conditions, as tourists may travel to escape climate conditions. Larger, more broadly

\(^{173}\) TIA, pers. comm.
\(^{174}\) Ibid.
based travel agents tend to have more even revenue flows and therefore are experiencing less financial stress.

A World Tourism Organization Business Council (WTOBC) noted that DMOs have in the past, tended to be providers of information (including weather) and have been involved in facilitating relationships between tourists and business. This situation is now changing, largely as a result of the increase in travel purchases being made through the Internet. It is forecast that one in every four travel purchases in the main generating markets will be through the Internet within the next five years. The majority of tourism enterprises are in the small-to-medium size sector, so the growth of the Internet is leading them to change at a much faster pace than they have been accustomed to previously. Travel agents will therefore have to move beyond ticket selling and look more towards value-added services.

It is widely reported that those planning vacation or business trips generally consult weather information at their destination prior to travel.

“Weather is one of the most important tools consumers look at on travel sites. There would be a big hole if we didn’t have it. Our users like to see what the weather is for their destination, even if they’re going to travel a few months out.”

Emily Schubert, Senior Manager of Content, Travelocity.com

As with hotel demand forecasting, weather, climate, and ocean data is not included in any destination demand forecasting models.

2.2.1 Climate Information Use and Potential

As the DMO sector becomes more competitive due to pressures of alternative booking mechanisms, direct marketing, and increased competition with the sector, adding value to customer services will become a differentiator in customer service provision. This will effectively push DMOs into more of a knowledge management role in which climate information will be a component.

**Geographic Scale:** U.S. mainly, but worldwide as well, to provide more value-added information to customers in the future

**Temporal Scale:** Short term (days for weekend breaks), medium term (months for annual holidays), long term (up to 1 year for meetings and conventions)

**Other Variables:** Recreation-specific weather information required for activity-oriented visits: sailing, surfing, aerial pursuits (gliding, flying, hang-gliding), fishing, etc.

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2.3 Hotels, Resorts, Accommodation, and Lodging

2.3.1 Background

The hotels, resorts, accommodation, and lodging subsector is the major component in the recreation and tourism industry, particularly where extended travel is involved. The three largest hotel and resort groups globally are Cedant, Six Continents, and Marriott. Appendix I lists the major hotel and resort brands and their subsidiaries.

The U.S. has exceptionally strong brands, including Starwood, Hyatt, and Disney, but 95% of the business establishments in travel and tourism are small businesses. Businesses in the leisure and tourism industry are numerically SME (small and medium size) business biased. These do not have a great deal of spare resources to promote themselves either in the U.S. or overseas so they mostly work with and through local tourist offices. There are many so-called ‘mom and pop’ outfits (B&Bs, small guest houses, and inns), which constitute 95% of the accommodation industry in the U.S., and a lot of the smaller players in the retail sector are also dependent on these businesses.

Larger corporate groups and brands have operational departments and dedicated functional staff. Financial modeling and business forecasting is carried out centrally and development plans are produced with the large budgets involved. The level of sophistication in modeling energy usage and demand forecasting (where climate information is a significant factor) is greater in the larger hotel and resort groups where the larger benefits justify the cost of such analyses. In small, family-run accommodation services, these types of assessment and systems management is unlikely to be carried out.

The recreation and tourism industry is characterized by short-term planning. This has been exacerbated by the terrorist attacks of 9/11, which has resulted in an even greater propensity for businesses to only look towards the immediate term. Industry trade associations provide support and a knowledge base for small operations, but the engagement of individual businesses in their local or regional representative organizations is not universally high. Trade associations (such as the American Hotel and Lodging Association [AHLA]), can provide market intelligence and a forum for dissemination of information, but membership and participation in their activities is variable.

To understand where and how weather, climate, and ocean data are applied in the hotel and resort sector, the investigation examined each of the main operational areas found in large national or multinational hotel/resort organizations for weather, climate, and ocean information use. There was surprisingly little interest in or concern for climate information and what did exist was notably more on day-to-day weather rather than on longer-term climate trends (or ocean conditions). This may reflect the short-term planning emphasis of business in general in the U.S. and the recreation and tourism industry in particular. However, climate factors (particularly climate change) may have a notable affect on properties and on business in the future.

For the purposes of this assessment, the larger hotel and resort groups are examined. In these, the need and application of weather, climate, and ocean information largely depends on individual operations. Therefore, in addition to interviews of a sample of individual hotels

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178 Research & Technological Planning, Travel Industries Association, pers. comm.
and resorts, an in-depth case study analysis of one of the largest hotel and resort groups in the U.S. was carried out to gain an understanding of how this sector functions in order to establish the extent to which weather, climate, and ocean information is currently being used. Potential additional uses of climate information were also identified via the case study example. The main functions in the accommodation subsector are listed below:

- Hotel and resort development
- Building maintenance
- Engineering systems
- Finance/budgeting
- Risk management
- Health and safety/emergency preparedness
- Regulatory compliance
- Public relations/marketing/communications
- Procurement
- Housekeeping
- Transportation
- Guest services.

Subsidiary functions include:

- Investment
- Architecture/landscape architecture
- Building construction, building codes
- Food
- Retail
- Insurance.

2.3.2 Climate Information Use

The following analysis reviews the operational areas of the accommodation sector (concentrating on hotels and resorts) for the requirement for weather, climate, and ocean information. While the separation of operational functions takes place in large individual hotels and at corporate level in hotel groups, small hotels and accommodation facilities operate in a limited, less segmented way (e.g., maintaining comfort levels, general building maintenance, guest services, etc.).

Public Relations/Marketing/Communications

Hotels at locations such as Bermuda carry out promotion campaigns that include weather-oriented average temperatures and sunshine hours. The Bermuda Tourist Authority also issues press releases and advertising material, but the weather is not generally the primary focus of marketing campaigns. There is casual use of weather information, which is usually very simple and generalized.

Starwood have an “environmentally friendly” franchise hotel that has attracted considerable publicity and has been written about to a large extent. The Sheraton, Rittenhouse Square, Philadelphia, is Starwood’s ‘flagship’ green hotel. All hotels have sets of environmental
guidelines and policies (e.g., on the use of public space and taking out trash), but the Sheraton Rittenhouse Square has gone to great lengths in selecting the materials it uses to ensure they contain no toxic substances and come from natural sources. This has had a discernable and positive effect on Starwood’s business. This hotel has used weather and climate information for:

- Energy conservation (heating, cooling, lighting);
- Insulation calculations around the building;
- Water conservation; and
- Renewable energy generation (solar cells, water power generation).

Climate Information Use and Potential
Climate information is not a major feature of marketing or sales. The focus is on new and repeat customers. Any climate data used is based on historic trends of a seasonal nature rather than specific weather events. There does not appear to be much interest in climate information in this area, and the current low-level requirement is likely to continue. The requirement for weather information is localized and basic in its requirements; existing information sources adequately meet these needs—daily temperature, precipitation and occasionally relative humidity being accessed.

Geographic Scale: U.S. wide for brands and locally for smaller businesses
Temporal Scale: Short term (days for weekend breaks), medium term (months for annual holidays), long term (up to 1 year for meetings and conventions)

Guest Services
As a courtesy to guests, many hotels and resorts print daily weather forecasts for display. Some hotels also subscribe to TV weather services accessible from hotel rooms. Resort locations use weather data as they may well have planned activities that are weather-dependent or affected by the weather. Resorts organizing activities may use this information to change venues from outdoor to indoor if the weather is unsuitable for outside activities (e.g., aerobics).

Environmental Policies
The interviews revealed environmental information is used in two separate ways: within organizations to achieve (sometimes significant) operational cost savings and as a marketing tool. Marketing use can be further broken down into simply attracting visitors as the climate satisfies their needs (e.g., guaranteed sun or snow) and to attract environmentally aware visitors by marketing “environmentally friendly” facilities or ecotourism.

Marriott has updated its internal environment policy since it was first devised. Marriott received negative comments from some owners who do not fully appreciate the environmental measures Marriott is implementing. The additional cost of new environmentally friendly equipment is often low as a proportion of overall costs and can be offset by potentially substantial cost savings and return on investment in a short period of time (as short as 3 months in some instances).
Equipment such as laundry washers, chillers, boilers, physical plant, and electricity generators are being replaced with more efficient, less polluting units. Other factors that enter the cost equation include installation costs, life expectancy, and running costs over the functional life of the equipment\textsuperscript{179}. Marriott is also aiming to offset its carbon reduction assets, but this is dependent on the environment in which the company finds itself—in Europe it are approaching this issue very differently than in the U.S. Marriott is concerned with reducing CFCs and has been an active supporter of the Montreal Protocol. Energy management systems have been introduced into Marriott properties and working with major manufacturing industries has encouraged them to produce more environmentally benign equipment. Marriott has 24,000 hotels and is replacing equipment in many of them.

**Hotel and Resort Development**

Hotels do not make business decisions to locate in a specific place based solely on the weather or climate of the area. Such decisions are taken more on strategic location from the standpoint of where a hotel group or brand needs representation. Decisions are ‘location driven’ only in that certain places are where business and pleasure travelers want to be; they are not directly driven by weather and climate.

Investment decisions are made on the basis of potential profit against risk to equity, and climate may be a significant factor in identifying risks. Environmental parameters are being increasingly factored into the investment decision-making processes, but usually as part of post-build costs such as climate impacts on insurance, heating, and cooling costs. An exception is state building codes, which have to be complied with, the development of which has taken into consideration climate and weather factors. These codes impact on up-front costs.

Clustering, or the ‘honey-pot’ mentality, is recognized as being a major driver in siting new developments or influencing acquisition decisions. Competitor analyses are carried out prior to the decision to develop on the basis of existing properties’ occupancy rates in a location and whether there is sufficient demand for additional hotel development. The presence of existing accommodation facilities, infrastructure, and services creates and stimulates the market as currently the market tendency is for visitors to go to well-developed resorts. However, a perceptible change in the market is occurring with the recent trend towards ‘ecotourism’ and ‘activity’ vacations, which are not dependent on a high level of existing developments.

Weather and climate play only a tacit role in the determination of the siting and location of new developments. Hotels will go where the demand is—if one hotel gets built, others will follow. If a hotel is getting 95\% occupancy, then there is certainly a market for another hotel\textsuperscript{180}. Market presence is the primary driver for expansion; if a competitor is there, we have to be there too. Climate information is, therefore, seldom a direct determinant for expansion. Other significant factors in locational decisions include local communications, labor availability, accessibility by the desired customer base, and transport facilities.

\textsuperscript{179} Marriott Hotels, pers. comm.
\textsuperscript{180} TIA, pers. comm.
The accommodation business takes it for granted that weather will be good in an established resort area. On one occasion Starwood carried out a detailed assessment of California’s weather, using monthly climate records they obtained from the local Chamber of Commerce, and supplemented by information from the Internet. One respondent noted, “We just looked at monthly weather patterns—very basic stuff.” This type of analysis is a nonstandard assessment for new build properties and appeared to be of only limited value to the company in its new hotel development.

State building codes are formulated specifically for the prevailing environmental conditions in a region or state. Thus in New England roof stress codes reflect the potential weight of snow which may be experienced, whereas in Florida walls must be of a specific strength to withstand buffeting by hurricane-force winds and driving rain. The authorities responsible for drafting the codes do so taking into consideration weather, climate, and ocean information. It is then up to architects, builders, and developers to comply with these codes.

One hotel subsector respondent stated that, “The occurrence of hurricanes will only be considered when looking at the cost of insurance; it gets factored into the feasibility of a project. This is regarded as incremental costs of a project.”

Real Estate
Jones Lang LaSalle Hotels, one of the largest hospitality realtors in the U.S. and Caribbean, observed that currently hotel expansion is mainly through acquisition (i.e., sales of existing hotels/businesses) rather than new builds. Jones Lang LaSalle’s main focus is on transactions, and they examine the overall economics of deals. Transactions may be seasonally related. On a recent deal Jones Lang LaSalle foreclosed on a property in Aspen, Colorado. The market of the property in questions was seasonal during 5-6 months of the year, thus limiting its annual income potential. This factor was taken into consideration in the final price agreed for the property. Unanticipated weather events, such as the heavy snowfall in Buffalo in December 2001, impact businesses, with considerable revenue lost due to the sudden seven feet of snow that fell over 5 days. This adversely impacted all businesses in the area.

Jones Lang LaSalle pays some attention to the weather and climate if a hotel property is on a hurricane track. This effects insurance as well as the bottom line but does have not a large impact on financial operating statement.

In general, new hotel investments usually break even around the third year of operation (although the Sheraton Rittenhouse Square, Philadelphia, achieved this after only one and a half years). While under construction and usually for the first few years of operation, hotels have to carry a loss on their up-front investment. To attract new business in the first years of operation, generally new hotels offer a lower room rate than their competitors, as they have not yet built their customer market.

Construction
Weather patterns at different times of the year will determine the optimal time to build. This is especially the case if exterior developments are taking place at locations where there is a discernable ‘wet season.’ In a recent exterior landscape and pool project in Miami, the average number of days of rainfall expected was included in the estimated build completion
time. Research has been carried out over a five-year period, which has determined the average number of days of likely precipitation in the Miami area, and this was factored into the construction period for operations, such as dewatering and pouring concrete for a swimming pool.

It is generally known what the industry ‘norm’ is for weather outages in certain areas, although this determination is not undertaken very scientifically. General knowledge and experience have led to these industry ‘norms’ being understood and practiced. For example, the District of Columbia area is considered ‘borderline’ climatically, so it is up to individual architects as to whether they use building materials more suited to the south or the north. Local conditions and extremes in climate and weather are generally known from historical data. Architects may carry out tests in controlled conditions in wind tunnels, construct mock-up panels, and conduct rain penetration tests based on local weather patterns to determine materials to be used and siting parameters of buildings.

The U.S. has codes and standards that have to be adhered to in many aspects of construction. These include building construction requirements, building systems efficiency, water quality, etc. Codes vary from state to state: in Los Angeles there are strict codes for emissions, whereas in Montana these are not so stringent. Construction in desert or ‘greenfield’ environments may have to take into account protected habitats or species.

Monthly climatic maxima and minima are of particular interest to architects and builders; design temperatures are determined in part by codes. Every state has a building ‘code agency’ which supplements national standards codes. In addition, Marriott provides mechanical and electrical engineers on projects with standard design guides, which apply to all hotels in the group. For each geographic location these guides include climate data assessments, which help to determine locality specifications. All the large hotel and resort groups have their own safety criteria that apply to areas such as windstorm protection, as this is a life safety issue.

Hotel and resort group architects have to deal with insurers because they stipulate specific requirements in conjunction with local building codes. Insurers require code compliance minimums and focus particularly on safety aspects. Exemplars are seismic requirements in California and hurricane resistance requirements in Florida. Building codes in each region reflect the prevalent weather and specific natural hazards experienced in an area. Starwood Hotels and Resorts engages ‘code agencies’ (consultants) to inform it of specific requirements in each state. These are usually local architects, engineering companies, and other building professionals.

Insurers collect data on storm damage (one respondent commented, “Your insurer has every piece of data to insure the building.”), from which they may designate their own requirements. Specific teams in the large hotel groups are assigned to deal with insurers; controllers and owners may also have to liaise with insurers. Items such as window units, glazing requirements, and attachments may be stipulated by insurers depending on risks identified. Underwriters keep detailed data of such risks and hazards for every property.

Property maintenance is an important factor in increasing resilience to storms and weather-induced stress on the fabric of buildings. Well-maintained properties cost less to insure. Maintenance is also taken into consideration when insurance companies carries out their
inspections. These are usually performed annually for most properties. Not only are well-maintained buildings able to withstand severe weather conditions with less damage, but also they will often make fewer and/or lower claims on insurance.

The U.S. Green Building Council has established a rating system for buildings as part of its ‘Leadership in Energy and Environmental Design’ initiative (although this scheme is not specifically for hotels). A rating from bronze to platinum is awarded on the basis of the number of individual points amassed. Climate factors are taken into consideration in this scheme.

Hotel and Resort Insurance
Insurance companies stipulate certain measures and safeguards on the properties they are insuring (see previous section and Insurance Industry section 2.7). This includes scrutinizing and advising on preventive measures to be taken to control risk and thereby reduce the likelihood of claims. In addition, location and other factors are taken into consideration when settling the premiums and deductibles of insured properties.

Hotels and resorts generally carry a high insurance deductible. The premium cost relates primarily to the location of the property. As many hotels and resorts are sited on coastal areas and on beaches, these properties are more exposed to weather events and hence have increased vulnerability to weather hazards, which is reflected in the conditions of insurance. Some insurers produce and distribute warnings of severe weather to their customers. Weather and climate conditions are an important consideration for minimizing potential losses in property insurance claims. If weather conditions are generally calm and hot and not prone to extremes in particular areas, this will contribute to lower insurance premium.

Some hotels and resorts buy weather and climate insurance with their property insurance (e.g., wind/hurricane damage). Complete destruction of a property is unusual, although Starwood had property destroyed on St John’s during Hurricane Georges. There is a large deductible on hotels—currently around 2% of the insured value—so if a $100m hotel is totally destroyed, the deductible to be carried by the insured party will be $2m. This encourages property owners to avoid making claims by implementing damage limitation procedures and absorbing minor damage into operating costs. Some hotel groups have now adopted the posture of being “self-insured.”

Engineering Systems
One of the primary functions of engineering departments in hotels is to maintain comfort levels. Depending on location, season, and prevailing weather conditions, this may mean activating heating or cooling systems. Weather forecasts help engineers forecast load on the boilers and other plant and help in scheduling maintenance functions (this cannot be carried out at peak load times). Some expert witnesses emphasized that engineers control comfort levels in common areas but guests determine their own room comfort levels, so engineers do not have complete control over load levels. However, in reality, estimates can be made within a range of usually 5 to 6 degrees Fahrenheit in accordance with prevailing weather conditions.

Most of the large hotel and resort chains such as Marriott specify design targets for their buildings that are applied in particular to new developments. These include temperature,
humidity, CO2, odor filtering, water quality, and wastewater management requirements. Water quality regulations are quite onerous for hotels and resorts in the U.S.

New or replacement systems installed in hotels are usually the cheapest available units, which creates problems for engineers concerned with efficient and effective cost reduction. As energy costs rise, more hotels will be utilizing online, real-time energy load prediction and consumption monitoring, which benefits from weather data input. Tracking energy consumption has taken on added significance in recent times with the advent of a deregulated energy market in the U.S: consumers will be able to choose from a range of suppliers offering different energy costs at specified times of the day.

Climate trends play a role in energy conservation, with data being used in comparative forecasting models. Bin data helps determine the number of hours air conditioning may be required for ambient air temperatures within a 5°F range. Hourly data is desired by engineers to enable accurate calculations of performance. Implementing detailed monitoring regimes in many hotels has resulted in substantial cost savings.

New-build facilitates use the latest design and construction techniques, including features that contribute to reducing the running costs of the building. These features include better insulation, energy efficient heating and cooling, etc. Thermal efficiency can be estimated which enables operating costs to be estimated at the design stage, but these costs are not accurate due to the large number of variable involved. Current modeling techniques are +/- 20% accurate.

An alternative approach is the ASHRAE temperature bin method\(^{181}\), where average daily heating and cooling energy use are calculated at each step of outdoor air temperature, with a typical humidity and solar radiation value attached to each temperature. The resulting performance factors are graphic plots of heating and cooling energy use as a function of outdoor air temperature (with cooling increasing with higher temperatures and heating decreasing). These are called the “graphic signatures” of buildings.

Essentially, the bin method requires energy calculations be performed at a range of outdoor temperature conditions, with the results multiplied by the number of hours expected at each temperature condition. The ‘bins’ represent the numbers of hours associated with groups of temperatures and are compiled in 5°F increments. Precompiled hour tabulations for geographic areas are available in annual, monthly, and occasionally 8-hour shift totals. All the hourly occurrences in a bin are assumed to take place at the bin ‘center temperature’. For example, it is assumed that 42°F quantitatively represents the 40-44°F bin\(^{182}\).

Third party providers (consultants) may be engaged to track energy usage and weather conditions for larger hotels and hotel groups. There are differences between hotel groups and individual hotels in the way in which building systems are operated. Small operators do not generally monitor energy use in real time, but in larger hotels engineers track energy usage and are responsible for fine tuning maintenance systems.


While engineering departments do not always contribute directly to business forecasting, heating and cooling systems costs are factored into operating costs. Many hotels concerned about energy usage and efficiency use computer-based programs to track their consumption. Weather data in degree-days (probably originating from NOAA), cold degree days (CDD) and hot degree days (HDD) are used, and it is anticipated that more sophisticated use of such data will be made to increase the accuracy of tracking energy use per square foot per occupied room.

Hotel guests can individually control their room temperatures but generally there is only a narrow band of temperature variation (about 5 to 6 degrees) between individuals’ personal preferences. This variation is not regarded as significant as part of the overall efficiency of a building.

Different hotel groups view energy management very differently: Holiday Inn does not undertake any power utilization or heating needs (fuel requirement) forecasts on the basis of the weather, as it would be, in their view, “a waste of time”:

“Each guest room has a thermostat so guests can adjust the heating or A/C to suit their own needs. Even then, you find that customers throw open windows even when the heating or A/C are on. It would be no help at all to have weather data. The weather is very predictable—we don’t need a sophisticated forewarning.”

Contrastingly, three separate initiatives are currently under way in Starwood Hotels and Resorts based on consolidation, monitoring, tracking, and reporting. The end results will include real-time energy control, historical energy use tracking, energy use forecasting, and future build and equipment specifications. Engineers involved in this work commented, “We can never get enough weather data.” Information on cloud cover, relative humidity, solar incidence, temperatures, etc., is required, preferably with a higher degree of granularity (hourly) than is currently available. Starwood Hotels and Resorts hire consultants to provide fine tuning of demand load forecasting on an hourly basis and are developing a computer-based system relying on real-time weather data input.

Currently used data sources include:

- Bin data, which aids the calculation of the number of hours air conditioning may be required for temperatures within a 5ºF range;
- Weather tables from the engineering society group literature, including wet bulb and dry bulb data;
- Various data from the Internet, although one respondent noted that “the National Weather Service has so much data on its web site that you cannot quickly get to what you want.”
- Degree-days, indicated on many utility bills; and
- Degree-days sourced from airports.

One long-established firm of consulting engineers to the hotels and resorts sector believes that there is no effective predictive model for energy use and forecasting. Energy use is recorded and given a factor, e.g., weather factor, occupancy, etc. An energy index may then be used based on the following formula: Energy Index = BTU/sq.ft./degree-day/year.
Empirical values are built into the program utilizing average weekly temperatures converted to degree-day values.

Different timescales are appropriate for different measurements. Annual average temperatures for a specific geographical location will vary year-on-year, but the relative humidity does not differ significantly from summer to summer or winter to winter between different years. Energy cycles are on a month-to-month timeframe, but hotels operate on daily or weekly time frames, so this information is not of use.

Wind-chill factors are not regarded as causing significant variations. Starwood, for example, has outside sensors in only 10% of its hotels. Some hotels manually adjust energy use within an hour of temperature change. It was noted that as soon as the temperature drops below approximately 70ºF, energy use increases very rapidly.

A large proportion of operating engineers in hotels do not undertake rigorous monitoring, analytical, or energy control measures. A widely applied indicator is needed, such as “value of merit,” along the lines of: ‘up is bad, down is good.’ Energy use in a large complex hotel can change 10 to 15% with different engineers in control. Simply by monitoring energy use reports and taking minimal action based on this may lead to an average 3% reduction in energy consumption. If this is monitored hourly, a further 3% savings can result. Starwood, for example, successfully saved 7 to 8% over 2 years (2000-01) without capital projects by being conscious of weather conditions and planning its energy requirements accordingly.

Solar power has not been used to any significant extent in the hotel sector in the U.S. (although elsewhere in the world, e.g., the Mediterranean region, its use is widespread). In the U.S., the shorter payback period by improving the efficiency of existing equipment (because of low energy costs) dissuades hotels from installing alternative sources of power.

2.3.3 Climate Information Potential
At present the use of climate data by hotels and resorts is inconsistent, but there is a noticeable increase in use, particularly by larger operators.

Three distinct trends were apparent:

- The requirement for additional granularity in some measurements;
- A desire for information to be consolidated for easier usability; and
- A need to improve the accessibility of online information by improved web navigation.

NOAA may benefit from working with weather information suppliers, i.e., those that interface with end users (e.g., engineering organizations) to consolidate information and improve ease of access for identifiable groups of information users, such as engineers. Information could be presented in a format that could be directly input into computer programs (e.g., comma delimited text).

Geographic Scale: U.S. mainly, but also worldwide

Temporal Scale: Short term (hourly for temperature), medium term (daily for some data, days, weeks, or severe weather warnings), long term (1 year+ for long-term climate trends)
Finance/Budgeting
In all the organizations contacted during the preparation of this report, weather and climate are not factored into the hotel and accommodation sector business forecasting models or directly accounted for in financial forecasts and budgets. Indirectly, weather and climatic conditions may result in the purchasing of materials and resources to prepare for emergencies or to deal with damage after an event. This is because budgets are set 6 to 12 months in advance and long-range climate forecasts do not currently provide predictive information that finance officers and budget staff can utilize in their financial models. Consequently, weather, climate, and ocean information is excluded from forward budget planning. Starwood has looked at programs that insure against weather and climate to hedge its risk, but no active financial applications are currently used.

Some consideration of the weather is taken into account in certain hotel brands reservation policy. If customers pay deposits in advance to reserve rooms but weather conditions preclude the room being occupied, hotels will generally refund the hotel reservation expenses (but not any costs associated with travel). For example, Holiday Inn operates a 48- or 72-hour cancellation policy (depending on season) whereby if bad weather is being experienced, there is no charge placed on a customer’s credit card (the usual cancellation penalty is one night’s room fee).

Seasonality as a business trend may be the only climate-related variable built into the hotel and resort sector’s business budgeting. However, seasonality is not always a function of weather. For example, downtown/city hotels may be affected by other seasonal market stimuli, such as trade shows, conventions, expositions, etc. In many cities higher levels of occupancy are experienced in the winter months.

Extreme weather events are often incorporated into models on the basis of historical data. An organization will know the average number of hurricanes per year affecting a particular area and the cost of those events in terms of property damage and lost trade, so they can be build this into a forward plan model. Starwood uses historical data such that:

“We use the fact that as they have had hurricanes in a particular area in the past, it is reasonable to assume that they are going to have hurricanes again during July to October. Returning events are not a problem to forecast. You don’t get the same occupancy rates at the time of severe weather events.”

It is not believed possible by the industry to build the weather into day-to-day budget forecasting. In the past, Starwood produced reports where weather conditions were noted along with the income of hotels. This is not now carried out.

Most hotel groups use their own business-planning models based on a yield management model. While there is some acknowledgement that weather and climate are significant in influencing business to some extent, weather, climate, and ocean data do not get factored in when budgeting a hotel. The winter months in Florida, Arizona, and California are usually busy because it is cold in other areas of the country, and historical seasonal occupancy rates form the basis of seasonal financial forecasts and budgets. This could be regarded as an “indirect” form of climate forecasting because it takes account of climate-induced trend to
date. This rather imprecise form of weather and climate accounting has apparently served the industry sufficiently well.

Travel patterns show distinct seasonal variability. Most reservations (particularly group bookings) are made at least 6 months in advance on the basis of a general presumption of what the weather will be like based on historic trends. There is a customer acceptance of the uncertainty of the actual weather on arrival, and thus it could be argued that there is no point in trying to incorporate weather information into models. However, if more accurate long-term weather information becomes available, customer booking patterns may change.

Interviewee comments included:

“If accurate information was available such that it predicted that in two weeks’ time a hotelier is going to be hurt, that might be useful. Also, if with a high degree of accuracy that we will have 5% more hurricanes next season, that might possibly be useful. Long-term and accurate information is wanted so they can estimate the expected occupancy rates. If a severe weather event is certain to occur over the next two weeks, it would be useful information for them. If we could be told in January with a high degree of accuracy that a hurricane is going to occur at one of our properties on 16 July, then we can change the budgeting to take account of this.”

“Hurricanes, tornadoes, heavy rain/floods, take a heavy toll on the industry. If we had accurate information well in advance as to what weather conditions would be at least six months in advance, this would be useful to us. What we need is something like a ‘farmer’s almanac’ that tells you what crops to plant as the season is going to be hot or cool.”

“Most hotel business is generated “on location”; it is not weather or climate sensitive. Hotels just get cancellations if there is bad weather. There is no way to off-load capacity when that happens”.

“Inclement weather is seen as a benefit—bad weather is good for business as people spend more time and money in the bar or don’t go out to eat, but you can’t plan for this in your business plan”.

Procurement
Maintaining an appropriate level of materials and equipment to utilize in times of emergency and purchasing specific items during times of potential danger are procedural requirements in branded hotel groups, stipulated in documents such as emergency preparedness manuals. It is unlikely that improved climate information would negate this need or have any impact on cost. It may, however, add to the level of preparedness at any particular time if a property is at risk.

Risk Preparedness
Every industry and business is exposed to a variety of risks, which ultimately translate into financial risks. Severe weather events, the impact of climate change, and rising sea levels are amongst these risks. There are a number of strategies to manage and mitigate risk in business, including risk reduction strategies, risk avoidance measures, and effective risk management, preparedness, and insurance. A list of risks commonly found in the hospitality and hotel sector is in Appendix D.
Most large hotel and resort groups have formalized disaster preparedness and response plans that are activated on issuance of an alert. Smaller hospitality providers do not have such elaborate systems in place and rely heavily on being directed by local authorities (e.g., U.S. Coast Guard or local emergency management office). Weather risks such as flooding, hurricanes, tornadoes, and fire hazards warrant specific preventative and disaster reduction measures.

The emergency plans produced by larger organizations are procedurally based. They include sections for potential risks (hurricanes, floods, earthquakes, blizzards, etc.), which contain pre- and post-event checklists and action plans. Franchised properties are not always required to comply with the group policy and procedures as they carry the liability themselves rather than transferring it through the group.

When weather warnings are issued by insurers, division-level technical services directors at hotel groups activate their preparedness procedures. For example, some insurers activate a ‘Cat Alert’ to warn of impending severe weather conditions. Properties receiving alerts will usually know from local forecasts if severe weather is approaching, but in more remote places, warnings from headquarters may be the first reliable indication of a potentially hazardous situation they receive.

Enhanced climate information would increase the effectiveness of emergency planning measures already in place, especially more accurate event forecasts, timescales, and severity estimates. An example of the information track is presented in figure 5.
2.3.4 Climate Information Summary

It is apparent that there are significant differences in the requirements for enhanced/additional climate information across the accommodation and hotels sector. These occur:

- Vertically in the industry where some large organizations require complex and detailed data while small organizations tend to be content with the information they have; and
- Horizontally across organizations of a similar size. For instance, Starwood is centrally organized and operates engineering energy saving initiatives that require detailed and granular climate information, whereas Holiday Inn has devolved control to individual hotels and does not consider energy saving initiatives cost effective.

Weather, Climate, and Ocean Information Services

One expert witness commented that the NOAA service has declined over recent years, a broad coverage not now being provided. NOAA only supplies data for the U.S. whereas many hotel and resort organizations operate internationally, so access to foreign data (especially Canada) would be useful if it was made available. One particular respondent said it was not easy to get data even for Alaska.

While the daily temperatures of areas in the U.S. are useful, another problem commented on is insufficient total coverage within states by NOAA data points. California was stated to have only 2 monitoring stations, which severely limits the usefulness of the data because variations across the state means that energy load forecasting cannot be made on the basis of such generalized figures.

It was asserted that NOAA had ceased to use local volunteers and that this has reduced the granularity of information: “the complexity of NOAA data has increased at the expense of spatial resolution.”

Other problems mentioned included:

- NOAA data supply was cited as unreliable;
- Variations in stations that are availability and technical problems result in incomplete data; and
- Information quality and completeness issues.

The comments above have not been checked for accuracy or veracity but have been included to indicate that there are views amongst some of NOAA’s data users that some problems exist.

Overview

An overview of the hotel and resort industry view of climate data comments follows:

**Geographic Scale:** U.S., Canada, Caribbean, and other areas where the U.S. has significant economic interests

Additionally, more detailed information from within the U.S. was stated as a requirement
Temporal Scale: Short term: very short term (days) data was universally considered satisfactory; extending this reliability to a week would benefit the “weekend break” industry; extending 3 to 6 month forecasts would assist the longer (annual) holiday market

Medium term: year-out trend forecasts (e.g., dry year/wet year) would be useful for the convention and conference industry; improved forecasting accuracy of severe weather events would enable the industry to deploy finance more efficiently and reduce the window of customer disruption

Long term: climate change estimates would facilitate better development design provision for building lifetimes and improved development siting (avoiding flooding, wave damage, etc.)

Other Variables: There seem to be at the very least perceptions of quality issues with NOAA data; it is not clear whether these are real or whether some PR is needed

It was commented that “the complexity of NOAA data has increased at the expense of spatial resolution;” this comment was encountered on several occasions during the research

The completeness and quality of NOAA data is becoming more important as it used for computer modeling applications; this refers to the number of NOAA ground stations, the frequency of measurements, the completeness of data, reliability, and the quality of data

The granularity of data (hourly) is important when the data is used for modeling and/or real-time building management applications

With larger and more complex data online on the web, it is important to maintain a coherent and understandable navigation structure to access quality data; this implies that more management involvement in NOAA web sites may be required because these are the outward face of NOAA to data users; consideration should be given to involving web usability consultants

2.3.5 Ski Resorts
Ski resorts tend to collect their own weather information. This is largely because the weather conditions are unique to the mountain/alpine climate (technically an artic regime), tend to be locale specific, and are not generally reported adequately by conventional weather reporters/forecasters.

There are two main areas where weather information is used:

◆ Operations—to make decisions about snowmaking, snow grooming, staffing, etc. Resorts usually check weather up to 2 weeks in advance to estimate expected snow level.
◆ Marketing—information (snow conditions, skiing information, weather information, etc.) is made available directly to the public as part of resorts’ marketing of skiing conditions directly and via journalists. Good weather and snow conditions are favorable for business, and as the skiing season is short, conditions are widely publicized to encourage business.

The majority of weather-related data is from each ski resort’s own observations or neighboring resorts weather stations. Resorts often work with meteorologists to obtain daily forecasts. Approximately $15,000 is paid per year for consultants (for snow reporting and weather information) by the larger resorts (e.g., Vail, Colorado).

The lack of consistent snow reporting systems and the paucity of easily accessible information was commented on. One resort collated data over 5 years (including temperature, snowfall, snow base, and related data) to determine a 5-year trend. This analysis proved useful to longer-term planning to better predict temperature, snowfall, and other such trends. The resort intends to make the information available to the public on its website. Interestingly, the average snowfall of 260 inches per year was exceeded significantly in 2000 when 388 inches fell. The lack of a standard for snow reporting is illustrated by one respondent commenting that 5 to 7 inches of snow had fallen at their resort, while an adjacent resort claimed 12 to 14 inches. This wide difference in reporting leads to a lack of confidence in the data and frustrates fair competition between resorts. A standardized snow reporting system would be able to more accurately reflect conditions.

The information the resorts gather is more detailed than data available through the National Weather Service or others. Weather information is communicated throughout the ski resorts to all departments, guests, and local lodges, it is emailed to skiers, posted on a website, and recorded on a telephone message for incoming callers.

A typical website, “Snow Report,” includes the following: snow depth, number of trails open, total miles of terrain open, number of lifts open, base temperature, summit temperature, number of inches of new snow in the last 24 hours, number of inches of new snow in the last 7 days, base depth (i.e., depth of snow), primary/secondary surface conditions (i.e., kind of snow, such as packed powder or machine-groomed), and the general forecast. The forecast is sometimes obtained from contractor meteorologists and includes the average temperature, wind, and precipitation.

Stowe Resort, Vermont, also provide links to National Weather Service and the Intellicast Skicast on its website, as well as emailed updates of the snow report. A respondent operating a small spa in Colorado provides a ‘ski report’ based on a full grooming report received from Vail Resort. (Machines groom down the snow to put oxygen in to the snow. This stimulates the longevity of the snow. It is rather like a combine harvester—it turns the snow over and packs it.)

Weather conditions are critical to the winter sports industry. Snow reports determine snowmaking decisions, as well as decisions relating to power supplies and loading. Resorts regularly use weather reports to plan their electricity purchases around off-peak usage. Stowe Resort saves at least $15,000 a year by using off-peak electricity resulting from accurate weather information.
There is a need to better predict localized daily highs for the temperature based on a single morning reading. Temperature readings are available from the National Weather Service and local data sources, but they do not adequately correspond to mountain weather conditions.

One ski resort commented that the weather is not considered a ‘deal breaker.’ While it adversely impacts the resort if there is insufficient snow, short-term poor weather conditions do not impact business to a catastrophic extent as in general visitors have paid their full deposits 45 days prior to their stay.

2.3.5.1 Climate Information Use and Potential

Geographic Scale: Highly localized

Temporal Scale: Two weeks out for resort planning and onsite visitors, 45 days out for customer advance bookings, and year-on-year annual snowfall trends

Other Variables: Detailed local information is already collected by resorts and made available by diverse means; however, it is apparent that the information quality is variable (snow information in particular) and the information distribution is erratic

2.3.6 Golf Resorts

Golf as an open-air recreation is to some extent dependent on climate information. This is important for both the management and use of golf courses.

2.3.6.1 Course Maintenance

The weather dictates golf course management activities such as:

- Watering—irrigation requirements vary with rainfall and evaporation rates;
- Fertilizer and Pesticide Application—spraying cannot be carried out if it rains above a certain amount or is windy, as the chemicals will be used inefficiently and lost to runoff and may cause them to damage habitats and/or wildlife if they seep into neighboring areas;
- Seeding—can only be undertaken when ground conditions, temperature, and precipitation are optimal; grass species planted vary with climate zones;
- Airification—can only be undertaken when ground conditions and precipitation are optimal;
- Grass Cutting—is undertaken regardless of weather (e.g., cutting may take place when it is raining); and
- Staff Management—the weather influences decision as to whether to retain staff onsite in inclement weather.

Weather patterns are monitored on a weekly basis over the course of a year for maintenance planning purposes. Rain, wind, severe weather events (e.g., thunderstorms), etc. impact the maintenance and work schedules.

Temperature is a key influence on certain activities as insect infestations and humidity influence grounds management. Winter seeding is not carried out when the temperatures are 30°F or lower, as the seed will lie dormant until the spring. Temperatures will also determine
which grass seed species will be used. Weed germination is temperature-dependent and “pre-emerge” chemicals are used to control summer weeds.

It can be seen that there are significant financial benefits that result from incorporating climate information into grounds management, especially in terms of efficient use of chemicals and nutrients and staff costs. Chemical treatments are expensive; one club interviewed spends around $100,000 per year on chemicals.

2.3.6.2 Climate Information
Weather and climate impact all aspects of the economics of golf courses in many ways, including visitor numbers, maintenance costs, shop sales, bar and restaurant takings, etc. It is therefore not surprising that a wide range of climate information is accessed by grounds managers:

- Internet services—Weather.com, DTN Intellicast;
- Local weather stations;
- Water temperatures (soil conditions are influenced by the proximity of coasts or lakes); large bodies of water ameliorate climate extremes;
- SSTCharts.com for water temperature as these affect the local weather;
- Satellite access via a PC is used to keep a watch on storm cells and their projected tracks; this facility is also used to warn golfers of the advent of extreme weather in case they want to terminate their rounds to retreat to safety;
- NWS is used to track hurricanes; dependent upon location, golf courses can suffer flooding and deforestation as a result of proximity to hurricanes; and
- TOROirrigation Software package is used to determine if irrigation is necessary, taking into consideration developing weather situations.

2.3.6.3 Climate Information Use and Potential

Geographic Scale: Local

Temporal Scale: Daily information for locally-based golfers, week-forward information for general grounds management, month-forward information for grounds management planning and visitors traveling in, and year-forward general information for financial planning; more accurate information about extreme weather events would be beneficial to facilitate the implementation of preventative measures and reduce the “window of disruption”

Other Variables: Long-term climate trends, particularly temperature, would extend the planning window; if temperatures are changing, this could impact the maintenance schedule, grass seed used, chemicals used, irrigation requirements, etc.

2.4 Sports Facilities

2.4.1 Sector Outline
Spectator sporting facilities such as large stadia for football, baseball, and other team sports attract thousands of visitors and constitute a major recreational and economic activity. Major
football and other sporting and entertainment events are held at the PSINet Stadium in Baltimore (home ground of the Baltimore Ravens).

Grounds management of large stadia use weather data for field management, especially grass management. Weather affects both the condition of the field and its care. For example, nitrogen fertilizer can be easily washed away and is not only lost but may constitute a major source of groundwater pollution. Grounds maintenance and treatments must be carefully planned taking into consideration precipitation and dew point conditions. Football stadium fields are commonly temperature-controlled, raising the field temperature up to around 58 degrees, warmer than outside temperatures. This enables virtually all-weather use of the fields. Temperature and wind conditions are crucial factors in the artificial control of field conditions and need to be assessed when setting field-heating levels.

2.4.2 Weather and Climate Information Usage

Relative humidity, ambient air temperature, and sunlight are critical factors in keeping the field adequately dry or wet. The number of hours of direct sunlight per day influences these conditions and will vary at different times of year. Weather information is used in the application of anti-dew agents to keep fields dry. Weather information is also used in disease management and use of chemicals. Many other field management activities are also highly dependent on weather conditions.

Sources of weather data quoted include:

- Weather.com;
- Local sources (for example a local news program’s website);
- The Weather Channel;
- DTN Weather Services, providing hand-held information via satellite; and
- Doppler radar (available on the web).

2.4.3 Climate Information Requirements

Stadium managers are primarily interested in storm tracking, ocean currents, temperature, cloud cover, wind speed, atmospheric conditions, relative humidity, barometric pressure, dew point, and solar radiation. Weather information is worth hundreds of thousands of dollars in getting the maintenance regime right. This can be illustrated by an example of where a slight miscalculation for a sod producer caused a large amount of sod to die as a result of frost, costing an estimated $1 million in losses.

**Geographic Scale:** Local

**Temporal Scale:** Up to one year and long-term climate trends

**Other Variables:** Field managers detailed the following desired improvements in data provision: more accuracy in lightning prediction, better projections for winter storms, and more detailed solar radiation information.
2.5 Theme Parks

2.5.1 Sector Outline
Theme parks are established on large areas of ground and as such they must comply with EPA regulations to monitor specific conditions such as run off. Regulations such as the National Pollutant Discharge Elimination System requirements covering run-off from properties is subject to monitoring. Disney World in Orlando, Florida, for example, has a person in position as a rainfall tracker who oversees the collection of continuous 24-hour data from a PC-based network system of 9 monitoring sites over the 43-square-mile Disney World property. This monitoring system had to be established because:

- NOAA data on average covers a localized area of 66 square miles, not sufficiently detailed for the purposes of Disney World’s compliance with EPA regulations; and
- The nature of the precipitation in Florida is generally in the form of very localized thunderstorms; hence the degree of run-off variability over the 43 square miles is considerable.

Once the monitoring scheme was established, information emanating from the rainfall monitoring was deemed useful for other departments within the Disney World complex.

2.5.2 Climate Information Usage
Theme parks are large financial organizations that are sensitive to weather variations. Visitor planning is a major exercise, which drives maintenance requirements, restaurant consumables, energy use, and virtually every aspect of the operation.

*Geographic Scale:* Very large but below the NOAA lowest average unit area (66 sq. miles)

*Temporal Scale:* From a day out to long-term climate trends.

*Other Variables:* EPA requirements depend on detailed, localized, rainfall information

2.6 Marine Transportation, Cruise Lines, and Aviation (Private and Commercial)

2.6.1 Cruise Lines
The U.S. cruise line industry is centered primarily on the Caribbean and Alaska and is seasonal in nature.

2.6.1.1 Sector Outline
The cruise line industry is a major tourist activity in the U.S. and Caribbean. Around 9% of the U.S. population takes a cruise at some point in their life.\(^{183}\)

Charter ships that go down and around the eastern U.S. seaboard and the Caribbean usually island-hop. The 3 main cruise areas are Alaska, the east and west Caribbean, and Mexico. Most of the major cruise lines follow the same or similar routes: in the east, from Ft Lauderdale to Cozumel to Barbados and back to Ft. Lauderdale.

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\(^{183}\) Windstar Cruises, pers. comm.
Ship deployment schedules are seasonally determined. For example, in winter most of the cruise lines concentrate on Caribbean cruises and in the summer cruise Alaska. The Holland America line also runs an Alaska to the Orient (30-day) cruise and back to Los Angeles. As a result of the upsurge in popularity of Alaska cruises, there is a stress placed on air transport and airport infrastructure resources to the embarkation ports on the West Coast. Windstar, for example, has to fly its passengers to Portland, Seattle-Tacoma, or other regional airports and bus them to Vancouver to embark on the ships.

Alaska cruises have flourished since 1986 after the Achille Lauro terrorist attack in the Mediterranean and security issues became paramount. Those wishing to go on cruises, particularly from North America, did not want to risk Mediterranean or European cruises. Alaska opened up for development because the weather in the Caribbean in the summer is too hot. There was also concern about the possibility of further terrorist activity along the eastern seaboard of the U.S., so people felt insecure cruising there. The World Expo in Vancouver in 1986 also boosted tourism in the area. Security on board ship is still an issue and one that the cruise lines take very seriously.

After the 9/11 terrorist attacks, cruise line business dropped considerably, but during the early part of 2002 there has been some recovery. Windstar was forced to reduce its budget in response to the downturn in business (no upgrades were being given to customers) but it could not risk cutting its service, otherwise it might be in danger of losing repeat customers. Cruise lines have had to reduce their prices considerably for the 2001/2002 season to attract customers back.

To get from the winter cruise area of the Caribbean to the West Coast for the summer sailing season, ships journey through the Panama Canal on ‘partial cruises,’ i.e., they take passengers for just the segment from east to west. This may mean that passengers join the ship at Ft. Lauderdale and disembark at Panama, Acapulco, Los Angeles, or San Francisco, depending on routing.

Routing decisions or routing alterations in response to weather conditions generally rest with the ship’s captain (although one cruise line does make such decisions at its land-based headquarters).

Ships usually route to ‘go with the wind.’ Ships have a maximum speed of around 20 knots, so can in fact ‘outrun’ a storm if they have to, but from a passenger comfort and safety viewpoint this is undesirable and should be prevented. Cyclones travel on average at about 10 to 15 knots, but are fairly short-lived at this speed before slowing down. However, it is preferable for ships keep out of the way of cyclones, which they can do with better, more accurate forecasting.

Weather and climate are not formally factored into their business planning as they usually plan a ship’s itineraries 2 years out. A cyclone may disrupt an itinerary, so the ship may have to go to another port, but it does not disrupt a cruise. The cyclone season has not affected cruise lines to any great extent as they have so far managed to keep well away from such severe weather by monitoring weather situations 7-10 days in advance. It was generally expressed that it is impossible to factor the weather into the cruise lines’ business plans. They would not purposely put ships into an area where it was likely the journey could not be completed.
Princess Cruise Line uses a ship routing division of the U.K. Meteorological Office for transatlantic voyages. For a fee, a run line is planned to route the ship to get maximum fuel consumption or to avoid bad weather. Route planning generally takes account of different considerations for passenger ships as opposed to cargo ships (fuel economy is of greater consideration to cargo ships).

### 2.6.2 Climate Information Usage

Weather maps derived from a number of sources are used on board ship as well as weather fax and satellite information. Severe weather conditions are closely monitored, such as hurricanes and tropical storms, concerning their severity, direction of movement, speed, etc. The NOAA web site is used, among others. If a particular cruise line’s ships are in the Caribbean and they have a warning that there is a hazardous situation to watch out for they will also liaise with their headquarters. Virtually all shipping now has access to the Internet at sea. Ships have local maps on board and computer maps, so they will know the latitude/longitude they have to avoid. An on-board computer will create a map and chart a new course if necessary, with estimated times of arrival at particular destinations. If a cargo ship is a day late, it does not matter, but it does if a ship is carrying 800 passengers.

Ships constantly access NOAA, CNN, NWS, Cable News, the USCG, etc. The hurricane advisory charts available from the NOAA web site are printed out if there is a hurricane in the vicinity of a ship. The graphics showing the eye of the hurricane and direction and speed are printed in colors, which they find helpful. A telephone recorded message service, 1-800-ROLLCALL “High Seas”, is no longer used, and direct radio is also used less now. Weather maps are accessed showing different quadrants. NOAA’s advanced forecasting and storm tracking facility are generally thought to be valuable. The Canadian Hydrographic Service and search and rescue satellite are also accessed as well as [www.pancanal.com](http://www.pancanal.com) to view ships going through the Panama Canal (hourly updates are given).

Ships use the National Ocean Service (NOS) website to provide information on the state of the coast and the ocean. They input their latitude and longitude and get precise weather reports.

As well as being the recipient of weather and ocean conditions information, many ships transmit data on conditions they encounter to METEO, based at the Royal Dutch Institute in the Netherlands (this a joint initiative with the U.K. Met Office and German meteorological service from which composite weather maps are compiled). Data on ocean temperature at surface, cloud conditions, precipitation, fog/visibility, wind speed and direction, ocean/wave conditions, swell, ship position, etc. are sent to METEO. This data is used for forecasting and transmitted to coastal stations along the U.S. East Coast.

Comparisons of barometric pressure, for example, are made between neighboring ships. Information is passed back to NOAA regarding actual conditions at sea, which serves to verify conditions. Ships can also directly access weather information from METEO. In addition, ships communicate with one another to share weather information as a matter of good seamanship. The housekeeping department on board ships usually phones the bridge for daily weather reports so they can inform passengers.

Wave height and the swell conditions are also monitored. Swells may run up to hundreds of miles and at times a “confused swell” causes bumpy conditions. On occasion if the sea state
is rough, the captain may choose to alter course and schedule, or may reverse the schedule/route. The captain normally makes the required routing decisions at sea but will consult with headquarters, and the cruise line president in the case of Windstar. Both forecasts and real-time data are used.

Essentially, cruise ships are not interested in local weather reports. They know conditions “as soon as they look out the window.” They are more interested in the overall weather picture for route planning. Ideally, they require 2 days’ accurate forecast, especially for the cross-Atlantic run. They download the Atlantic weather picture, including high and low pressure systems, track the fronts, their speed and direction of movement, and then plan a route. Vessels will generally go to the south of a low-pressure system in the Atlantic if necessary.

The captains of the ships are ultimately responsible for the ship and the safety of passengers and crew; headquarters may advise if problematic weather arises.

Disney use the Hurry-track program developed by a company in Georgia that customizes NOAA data to track specific ports of call and islands in the Bahamas. Track-track software customizes the presentation. NOAA has much more sophisticated data but Disney does not need this. The data is imported into the Track-track program at headquarters where they enter the position (latitude and longitude) of the ships and the position of hurricanes. Disney headquarters then advises the ships what to do in the case of possible severe conditions.

Ships use the Internet, NOAA, and other weather sites such as DTN Intellicast. Some subscribe to private custom weather reports. Some cruise lines have contracts with independent weather forecasters to provide daily forecasts for specific areas. These forecasts probably use NOAA data. They monitor the weather forecasts and actual conditions at least once a day or more frequently as needed. The DTN information is downloaded onto a dedicated computer. NOAA wave height data and wind speed charts are monitored, as well as tropical and nontropical systems. Sea temperatures are not used extensively. This data does not impact business decisions (you can run a few miles away into warmer waters if needs be) and are not factored into business forecasts.

**Geographic Scale:** Most cruise lines have ships in the Caribbean, which has very good weather report coverage. Additional coverage that might be useful would be beyond the limits of the continental U.S. (e.g., Bahamas and Caribbean).

**Temporal Scale:** Depends on the weather situation at the time. In calm, stable conditions ships will monitor daily whereas in severe storm situations, this will be done hourly. Also it depends where they are; in the Caribbean they like 24-hour forecasts, whereas if they are in open sea (e.g., across the Atlantic) they like 2-day forecasts. For the Caribbean, they review the whole Caribbean and North Atlantic situation to see weather developing. In the Caribbean, severe weather situations can develop fairly rapidly. The temporal resolution varies greatly according to the particular threat. Daily forecasts are generally monitored, but in the hurricane season they make use of 7- to 8-day forecasts.
Spatial Scale: When tracking hurricanes, a wide area is covered: from the mid-Atlantic to mid-Gulf of Mexico and up to Cape Fear and the mid-Carolinas. When tracking a specific hurricane, information users require the highest information resolution available.

2.6.2.1 Climate Information Shortfalls
The area least covered is the west side of Mexico (LA to Acapulco). It is only in this area that Princess Cruise Lines has experienced real problems caused by inadequate weather coverage: a cyclone traveling up the coast went undetected by a Princess ship in the area. “It was towards the end of the season and we had little warning, but luckily the cyclone changed course before reaching the vicinity of our ship”.

2.6.3 Aviation
2.6.3.1 Sector Outline
For air transport, weather is a key determinant for critical operational decisions. Both the airline and cruise industries are more weather-sensitive than most other subsectors.

The yield management model was originally developed in the aviation industry and it still has significance for this subsector tourist industry. Essentially, weather and climate data are used to calculate the weight and balance of an aircraft; this is based on the center of gravity of an aircraft and determines how much thrust is required to get the aircraft airborne. It is
essentially an engineering model that relates to different climatic conditions and is a function of the ‘zero dynamics’ of a plane. Research work is currently being carried out by the George Washington University Aviation Department on developing models to use 3- to 4-hour forecasts, although a of data supply source to apply to the models is not yet available.

2.6.3.2 Industry Organizations

Industry associations such as the Air Transport Association (ATA) produce air traffic demand forecasts. Every airline has a meteorology department because the weather is a crucial variable in the aviation industry. Northwest and American Airlines have large meteorology departments. Most airlines rely on the NWS. Specific economic forecasts are translated into the U.S. economic outlook as a whole and extrapolated as to how these will affect the airlines. Business forecasts are usually carried out for a whole year. Some trends are predictable: in the summer season travel is increased not just due to the weather but also because of school holidays so families tend to take vacations. The international air transport industry (represented by IATA) is particularly concerned about the economic and cost policies imposed on the air transport industry.

In the U.S., the International Civil Aviation Organization (ICAO), based in Montreal, is a regulatory body. Its members are sovereign states, the governments of which have agreed on procedures on a global basis. Annex 3 of the ICAO binding policy document describes the weather requirements of all states (the Annex defines the required content of the charts). The organization has amassed a considerable collection of statistics concerning all aspects of flight data.

ATA is a lobbying association representing the airlines that carry more than 95% of all U.S. passengers. Air carriers are part of the process of moving people and goods from A to B: passengers have to be dispatched; if they wish to go to Chicago from Orlando, there are only a few ways of traveling and only one or two airports they can go to.

2.6.3.3 Climate Information Usage

Weather and climate are a key input to revenue modeling in the aviation industry. There are direct economic repercussions for the travel and tourism industry from high altitude weather patterns. For instance, on certain long-haul runs (e.g., to Japan), aircraft take a “nose beating” in strong headwinds. Consequently, there are certain times of the year when tour operating companies and airlines will not oversell tickets. These occasions of strong headwinds can be predicted and the data are entered into the model (these conditions generally occur seasonally).

Climatologically, a ‘good airport’ is judged on how many days it is usable. Carriers, in deciding on new airports to fly from, use this measure. Hence, it was for this reason that FedEx chose Memphis as its ‘hub’ for U.S. operations. (In Europe, FedEx had to settle for Stanstead in the U.K.).

Commercial

In the U.S., flight weather data is available free of charge, but in many other countries there is a charge levied. The service in the U.S. is paid for by taxes on the industry. Accurate actual and forecast weather data, particularly for departure, is crucial to flight operations. Essential data includes upper atmosphere winds, temperature, and air moisture content. The two
organizations producing significant weather charts at upper levels are NOAA (linked to the FAA) and the U.K. Met Office. Between them they provide global coverage charts. Data is obtained through the World Area Forecast Center.

Temperature is one of the most important factors for aviation because above 49°C there are limitations to flying. The fuel becomes highly volatile at high temperatures. Charts generally show significant weather conditions for the upper levels, particularly for hazardous weather and other conditions (jet stream characteristics, turbulence, volcanic eruptions, etc). It is expensive for airlines when the weather conditions are below an optimum level, so a percentage cost is built into the price of tickets to cover the added costs of poor weather conditions. Airlines are not insured against weather conditions—their insurance only covers them for damage to aircraft. If weather forecasts were more reliable, this would result in cost savings as better, more accurate flight plans could be set, resulting from the optimization of the use of aircraft and crews.

Less than optimal flight weather conditions are a statistical cost that cannot be predicted one year in advance in order to model the additional costs accurately. From 1 to 3% additional costs are usually attributable to weather conditions. For example, flight diversions often result from adverse wind conditions, so flights may have to be rerouted. About 500 flights may have to be rerouted if there is a hurricane affecting Miami. In addition, accidents may occur due to wind shear and high wind speeds when a pilot may be unable to control the aircraft. In June 1999, flight AA1420, an MD82, landed in high winds resulting in 11 fatalities and 149 injuries. This accident was not only due to the wind but poor judgment of the crew. However, if weather conditions had been better, the accident would not have occurred.

For the last 50 years the National Transport Safety Bureau (NTSB) has investigated every aircraft crash in the U.S. Crashes are seldom due to a single simple factor, but generally result from a combination of factors. Airlines have their own policies concerning safety procedures and safeguards. In addition, the FAA and manufacturers impose regulations and restrictions, and further requirements are laid down on the issuance of certificates. Each operation also imposes limits. Operators themselves vary in the way they fly and operate their aircraft, which may depend on training, the geographic region in which they are operating, the aircraft type, whether they have experienced crews, and if they know the airports well.

Weather and climate data are used for trend analysis. For fog, overcast sky, wind conditions, etc., ATA uses NWS data. Hourly weather observations from airports are monitored. The NWS, National Environment Protection Agency, and National Center for Atmospheric Research tools are used. Sensors on aircraft also collect weather data, which is sent via AHF radio to the National Center at Boulder, Colorado. In normal operational mode, this data does not get transmitted to ATA. Carriers may use this data for a variety of purposes, for example, for deciding on de-icing needs.

ATA is generally concerned more about conditions in the upper atmosphere and factors that will affect routing. For this reason it is particularly concerned about thunderstorms. A large research project by ATA is currently in progress on the accurate forecasting of thunderstorms. Thunderstorms can be predicted with an acceptable level of accuracy approximately one hour before they arrive; ATA wants to see this increased to 6 hours.
However, satellite observation and lightning detection provide observations of events as they are occurring, and are not prediction of events. The industry wants over 90% surety, although at present it is willing to compromise; 60% surety is too low a level. It has been observed that the meteorological community is made up of scientists and the aviation community is made up of operational people; and that those in aviation have little confidence in the weather people.

The nature of long-range forecasting is very probabilistic, particularly if it is being carried out for 6 months ahead. It may take the form of a numerical value, such as in February predicting in 6 months time that in mid-July there is, on a scale of 1-5, a likelihood of getting a hurricane at a specific location.

The use of satellites for lightning detection (i.e., not forecasting) and imagery for volcanic dust are necessary for aircraft safety considerations. Volcanic dust particles adversely affect aircraft engines and wind shear can cause difficulties in aircraft handling. The GOES 8 satellite is equipped with a camera and data channel for detection of volcanic ash. VAFTAD, denoting where volcanic ash is in the atmosphere and the direction in which it is moving, is transmitted twice a day to the aviation industry. Currently the areas affected are in Latin America and in the northern hemisphere near Iceland, as well as in Asia.

Ash affects, and is affected by, weather and climate, and therefore has an effect on the travel industry. Soot from ash is also a problem: in Alaska 2 to 3 inches of soot in Anchorage led to the closure of airports in the east for about 2 weeks.

ATA has a close relationship with the NWS: ATA gives advice on the products the NWS issues and helps with the NWS R&D budget. ATA has an R&D program on thunderstorm prediction. Convective storms are a problem in the U.S. in summer. ATA has been working on a ‘collaborative convection forecast product’ (CCFP). In April 2002 the NWS and the airlines were expected to have a national prediction model available for convection forecasting up to 2 hours before a thunderstorm.

The Air Traffic Command Center is at Herndon, Virginia, and will have the CCFP posted on its website. The FAA and the airlines together decide if there is to be a change in the routing of aircraft due to forecasted weather, so aircraft may be diverted to other airports to avoid thunderstorms and other severe weather. The NWS and ATA are working to make the CCFP more reliable. There are considerable economic implications resulting from weather-induced alterations to flight plans and delays. Airlines do not like to reroute aircraft if a predicted storm does not materialize because this has considerable financial impacts; 70% of delays in the summer are as result of adverse weather conditions, so better, more accurate weather forecasting would have an enormous impact on airlines, passengers, and business people.

The NWS is critical to the airlines’ operations. In the summer they have a 2-hour window forecast. NWS forecasts are important to strategic planning: they have telephone conference calls every 2 hours to discuss situations and plan appropriate action. “Many people in private industry want to do what the NWS does—they use NWS data and then sell it back to ATA.”

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184 ATA, pers. comm.
There is an FAA flight service stations network covering the U.S. These are federally run and usually state-based. The Leesburg Station, for example, covers the area of Virginia and Maryland. An automated dial-up aviation weather recording provides information on soaring conditions and includes details on: adverse weather conditions and forecast special events; new aerospace procedures; surface observations; winds; visibility; cloud layer; fronts; freezing rain and snow echoes; movement of weather systems; and ‘flight watch.’

Specific enquiries can also be made of ‘flight briefers’ based at the Leesburg Station. They give details on sky conditions, cloud base, visibility at the surface, temperatures, dew point, icing conditions, rainfall, thunderstorm activity, etc. They can provide information to both commercial and general aviation. The service is free and sources of information are the NWS, flight control towers, private weather services, WSI weather maps, etc. The data is updated on a daily basis, but in certain conditions it is updated every 2 hours.

Recreational Flying

There are 635,472 certified pilots in the U.S., at the time of writing; full certification pilots (excluding students and those not instrument rated) comprise half this number (308,000). The IAOPA has 400,000 members in the U.S. and Canada (Canadian members constitute around 10-15%).

Noncommercial private flying requires lower level data and different charts. Some airports provide recreational flying data. This service is billed through airport taxes and other taxes (e.g., gasoline/aviation fuel taxes; landing/flying taxes) and provides for auxiliary services such as fire fighting. Private airports in the U.S. are not usually burdened by landing taxes.

It is crucial for pilots to know the weather conditions where they will be flying. Flight weather conditions are provided online and are on the IAOPA website at www.flightbrief.com. This is supplied by DTN and is available to IAOPA members at $5.95 a month. Also Meterologix provides weather data and is the largest, most sophisticated weather database available (based in Minnesota). This is available for $9.95 a month. There is a wide variety of weather products on which to base ‘go’ or ‘no go’ decisions. It also depends on the skill of the pilot, the aircraft type, and handling characteristics.

The FAA call flight service (1-800-WXBRIEF), gives pilots a customized briefing for the flight plan they intend to follow. This is in three forms:

- Standard;
- Abbreviated briefing (this is essentially an update on a full weather briefing that may have been received previously as the information is time-sensitive); and
- Outlook, usually 3 days advance forecast.

Students must fly in good visibility and are not allowed to fly in clouds, as they are not instrument rated. Therefore the weather is a crucial factor in their flight planning. Pilots are required by regulation to look at weather reports (Federal Aviation Regulation Code 14, 91 103). Before a flight all pilots must familiarize themselves with all information concerning their planned flight, including weather reports and forecasts. Aircraft performance is affected by the weather (wind, temperature, altitude, barometric pressure).
Airports
Passengers statistics collected by most major airports including deplaning, in-plane, and quantities of cargo transported. Just under 36 million passenger journeys are made per year through the airports, with 59% being personal, 32% business, and 9% both. The national average arrival rates by air for states in the U.S. is 14%, whereas for Arizona, it is 28%. In Phoenix the weather is generally very good; the city may have about 10 bad days a year. The frontal systems come in very fast and may be over within 20 minutes. Pilots will not take off in stormy conditions. If storm systems are present and visibility is bad, they tend not to rely on equipment but just look out the window across the airfield. Below 4 miles visibility data is relayed to the NWS. Visibility is a major problem in some airports, such as New York.

Aircraft are more susceptible to high temperatures than commonly realized. In 1990 there was a week during which Phoenix airport temperatures reached around 120°F:

- June 25: 120°F
- June 26: 122°F
- June 27: 119°F

Although the airport was not forced to close, most flights were cancelled because flight performance charts did not include data above 120°F. Temperature and altitude affect an aircraft’s performance, so the charts were rapidly upgraded to take account of higher temperatures. The air is denser at higher temperatures and so the weight ratios have to be calculated accordingly for different air temperatures. At given temperatures an aircraft can take off at ‘x’000 lbs. thrust.

As safe performance is a major concern of airlines, most airlines chose not to fly while the temperatures were in excess of 120°F, as they did not have the relevant data in their flight tables to enable them to calculate the configuration of their aircraft in such conditions. Flaps and other aircraft settings are adjusted in accordance with ambient temperature. Flight manuals were amended after this event (in fact they had to radio through to Saudi Arabia to obtain data for high temperature flying).

The weather influences the way aircraft turn into and out of the airport. Most weather data is generated by onsite monitoring equipment. Data on wind speed and direction, frontal passages, wind shear alerts, micro-bursts, etc., are generated through ground equipment and direct visual observations. Terminal Doppler Weather Radar (TDWR) monitors gust fronts and storm fronts, and projects their direction of movement and speed—this “next 15 minute” scenario is depicted on a screen display. The system identifies ‘cells’ of activity: a large system will generally have micro-bursts associated with it and these are shown on the display. Wind shear and micro-bursts are printed out, enabling the airport to warn pilots. Hourly updates are made.

The Automated Surface Observing System (ASOS) provides hourly updates on sky conditions, visibility, barometric pressure, and wind direction and speed. This is sent to the NWS. This is augmented and informs the airport if there are significant weather systems outside of the immediate area. Between them, the ASOS and TDWR provide all the data required. In times of bad weather the data can be updated every 5 to10 minutes. The ASOS monitoring equipment is close to the airport (within 10 to15 miles); it gives data for 40 to50
miles in good detail. It is used for planning and safety purposes. Accurate data is essential to make decisions on the specific runways to use and, if necessary, to help guide aircraft away from severe conditions.

2.6.4 Port Facilities

2.6.4.1 Sector Outline

An essential element of the infrastructure of the recreational cruising, sailing, and boating sector is the ports and marinas that provide safe mooring, refuelling facilities, embarkation, and disembarkation facilities, provisions, and pilot facilities, and act as a focal and meeting point (e.g., through sailing clubs).

Ports and marinas are responsible for the safe passage and other services to their clients. Port Canaveral generates 70% of its revenue from cruise lines. The port has surplus capacity currently for cruise ships. The port has 3 large terminals on the north side (one exclusively for Disney, which uses it 3 days a week); on the south side are 2 terminals, one of which is idle. If hurricanes are in the region, ships are diverted to Port Tampa and Port Everglades.

Pilots work the harbor and offshore up to about 3 miles. There are 8 pilots in the Canaveral Pilots Association, 4 on 24 hours’ unscheduled notice. They usually have around 8 arrivals per week of large cruise ships. The 3 main cruise lines docking there are Royal Caribbean, Carnival, and Disney.

The port does not usually issue weather warnings, although they may call a Disney ship if thunderstorms are in the area near departure time. During the hurricane season the port monitors the situation at least a week prior to the likelihood of a ship reaching the area. Efforts are coordinated with the USCG and the Port Authority.

One concern of the port authorities is with rainfall as the port environment department monitors and samples stormwater outfalls in keeping with the National Pollutant Discharge Elimination System (NPDES) requirements. Stormwater runoff must be sampled during the first 30 minutes of a storm event (i.e., the first flush) and if the storm delivers at least half-an-inch of precipitation. Although it is not required by regulations, water quality sampling and monitoring is undertaken. There are 6 sampling stations in the port and 5 stations in the adjacent barge canal. Water samples are collected monthly and the data compiled in the annual and 5-year reports. Data is also kept for historical purposes. In general the system has shown to be very stable.

The environment department is concerned with beach restoration and implementation of an Inlet Management Plan. The coastal engineer is primarily responsible for the plan and works closely with the U.S. Army Corps of Engineers. Erosion rates are of critical concern so wind and tidal data are collected to determine required actions. Water temperature is also a fairly critical factor as this is linked to periods of algal blooms.

The port operations department works closely with the USCG on emergency management. The captain of the port is the coast guard who has it within his power to close the port. As there is no ‘safe’ port in Florida, they have to get all boats out of the water when a hurricane is forecast. Recreational vessels are hauled on to the land; fishing vessels go through a lock to the river, and the larger vessels are ordered out of the port. The recreational vessels present
the biggest problem, as owners have to make arrangements to have their boat hauled out. The port is a “landlord port,” which means the land is leased to private individuals who then develop the buildings and facilities. There are 3 different marinas and a yacht club. Each marina knows how many boats it has: if a boat is leased from a marina, then the marina will haul it out, but if an owner has not made arrangements to have his boat hauled out, the Coast Guard will do this and levy a fine on the marina for not getting it out (the fine is passed on to the owner).

In the fall of 1999, the port was affected by Hurricane Georges, Hurricane Floyd, and, to a lesser extent, by Hurricane Irene. The port was not closed for Hurricane Irene, but the boats were hauled out for the other two. The port did not close at any time during 2000 and 2001.

2.6.4.2 Climate Information Usage

The Port of Charleston (PoC), South Carolina, subscribes to the DTN weather service providing up-to-the-minute weather conditions; previously the port used ‘Fleet Weather,’ which was more expensive. DTN is a cheaper service and uses Doppler radar, which is better for the port’s purposes. This is used in conjunction with NWS reports. The port also provides severe weather warnings. It has no reporting requirements placed on it. The port is concerned about water pollution in the harbor, but the EPA, not the port, carries out the water sampling.

Some vessels use their own weather service. Fog is their main concern, and this is more prevalent in the winter. They are not concerned with data such as ‘what percentage of days per year or how many days it is foggy,’ or how many days per year there are high winds. They rely to a large extent on their own observations as well as real-time reports on conditions. Wave height is not usually monitored as it is not generally a concern in the port. The port accesses Cape Weather at the Air Force station, the Weather Channel, Intellicast, the TV or Weather.com, and NOAA Weather Radio.

The Port of Canaveral Authority regards wind as a major concern. NWS information is programmed in portable radios at the port (i.e., dial-up channel), so weather information is available continuously. All pilots carry radios. This service, while being low tech, gives the required coverage. However, in times of severe weather, the Brevard County Office of Emergency Management supplements this by sending out weather warnings by fax.

During severe conditions, wave height and tide information is of particular importance. The NWS information is monitored daily and usually every 3 hours or every hour during hurricanes. The NWS may run hurricane planes 4 times a day to observe the eye of the storm to relay back information on location, wind speeds, travel velocity, etc. In addition, the port subscribes to ‘Hurricane Watch’ service and has this accessible on several computers in the office. This tracks hurricanes’ circles of motion, wind speeds at 1, 2, and 3 miles out, and supplies a projection.

U.S. Sailing Association provides weather links on its website for use by its members, including NOAA and related web information. Information is used in all types of sailing. The offshore department facilitates member access to data (via website). Weather and climate data is distributed to members, primarily racing sailors and cruising sailors. This includes storm tracking, ocean currents, tide, surface winds, 500 millibar data (cf. isobar), and all other basic weather information (temperature, barometric pressure, etc.). Most experienced sailors
look at the most detailed weather information. The U.S. Sailing Association does not purchase any weather information.

Most sailors use between hourly and weekly forecasts but some use longer forecasts for planning purposes. A 3-hour update is currently the most frequent period available from NOAA. They also use VHF weather stations on radio. Members operate in North America, coastal U.S., and inland waterways. Some members do high-sea cruising along coasts to the Caribbean or Pacific coast of Mexico (as far south as Acapulco); fewer participate in races to Bermuda, Hawaii, or in transatlantic and transpacific races. Other weather management mechanisms include boat-to-boat and boat-to-shore communications, set-aside stations for weather reporting from NOAA, and weather faxes.

2.6.4.3 Climate Information Potential

There is an apparent need for better probability, projections, and estimates in forecasting (e.g., one race overseas where a sudden storm developed resulted in the death of 6 sailors). Specialized up-to-date (hourly) information during times of severe storms is needed, such as tidal surges, sea state, and wave height. “Weather is always important, and becoming more so as more amateurs are sailing than ever before.” While the U.S. is particularly interested in climatic change per se, it has observed changes in microclimates around San Diego, “where the urban heat island effect has made winds stronger than in the past”.

Geographic Scale: North America; coastal U.S., and inland waterways. High-sea cruising along coasts to Caribbean or Pacific coast of Mexico, Bermuda, Hawaii, and transatlantic and transpacific races

Temporal Scale: Hourly to 3 months

2.7 Insurance Sector

2.7.1 Sector Outline

All recreation and tourism activities carry a level of risk: the extent and sources of risk vary within economic activity subsectors. The insurance sector plays a key role in the recreation and tourism industry by helping to spread the inherent risks to which the industry is exposed and by stipulating standards of construction and maintenance for facilities and operating practices for recreational and tourism activities. Insurance companies’ requirements to some extent dictate standards with the threat of denial of cover. In the recreation and tourism industry, where companies are dealing with issues of public health and safety, service providers have to be adequately insured.

Large hotels and resorts will be self-insured to a greater or lesser extent (depending on the deductible element of a claim). Insurance is often obtained through a broker, who also provides other services. Premiums and deductibles will be determined in accordance with the level of risk that actuaries calculate for a specific property or recreational facility. Hotels on beaches in hurricane-prone areas carry a heavier insurance burden than hotels inland away from natural hazards (or at lower risk of natural hazards occurring based on statistical evidence of weather and climate data going back at least 50 years); most insurance policies in the U.S. do not cover flood from surface water because separate Federal Flood Insurance covers this.
Insurance carriers set a premium rate based on the probability of whether or not there is expected to be a loss and the financial extent of a potential loss. This is often related to weather, climate, and natural hazard; for instance, there is a potential for increased likelihood of loss affecting properties situated on the Florida and California coasts. Insurance companies have meteorologists to advise on the risk of exposure to loss due to severe weather. Hurricane Andrew severely impacted many big insurance carriers. The largest property insurance carriers in the U.S. include: Factory Mutual System (FMS), AIG, IRI (Industrial Risk Insurers); Zurich; and Chubb.

The size of the deductible (the amount that has to be covered by the insured) is usually up to the policyholder. The total insurance premium is based on the level at which the deductible is chosen.

All properties run the risk of weather damage. This is particularly the case with hotels located on beaches. However, location is the commercial decision of hotels and resorts, and they have to accept the higher risk and insurance premiums. Insurance premiums are usually set on the basis of past losses. Individual states are divided into “territories.” Trends are established by assessing data over 3 to 5 years for basic losses and for catastrophe data over a longer period. Mathematical models are used to analyze catastrophic losses. This determines what the rating structure should cover. Generally this is projected 18 months ahead. Underlying experience and past events and trends are the key factors determining the insurance premium (and deductible).

For commercial risk, it can be advantageous to have a high deductible to reduce insurance costs. It is cheaper to include provision in budgets for minor damage than to insure against these. Usually the ‘unexpected’ and fire are insured.

A comparatively new way of offering a deductible is a percentage deductible. This was introduced after Hurricane Andrew and now is fairly common, as other disasters have cost the insurance industry a large amount of money. Locally, hurricane damage is very expensive. A number of insurance companies have imposed a percentage deductible: for example a policyholder may be responsible for 5% of the loss and the insurer 95% of the loss.

The basis of the premium is the ‘full commercial value of a property,’ for which an estimate is usually obtained. Other factors that influence the premium include the maintenance of the property, for which adjustments are made. Commercial property is usually inspected on a regular basis to determine if the property is being maintained and is in good condition.

A number of (noninsurance) companies specialize in the creation of catastrophe models that are sold to insurance companies. The insurance risks are entered into the model (meteorological data is usually embedded in the model). An actuarial consulting firm, Tillinghast Towers Perrin, sell such models to the insurance sector.

Other factors involved in insurance premium calculation, apart from the deductible, include location, historical risk calculations, type of construction; quality of maintenance, installation of preventative mechanisms (e.g., sprinkler systems, security systems), accessibility by the emergency services (out of town locations may be a long drive from a fire station), etc.
2.7.2 Climate Information Usage
Consultancies specializing in catastrophe modeling monitor hurricanes and have a library of hurricane paths, measurements, central pressure data, etc. This is used to predict the likelihood of catastrophic events occurring and probable damage levels. These consultancies have a voracious appetite for weather information in order to be able to make predictions for smaller aerial extents, which makes the models more accurate and profitable. These consultancies generate stochastically a large number of possible scenarios that have characteristics similar to historical events and then estimate the probability of a specific event’s damage to property.

Insurance brokers also provide consultancy services, such as issuing alerts for severe weather and other hazards. A number of the larger insurance brokers issue weather warnings to their clients. AON, for example, issue “Cat Alerts,” which are transmitted to their clients’ risk managers and individual properties that may be in the path of a hazardous weather event. Cat Alerts include tropical storm status and are used in impact forecasting in conjunction with the meteorological information from NOAA and FEMA. Clients receive Cat Alerts as part of a services package for which a fee is paid to the insurance brokers. The Cat Alerts warn hotels in specific locations that storms are likely to strike and they assess the potential for damage pinpointed for each property.

2.7.3 Climate Information Use and Potential
*Geographic Scale:* U.S.-wide

*Temporal Scale:* All historical data, detailed current information, and such predictive material as is available

2.8 Emergency Management
2.8.1 Sector Outline
Every county has an Emergency Management Office (EMO) with strong links to the healthcare agencies. Essentially, EMOs follow FEMA guidelines and obtain some services from FEMA. They are an important element in tourist sector safety, particularly in coastal areas.

Brevard County, Florida, for example, covers 72 miles of oceanfront, a barrier island, and 60 miles of intercoastal waterway, including the Indian River canal port and barge canal. It also includes a port on the Atlantic (Port Canaveral) and coastline area. The barge canal links to the intercoastal waterway. As Brevard is a coastal county, a considerable amount of resources are spent on weather data services and hurricane tracking.

2.8.2 Climate Information Usage
The EMS obtains marine warnings and utilizes other data provided by the NWS (particularly for hurricane warnings), radar services, satellite warning systems, and the Internet. Weather is monitored on a daily basis and hazard analysis is done (fire, water events, tornadoes, etc.). Baron Services, based in Huntsville, Alabama, provides radar reports and lightning data in real time, hourly updates. The resolution is down to street level capable of showing lightning conditions and strikes. The service subscription is $175 a month. The EMS is not concerned with wave height conditions but does need to know rip tide and storm surge conditions.
because warning signs have to be posted on beaches when conditions are dangerous (11 people have been killed over the past few years by venturing out in rip tide conditions).

The EMS only has limited access to wind information and does not have real-time monitoring of winds, although this is obtainable from nearby Melbourne Airport. Data from around 40 monitoring stations is obtained through the Air Force and other organizations and is shared with Melbourne. It is considered that real-time wind information would be a useful information resource.

The EMS carries out preliminary damage assessments but it has to wait until specific weather events are over to accurately assess damage. Currently the EMS is in the process of getting a model to aid with preliminary damage assessments (in part this utilizes storm wave values). PCW Weather supplies the software facilitating direct dial-up and automatic download of data, which then automatically populates the computer program. This costs less than $1,000. Projected wind fields, duration, and an estimate of damage resulting from an event can be extrapolated by relating to detailed data of when homes were built and the building codes operative at the time of construction. Consequence Assessment Tool Sets (CATS) are being developed by the Department of Defense Threat Reduction Agency and will aid the prediction and estimation of damage process in advance of severe weather events.

Arsonists know when weather conditions are conducive to fires, and the EMS warns local fire departments and law enforcement when such weather is likely. At present the EMS ‘blasts faxes’ to hotels, but it would like a better online information system available directly to properties. Ideally EMS would like to develop a web-based warning system but it is unable do this. However, it is considered that many hotels and resorts do not pay much attention to information coming through on the web.

The EMS depends on hotels having a NOAA weather radio (VHS). This should be constantly tuned to a set frequency and is only activated when severe weather warnings are given by the activation of a tone and a computer-generated voice describing the type of weather likely to be experienced. The EMS recommends that all hotels install this system. It would also like all hotel, motel and accommodation facilities to have in-house TV systems linked to satellite subscriber information systems to give early warnings.

‘Project Impact: Brevard Prepares’ is a forum to build disaster awareness in the county by informing the public about emergency preparedness, in particular against severe weather events. There are two main initiatives currently being worked on:

◆ A series of videos on local preparedness measures with special emphasis on the workplace. Each video will be 8 minutes long and will cover hurricanes, wildfires, tornadoes, etc. Some videos for home use will also be made.

◆ A brochure for hotel guests in Brevard County describing what to look out for and what to do to lessen the effects of particular hazards (e.g., undercurrents, sunburn, jellyfish, etc.). The EMO wants to prepare visitors who have never seen or experienced certain phenomena before. Brochures will include year-round information because it cannot afford to produce seasonal brochures, and will include information on the turtle season, e.g., the banning of lights on condominiums on the ocean during the March-April egg-laying season.
2.8.3 Climate Information Use and Potential

Geographic Scale: Local

Temporal Scale: Severe event horizon

Other Variables: Need real-time wind condition information, storm surge, and tide data. Conditions of particular concern are storm surges, water spouts, severe lightning, etc.

2.9 Chambers of Commerce, Convention and Visitor Bureau, and Economic and Development Councils

2.9.1 Sector Outline

Convention and visitor bureaus (CVBs) and visitor centers play important roles in promoting areas for tourism and business and leisure travel. These establishments use weather and climate data in their marketing and promotional activities as well as being the purveyors of weather and climate information to enquirers.

These organizations also promote, market, and encourage businesses to locate in their areas and promote tourist developments. They use and supply weather, climate, and ocean data. In more rural communities where there are no visitors bureaus, the chambers of commerce are the primary source of weather and climate information. Individual states do not always use the same nomenclature for these offices; for example, Arizona has a separate “Office of Tourism” whereas in Miami the “Convention and Visitors Bureau” undertakes the tourist promotion and monitoring role; similarly the “Beacon Council” role is primarily attracting and keeping business in the area whereas “Megacorp” is the Office of Economic Development of Mesa, Arizona. The following section will review these similar organizations’ functions in relation to weather, climate, and ocean information provision as it relates to the recreation and tourism industry in their areas.

Weather and climate play an important role in destination choice, especially the events-planning side of the industry. CVBs keep track of this, as it is a volatile part of the business if they are located in an area that is a high-risk location such as an area prone to hurricane damage. Monitoring the weather for tornado, flooding, and fire risk is a component of their work. They also use weather as part of their promotional efforts; brochures often show monthly average temperatures\(^\text{185}\).

Business and industry need to understand the warnings that may be issued. When hurricanes are forecast for particular areas, people keep a very close watch on the forecasts. Every CVB and chamber of commerce closely monitors adverse weather conditions.

None of the organizations’ business models use weather, climate, and ocean data directly. Weather and climate is “intuitive.” CVBs try to give weather and climate information for visitors usually by way of a website link or put it in some hard copy form, e.g., visitors guides, average temperatures, and rainfall over the year.

Usually in colder climates, hotels are not full in winter, so a seasonal element to their business is apparent. Buffalo usually receives a lot of snow, so the local CVB is trying to pro-

\(^{185}\) TIA, pers. comm.
mote a more positive impression of the city by working around the snow image. By contrast, Rochester, New York, has a section in its visitors guide focusing on what to do in lots of snow. These two contrasting situations illustrate an interesting contrast with one area down-playing the negative aspects of the climate while the other is trying to make something of it.

Business forecasts are usually made either per season or per year. The IACVB collects financial and operational data for a sample period of a year. Best- and worst-case scenarios are modeled, e.g., “will a hurricane hit us this year?” It could be financially devastating if it does. For crisis management after the 9/11 terrorist attacks, the IACVB asked its members to send plans for areas such as Florida (where preparedness against hurricanes is commonplace), so other members could refer and draw up plans against terrorist attacks.

Destinations are not usually greatly impacted by drastic climate or weather changes, although places such as Buffalo and Rochester need to factor in problematic winter weather; other destinations that do not have these fluctuations do not need to pay so much attention to them. Most CVBs do not have research personnel (only about 30 CVBs have a research person, and most of them are part-time). Their main function is to meet the needs of customers, not to do research.

2.9.2 Climate Information Usage
Convention and Visitor Bureau (CVBs)
CVBs incorporate a knowledge base for planning weather and tourism development and are concerned about disseminating knowledge for promotional purposes. Associations and corporations ask the CVBs specifically for weather statistics, as there is a general preference to host events in warm weather destinations.

CVBs also use weather and climate data for bid proposals, such as bids to host the Super Bowl, by making a case that the weather is reliably better than other areas. They even use hourly data and compare with similar conditions in other, rival cities. Miami CVB uses hurricane season data to show that while there is a high propensity of hurricanes that develop offshore, this does not necessarily mean that they will hit the Miami area. “Sports weather” is a requirement in bids, particularly for outdoor venues such as the Super Bowl. Weather and climate are considered an attribute in sports events planning perhaps more than any other factor. Similarly, if a location is bidding to hold a major convention, it must be shown that the weather is good and there is less chance of rain than in other cities, so weather data are included in the proposal.

The Super Bowl organizers in particular are concerned about good weather at the time of their events. Many organizations make Florida (and Miami in particular) a destination for their conventions: the American Bar Association, the American Medical Association, the National Marine Manufacturers, distribution associations, Microsoft Corporation, etc. Meetings and conference planners will pay considerable attention to the weather at a destination.

Bids are also made to host soccer games. During the winter months it is still comfortable to play outdoor sports in the Miami region, as there is low humidity and comfortably warm temperatures. Data on the temperatures at certain times of year, the average high/low figures
and precipitation is used to support events bids. Weather trends such as “it tends to rain after 3:00 pm every day” are used in brochures.

Florida hosted the latest Professional Convention Management Association (PCMA) “Pow Wow” in January, which is a time of year that automatically limits the selection of venues. In January Florida is usually very dry with little precipitation and temperatures in the seventies. The dry season lasts up to April, but brings fire hazards, particularly in March and April and sometimes into early May. However, visitors do not usually pay much attention to this. In 2001 the lack of precipitation led to water rationing, but this did not impact the tourist industry as restrictions were on the washing of cars and watering of gardens.

The state climatologist at the University of Florida supplies weather and climate data used in the Miami CVB bids. Detailed, basic data is provided free-of-charge for daily and monthly historic data. If specific data is required, say, temperatures for the first Sunday in February for the last 6 years from 6 to 11 pm, a charge is made for a specific report. The University probably gets its data from another source(s) and processes it for the CVB. Some information is also obtained from Beacon Council (an economic development council).

Tourism is a major component of the metro Phoenix area and Arizona economy. Weather and climate data are used for tourism promotional purposes, particularly as Arizona is a warm weather destination for people from Canada and the north in winter. If these visitor source areas experience warm winter weather, it adversely impacts Arizona visitation. There is no budget provision for weather-related variation because the general perception is that as people have no control over the weather, it is not feasible to allow for this variable in financial forecasts or budgeting. In the case of Arizona, Phoenix has an average 335 sunny days a year, so any variations in visitation are unlikely to be due to the weather. Out of state, and hence uncontrollable, factors are the ones that mainly adversely impact Arizona’s economy from tourism (e.g., warmer weather in the north in winter, avoidance of flying as after the terrorist attacks of 9/11, general state of the economy, etc.).

It is worth noting that the effects of El Nino and La Nina were felt both climatically and economically in the Midwest as the weather was milder (e.g., Chicago had their first real snowstorm of the season in February 2001 whereas this usually occurs far earlier), and in Minneapolis in February temperatures reached an unseasonable 47ºF. While variations in climate and visitation are recognized by the Arizona CVB, it does not focus on the weather as it contends, “it cannot be accurately predicted or controlled.”

Weather information is obtained by the CVB from a ‘farmer’s almanac’, the Internet, and the Weather Channel as these sources are free. If Arizona is experiencing extremely hot weather this tends to have an adverse effect on tourism. The farmer’s almanac is based on weather patterns over the last 30-40 years, whereas respondents commented that predictable changes seem to be occurring on a 5-10 year basis. The CVB only uses ‘after-the-fact’ information in business models to explain why visitation may not have been as strong as average in one year compared to others. There is no formula for weather or climate prediction in any business models it is familiar with. “There is no way to factor in weather in climate—but we know it matters when it snows heavily”.

In March baseball’s spring training commences and carries on through early April. Spring training swells the visitor population in Arizona and Florida in particular. Nearly a million
visitors attend spring training in Arizona every year, with each person attending an average of 3.5 games. A further two teams are expected to make Arizona their spring training location in the near future. Three accommodation projects are currently being worked on in response to the increased visitor numbers due to these events: the Westin, Marriott, and Sheraton. Two are in Phoenix and one is in the south at Gila River. These 500+ hotels will open in late 2002. Hotel bookings are usually buoyant during this time as are RV parks and campsites, along with other winter visitors.

Arizona hosted the 2002 Super Bowl. The average January temperature and average rainfall were important in the bid, although it is accepted that it does not mean that on a given date the weather is assured. A warm weather climate is important in the Super Bowl venue selection, although sometimes there is rain in January. In Arizona, a new stadium with a retractable roof is being build, lessening the dependency on weather conditions. Phoenix also hosts open golf tournaments every year. However, if the ground is hard they have to close the golf course.

**Offices of Tourism**
State offices for travel and tourism track visitation numbers. They do not actively use weather and climate data, although records of temperature changes all year round are kept. For example, in Arizona, the north and south of the state comprise two distinct geographic regions. The skiing industry is based in a number of areas in the state, so it tends to look at monthly temperature, rainfall, and snow data. Weather data is obtained from the University of Northern Arizona. The Office of Tourism also provides weather data if requested. Weather information is also included in the brochures the office produces and on its website.

Arizona is not prone to major dramatic weather events. It is either hot or not so hot in the south, or snowy or not snowy in the north. When temperatures are particularly high (above 120ºF), it impacts Phoenix and the airport. Outside consultants track visitation to Arizona and carried out a syndicated panel study (i.e., national panel travel behavior). As well as by air, travelers enter the state by car, RV, or rental car hired in other states.

**Economic Development Councils (EDCs)**
The role of EDCs is primarily attracting and keeping business in their local areas. There is concern in some businesses about hurricanes and hurricane-induced destruction, particularly after Hurricane Andrew when questions were raised about where building should take place in close proximity to the coast. Subsequent business decisions took this particular weather event into account.

One of the main areas of work of EDCs is to carry out business forecasting, in particular to estimate the numbers employed during the next quarter or in the following year. No business models of this type take weather and climate information into consideration. Weather and climate may be included in the decision-making process influencing destination preferences, but this assessment is unlikely to be carried out in a formalized way with in-depth data analysis. It is generally known what the weather conditions will be like in any one part of the country at specific times or seasons of year. Visitors tend to avoid Florida during the hurricane season, not because they are afraid of getting caught in a hurricane, but more because it is very hot at that time of year.
Weather and climate conditions for business location decisions are not as important as factors such as the available labor pool, local skill levels, accessibility, average cost of wages, rental rates, how many flights per day, number of cruise lines docking to bring visitors to attractions, etc. EDCs have weather and climate information, but it is so readily available via a range of media (e.g., through the web), that they do not usually have to provide it to their clients. For example, it found that people are not concerned about hurricanes as there are many other reasons why businesses choose to locate in an area. The Beacon Council in Florida has not tracked how many bookings may have been cancelled due to a 5-day warning that a tropical storm was in the vicinity although it acknowledges that it would be interesting to do so.

Hotels and event planners, and possibly some airlines, are likely to be more interested to know if there was a correlation. In fact, 2-3 years ago the Beacon Council carried out a survey on what needed to be done to stimulate the aviation industry, but weather and climate was not a parameter that was considered as being crucial.

EDCs such as the Brevard County EDC, Florida, primarily carry out research on wage comparisons across the county, the cost of living, and the costs of housing and accommodation. They also keep records on temperature, but because it is generally known that around 90-95% of the year it’s sunny, it is regarded as a ‘constant.’ Hurricanes are not a severe problem in the area.

The Office of Economic Development of Mesa, Arizona, maintains an extensive database providing economic development organizations and site selection information. As Arizona has warm weather in winter, it is a significant destination for people from the north and northwest. Information is provided on the ‘quality of life’ on their website, including climate (average daily temperatures, rainfall, snowfall, cold degree days, hot degree days, wind speed, sunshine, elevation, etc.). Development site selection invariably is decided without referring to weather information. Site selection companies, landowners, developers, private businesses, transport companies, telecommunications firms, and real estate companies are involved in site selection process. Local demographics are an important factor in choosing a location for business as well as climatic factors. Developers generally visit an area just to verify their decisions rather than to research sites prior to selection.

The Regional Economic Development Strategy being produced by the 2002 Greater Phoenix Leadership Coalition includes an analysis of the tourism cluster. This has grown by 43% in the last decade: 1990: 14.3%; 2000: 12.8%, (the next largest growth is shown by the ‘advanced business and services’ sector).

Arizona was considerably affected by the terrorist attacks of 9/11: reduced air travel especially impacted the region (sales tax dollars earned by tourism were consequently also considerably lower). The region’s economy was 30% lower immediately after 9/11, but this recovered to 5% off the seasonal norm by January 2001. Another consequence of the terrorist attacks is that companies are now more concerned about ‘at risk’ situations. Arizona is considered a ‘safe state’ as regards weather and climate hazards: the state is not exposed to tornadoes or hurricanes, so there are fewer risks in the overall risk profile of businesses that choose to locate there. Therefore states such as Arizona are now beginning to show a discernable benefit in the wake of the terrorist attacks.
2.9.3 Climate Information Use and Potential

*Geographic Scale:* Statewide

*Temporal Scale:* Annual rainfall, temperatures, etc., for tourism-related use

2.10 Architects, Planners, and Landscape Architects

2.10.1 Sector Outline

Consultancies and firms such as EDSA play an important role in hotel, recreation, and resort development, undertaking site planning and landscape architecture, urban design projects, and resort planning for the public as well as private sectors. This work includes producing park plans, site plans, shopping area plans, renovation, and design guidelines for waterfront areas. EDSA has produced these for areas such as Ft. Lauderdale and Puerto Rico. It also produce ‘tourism development plans’ for areas such as Daytona Beach.

Sandy & Babcock primarily focus on resort development, hotels, timeshare, golf communities, and residential developments. The company works internationally and employs 50 people. WAT&G is a firm of architects, planners, and consultants who specialize in the hospitality, leisure, and entertainment sector.

2.10.2 Climate Information Usage

EDSA does not use NOAA data; instead it goes to the Chambers of Commerce for weather and climate information for the areas in which it has contracts. It needs to have some idea of the sun/shade effects at particular locations; coastal conditions; and if areas are susceptible to hurricanes or any other severe weather events. If there are specific requirements, engineers are generally consulted for specialist advice on weather and climate. EDSA regularly uses about 4-5 firms of coastal engineers and about 20 specialist civil and geotechnical engineering firms.

Sandy & Babcock applies weather and climate into design criteria. It draws upon several sources including tourist boards. It needs degree days and average monthly temperatures, which can very often be gleaned from a standard atlas for free. Developer clients often provide climate data as part of their contractual ‘package.’ Sandy & Babcock may also use consultants to bring in expertise. Sandy & Babcock works with as number of planning firms such as EDAW, EDSA, and SWA, all three of which carry out general environmental analysis. This analysis usually includes topographical features, weather types, and other factors that may be significant for a development. Topography is particularly important because if too much pesticide or fertilizer is applied to certain topographic areas (such as slopes), then it may ruin fish stocks in the ocean or in lakes. The ‘coast level limit’ line is being adjusted due to climate change, a predicted rising in the sea level as well as natural erosion is combining to increase slope instability in coastal areas.

WAT&G uses weather and climate information, but it has to rely on data that is locally available. The weather and climate influence the building technology it will use on a project and the development strategy (for example in the Caribbean where it is prone to hurricanes). “Weather and climatic influences are an essential ingredient in the design of buildings—shade/shadow, building systems, insulation, all determine the end design.” In a development in Atlantic City, where there is a very high salt content in the atmosphere, the company has
had to work with the manufacturers of various building materials to ensure it will be salt resistant. The U.S. has a broad-based construction industry, and vendors to the industry supply coast-to-coast, so the manufacturers have to make models to ensure client specifications are met. They also work with the U.S. Building Research Institute and the American Institute of Construction.

WAT&G obtains weather and climate data from sources that vary for each project and at each locality. This ranges from local empirical data to research to standard sources such as the NWS. It depends on what is available as to whether or not the company is willing pay for it. Many architects’ agreements stipulate that it is the responsibility of the owners to provide this data. There is no standard relative to weather and climate data. Information is needed on temperature swings, temperature range, rainfall, wind, unusual weather patterns, and solar patterns.

WAT&G does not have its own models. It carry out shading and sun control studies and build models of designs. It has packages to study shadow and shade casting on other buildings and for landscape architecture purposes. In particular it is interested in:

- **Landscape**—shade casting and windbreaks;
- **Hospitality**—hotels, resorts, time share condos, beach clubs;
- **Leisure**—natural/entertainment, mixed use;
- **Entertainment**—large theme parks, themed attractions, theatre; and
- Non-sports facilities, except sporting facilities where they are part of a recreational resource in the hospitality and leisure sector.

### 2.10.3 Climate Information Potential

The Chambers of Commerce do not provide sufficient (or sophisticated) weather and climate data. Landscape architects need to have information on sun angles and prevailing winds, but they do not get enough good data on these aspects: “data on trade winds from a prevailing direction are of little use for our purposes as it is the occurrence of NW winds that are important as these bring in the most severe weather events and have to be taken account and planned for. The inclination of the sun during different seasons is necessary information. The amount of rainfall is also important—a difference of 30 inches of rainfall can be found on different sides of quite small islands, even only 20 miles apart.”

“Graphic representation of the data is the most useful way of showing the information and helps to support the design.” “We are designers, not statisticians, so we don’t want just raw data.” They would be happy to buy the data provided it was of sufficiently high graphic and informational quality that would be of help to them. Specific data that would inform their work includes: sun angles; temperature range; wind (direction and severity); ‘summary’ of the weather (including rainfall); vegetation the climate supports (listings of native species for particular climate/weather regimes); ‘areas of climate’, i.e., where the climate is similar (e.g., is the climate of Singapore similar to other areas/regions of the world?); areas of natural hazards (very important); and data cross-referenced with FEMA. Data for monthly time intervals is also appropriate.
Requirements of the U.S. Recreation & Tourism Industry for Climate, Weather, & Ocean Information

Landscape architects, such as EDSA, and their clients respond to the underwriters’ requirements: “the underwriters tell you what to do.” This includes such things as minimum flood elevation, as they are concerned with:

- Possible height of floods; and
- Probable velocity of floods.

EDSA has to design with these parameters in mind. Hotel companies hire underwriters to carry out risk assessments. “Liability is possibly not so much of an issue -- no one has yet been sued for too much sun exposure yet -- but if a hotel gets flooded out this may be a possibility.”

WAT&G wants a highly interactive web-based system in which it could locate any development it is working on and download the data on the overall weather patterns. It needs accurate, up-to-date information in English. Importantly it needs design degree-days highs and lows as they apply to the comfort standards it would like, reaching a mean of highs and lows.

2.11 Weather Reporting in the Media

Wider and more general access to, and coverage of, weather information and forecasts to the public (via Weather Channel, Weather News, weather.com, CNN, etc.) was regarded by some respondents in the accommodation sector to adversely affect business. Daily weather is very often localized in nature (e.g., thunderstorms, tornadoes, etc.), and weather reporting by the media is at a larger scale and local variations cannot be accounted for. Reports at this level of severe weather or storm warnings, or televised scenes of adverse weather being experienced at one locality in a region, can cast an unjustified shadow over a wider area to the traveling public.

The problem was raised by ski resorts that noted that temperature readings made available by the National Weather Service and other media are local (in the valley) and do not adequately correspond to local mountain weather conditions.

A South Carolina hotel commented:

“The hotel receives some ridiculous phone calls as a weather warning for S.C. may have gone out...which relates to weather in the west of the state or in the mountains, and people phone the hotel to ask ‘what are the snow levels like?’ when the coast areas are experiencing 74 degrees Fahrenheit. The same is true for the ‘hurricane watch’... the potential trajectory of a hurricane may result in reservations being cancelled when in fact it is quite safe in the area of the hotel. Also, if it is raining inland in S.C., it may well be sunny at the beach.”

When hurricanes are reported, there is a general public perception from the news coverage that the whole resort or a whole island in the Caribbean is wiped out. (This is also true of such news coverage when this happens in Florida and South Carolina.)

Such reports can have adverse effects on local businesses where a misleading impression of bad weather is propagated.
### 2.11.1 Weather, Climate, and Ocean Information Used in the Accommodation and Hotel and Resort Industry

<table>
<thead>
<tr>
<th>Function</th>
<th>Current applications and decisions utilizing w/c/o/ information</th>
<th>Business objectives</th>
<th>Geographic area</th>
<th>Weather, climate, and ocean forecast and historic data used</th>
<th>Spatial resolution currently used</th>
<th>Temporal resolution currently used</th>
<th>Potential use and future applications</th>
<th>Data requirements for the full spectrum of applications</th>
<th>Format/Access Points</th>
</tr>
</thead>
<tbody>
<tr>
<td>Marketing/Communications</td>
<td>Promoting and advertising to specific market segments</td>
<td>Maximize reservations and bookings</td>
<td>Local, national, international</td>
<td>[Occasionally, sunshine hours]</td>
<td>Group level, individual facility or property</td>
<td>Monthly</td>
<td>Enhanced marketing information; directed advertising</td>
<td>Average monthly temperatures and precipitation</td>
<td>Web-based</td>
</tr>
<tr>
<td>Finance</td>
<td>Budgeting, seasonal variability in occupancy, investment decisions in new properties</td>
<td>Maximize RevPar</td>
<td>Local, national, international</td>
<td>None</td>
<td>Group level, individual facility or property</td>
<td>N/A</td>
<td>Accurate long-term forecast: 3-6 months to incorporate into budget and business plans</td>
<td>Long-term severe weather prediction</td>
<td>Web-based</td>
</tr>
<tr>
<td>Risk Management</td>
<td>Identify, reduce, manage, and mitigate risk</td>
<td>Minimize insurance claims and litigation</td>
<td>Local, national, international</td>
<td>Severe weather alerts</td>
<td>Group level, individual facility or property</td>
<td>Long-term and daily</td>
<td>Increase accuracy of identifying natural treats to life and property; review emergency</td>
<td>Severe weather hazards: hurricanes, tornadoes, gales, floods, fire, volcanic eruptions</td>
<td>Web, graphic presentation; warnings direct to PC</td>
</tr>
</tbody>
</table>

Table 6. Hospitality/Accommodation Sector: Summary of Information Requirements and Business Decision Assessment
Table 6. Hospitality/Accommodation Sector: Summary of Information Requirements and Business Decision Assessment (continued)

<table>
<thead>
<tr>
<th>Function</th>
<th>Current applications and decisions utilizing w/c/o/ information</th>
<th>Business objectives</th>
<th>Geographic area</th>
<th>Weather, climate, and ocean forecast and historic data used</th>
<th>Spatial resolution currently used</th>
<th>Temporal resolution currently used</th>
<th>Potential use and future applications</th>
<th>Data requirements for the full spectrum of applications</th>
<th>Format/Access Points</th>
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</thead>
<tbody>
<tr>
<td>Risk Management (continued)</td>
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<td>preparedness procedures; identify future threats and their effects (e.g., climate change)</td>
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<tr>
<td>Safety and Emergency Preparedness</td>
<td>Formulation and implementation of emergency preparedness measures; alert monitoring; establishing response mechanisms</td>
<td>Maintenance of health, safety, and security; prevention of accidents and disasters; enacting preparedness procedures</td>
<td>Local, national, international</td>
<td>Severe weather alerts</td>
<td>Group level, individual facility or property</td>
<td>Daily or hourly during severe weather alerts</td>
<td>Accurate, longer warning lead times of threats to life and property; training safety personnel</td>
<td>Severe weather hazards: hurricanes, tornadoes, gales, floods, thunderstorms, fire weather, volcanic eruptions</td>
<td>Web access and warnings direct to PC</td>
</tr>
<tr>
<td>Development, Building, and Construction</td>
<td>New developments: construction or acquisition; property maintenance; compliance with state building codes</td>
<td>Build new facilities as quickly as possible; estimation of construction time or days lost to bad weather</td>
<td>Local</td>
<td>Average annual conditions</td>
<td>Individual facility or property: 10 miles radius</td>
<td>Monthly temperature and precipitation averages</td>
<td>More accurate contract clauses on construction and suppliers’ performance</td>
<td>Severe weather hazards: hurricanes, tornadoes, gales, floods, thunderstorms, fire weather, volcanic eruptions</td>
<td>Web-based at local level (e.g., through local information supplier such as chamber of commerce)</td>
</tr>
<tr>
<td>Function</td>
<td>Current applications and decisions utilizing w/c/o/ information</td>
<td>Business objectives</td>
<td>Geographic area</td>
<td>Weather, climate, and ocean forecast and historic data used</td>
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<tr>
<td><strong>Landscape and Grounds Maintenance</strong></td>
<td>Maintenance of external appearance and upkeep of recreation areas</td>
<td>External attractiveness and functionality of facilities</td>
<td>Local</td>
<td>Average seasonal conditions and severe weather alerts</td>
<td>Individual facility or property: 10 miles radius</td>
<td>Daily temperature and precipitaton averages</td>
<td>Increased cost savings from better scheduling of agriproduct applications</td>
<td>Rainfall: intensity and total; drought prediction, seasonal shade and shadow casting</td>
<td>Web-based</td>
</tr>
<tr>
<td><strong>Engineering Systems</strong></td>
<td>Emissions regulations, maintenance scheduling, comfort levels, energy supplies</td>
<td>Energy efficiency and cost and energy savings</td>
<td>Local, national</td>
<td>Temperature, relative humidity, precipitation</td>
<td>10-50 miles radius</td>
<td>Hourly or daily</td>
<td>Further fine-tuning of equipment and energy conservation</td>
<td>Degree days (cold and hot), relative humidity, precipitation</td>
<td>Direct input to computer</td>
</tr>
<tr>
<td><strong>Regulatory Compliance</strong></td>
<td>EPA compliance reporting requirements (emissions monitoring, runoff compliance)</td>
<td>Lower liability to consequences of non-compliance</td>
<td>Federal, state</td>
<td>Rainfall intensity (first 30 minutes of a precipitation event) and total precipitation</td>
<td>10 miles radius</td>
<td>Monthly or daily</td>
<td>Full compliance with regulations; lower risk of unscheduled emissions</td>
<td>Daily runoff, precipitation, wind speed and direction, severe weather warnings</td>
<td>Direct to computer (or web-based) from local source</td>
</tr>
</tbody>
</table>

Table 6. Hospitality/Accommodation Sector: Summary of Information Requirements and Business Decision Assessment (continued)
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<table>
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<th>Data requirements for the full spectrum of applications</th>
<th>Format/Access Points</th>
</tr>
</thead>
<tbody>
<tr>
<td>Procurement</td>
<td>Emergency supplies and provisions for disaster preparedness</td>
<td>Cost savings by obtaining cheapest products</td>
<td>Local, national</td>
<td>Local severe weather warnings</td>
<td>Daily or monthly</td>
<td>Efficient and informed purchasing decisions</td>
<td>Average temperature and precipitation, severe weather warnings</td>
<td>Web-based</td>
<td></td>
</tr>
<tr>
<td>Transportation</td>
<td>Access to property or facility</td>
<td>Unimpeded movement of people and goods to and from property or facility</td>
<td>Local, national, international</td>
<td>Local severe weather warnings</td>
<td>Daily, weekly</td>
<td>Better load planning and forward planning for transport services for evacuation</td>
<td>Severe weather warnings</td>
<td>Web-based</td>
<td></td>
</tr>
<tr>
<td>Guest Services</td>
<td>Scheduling recreation activities; providing information for guests (lobby charts and/or guest TV)</td>
<td>Enhanced visitor enjoyment and satisfaction</td>
<td>Local</td>
<td>Daily temperature, precipitation forecasts</td>
<td>Local temperature, precipitation, severe weather warnings</td>
<td>Daily</td>
<td>Longer lead-times to plan for or cancel events</td>
<td>Daily runoff, precipitation, wind speed and direction, severe weather warnings</td>
<td>Internet, TV, local press</td>
</tr>
</tbody>
</table>
2.12 Environmental Information Timescales

Figure 7 demonstrates the influence of present and future environmental conditions on the operations and planning of the recreation and tourism sector. As with the energy sector, the suite of decisions range from those requiring near-real-time condition information, such as for cruise liner positioning and disaster management through the mid-term operations of staff scheduling, stock pricing and sales and earnings forecasting, to the long-term strategic planning initiatives of building siting and design and master planning for landscape selection.

![Figure 7. Stylized Diagram Illustrating Time Scales of Environmental Information That Impacts the Specific Operation or Decision—Improvements in the Forecast Skill Improves the Probability of a Correct Industry Decision](image)

As the improvement in the skill of the environmental models increases and forecasts become more reliable, so too the business forecasts, derived in part from these variables, improve. Thus the industry has a real stake in seeing that the physical monitoring and modeling are sustained and improved.
3. Conclusions and Recommendations

“The history of humanity has always been a race between learning and disaster.”

H.G. Wells

3.1 General Observations and Trends

3.1.1 Main Characteristics of the Recreation and Tourism Industry

This analysis of the recreation and tourism industry confirms it is a major contributor to the U.S. economy as a whole. It is an unstructured and disparate industry, and the current and future requirements for weather, climate, and ocean information differ widely among the industry sub-sectors. It is highly prone to the influences of global forces, which are felt right across the industry, even at the smallest business unit level. Unlike most industries, it is difficult to estimate the market share individual companies have within the sector as a whole, frustrating efforts to fully analyze industry ‘drivers’.

The research has shown that there are also both direct and indirect influences of weather, climate, and ocean conditions on the industry. Golf resorts may claim that the weather has little affect on their business (golfers will play rain or shine, hot or cold), but the weather greatly influences decisions concerning the course maintenance regime. This includes issues such as watering regimes, fertilizer application, pesticide/weed killer application, seeding programs, staff management, etc. Despite the fact that it is difficult to draw any generalized conclusions from such a diverse industry, it was possible to identify certain trends, which are described in the following.

It can be seen from the expert witness evidence that there are both implicit and explicit influences of weather, climate, and ocean conditions operating on decision-making processes. This is illustrated by the fact that while hotels and resorts claimed that weather and climate do not affect their marketing or site selection decisions, the location of resorts is where it is implicit that the weather will be consistently ‘good’ for specific recreational activities such as sun-bathing or skiing at their location.

The main factors influencing the location decision-making process include competitor presence, accessibility and transport services, infrastructure, local ‘attractions’, local labor pool, natural environment, visitor services, etc. Super-imposed on these factors are parameters such as insurers requirements, local by-laws, federal regulations, planning zone, and building code requirements. The ‘clustering’ propensity of the hotels sub-sector means that the initial developers generally establish that an area is economically viable. Once this has been confirmed by high occupancy rates and sales, other businesses move in on the basis of “if our competitors are there, we have to be there too” rather than any detailed analysis of the location.

Weather, climate, and ocean conditions do not exert major influences on business forecasting. As one respondent commented124, “PwC and STR have the most comprehensive research tools available to help industry leaders make intelligent, informed decisions that will

ultimately improve the bottom line”. However, weather, climate, and ocean data do not appear as parameters in these models.

A complex series of interactions and business interdependencies characterize the industry (figure 1). An illustration of this is that hotels depend on DMOs to ‘market’ a particular destination; the transport industry to convey visitors (air, sea, road); and sufficient infrastructure (airports, sea port embarkation and disembarkation facilities, water, and power supplies, food supplies, etc.) to provide for required visitor comfort. Facilities such as restaurants, recreational activities, theme parks, as well as natural attractions serve to draw customers to an area or resort.

One of the most significant characteristics of the recreation and tourism industry is that the majority of the industry is in the small business category. Not only do these businesses not have the wherewithal to meaningfully incorporate weather, climate, and ocean data into their decision-making processes, but also they rarely use formalized business models or forecasting procedures. However, the degree to which weather, climate, and ocean data are required by the industry as a whole depends more on operational activity. The in-depth functional analysis of the hotels and resorts sector in this investigation resulted in the identification of specific operations and their weather, climate, and ocean data use and needs.

The relationships between weather, climate, and ocean information and the recreation and tourism sector vary largely according to specific operations. The ‘type’ of weather, climate, and ocean data found to be used across the sector were essentially:

1. Future forecasts/predictions;
2. Historical data; and
3. Real-time data.

Publicly available or published sources of weather, climate, and ocean data were supplemented by on-site monitoring and tailored subscription services or consultant’s services in a number of instances.

3.1.2 Forward Planning and Event Scheduling

A large part of the recreation and tourism industry is event driven. The lead-times for events vary, although events planning (conferences, festivals, Civil War re-enactments, fairs, conventions, shows, music festivals, etc.) generally takes place at least 6 months in advance of the event and often longer. Planning so far in advance, with the current capabilities for accurate long-term daily weather forecasting, means that weather, climate, and ocean data are not considered in detail (except for general ‘seasonal’ considerations). There is, however, an acceptance that events (particularly if staged outside) may well be vulnerable extreme weather conditions.

The majority of respondents found long-term weather forecast predictions inadequate for the purpose of event planning. Historic weather, climate, and ocean data trends are often examined, but many events are traditionally held at the same time every year for historical and/or scheduling reasons, so the weather on a particular day is left to ‘chance’. The Washington, D.C., ‘Cherry Blossom Festival’, for example (which attracts visitors from both the U.S. and abroad), is highly weather-dependent as is the attraction’s timing itself, and
weather conditions also influence the number of visitors. The main focus, the blossoms in the ‘peak bloom’ period, is highly dependent on the weather (in particular, temperature, precipitation, sunshine hours, day-length, etc.). The bloom timing is critical as it usually lasts no longer than a few days to a week.

3.1.3 The Role of the Financial Services Sector in the Recreation and Tourism Industry
Throughout the investigation, the insurance sector was cited as a major influence on the operations of the recreation and tourism industry. The main areas in which the insurance industry (both brokers and insurers) exert an influence include:

◆ Providing insurance products;
◆ Assisting with risk assessment;
◆ Contributing to risk mitigation and management;
◆ Consultancy services;
◆ Compliance oversight (building codes, H&S regulations, etc.);
◆ Identification of impending problems/disasters and short-term weather events (‘Cat’ Alerts);
◆ Property inspections;
◆ Specifying emergency preparedness procedures; and
◆ Reporting on and making recommendations concerning the ‘condition’ of properties and facilities.

In addition, banks, investment finance brokers, and investment companies also influence the industry by:

◆ Imposing conditions on properties for eligibility for capital;
◆ Assisting with risk to equity assessment;
◆ Prompting risk mitigation and management;
◆ Providing supervision and monitoring procedures;
◆ Ensuring compliance oversight (e.g., adherence to building codes, health and safety regulations, etc., as a condition of funding); and
◆ Supplying consultancy services.

The investigation has purposely not focused on the development and application of new financial instruments such as weather derivatives, and no respondents raised the topic with the interviewer. However, it should be acknowledged that these new financial instruments require accurate weather data for the financial markets, shareholders, and companies who may be hedging their risks. It is anticipated that the tourism and recreation industry, as well as utilities, transport, and construction industries will increasingly use environmental information in this way. The data on which this is based includes ‘degree days’ and rainfall etc., demanding a high degree of geographic accuracy and reliable supply of data. It is anticipated that long-term probabilistic forecasts of seasonal deviations from normal conditions will become increasingly important to the industry. It should be noted that some of the more sophisticated facility engineering support operations also expressed a desire for such information.
3.2 Issues Identified

3.2.1 Barriers to the Incorporation of Weather, Climate, and Ocean Data in Business Models

The investigation shows that apart from a few activity sectors (such as the aviation, cruise line, and skiing sectors), little detailed attention is paid to weather, climate, and ocean information as a basis for decision-making, business forecasting, or budgeting. This results in part from the following ‘perceptions’:

1. The weather cannot be changed so it cannot be factored into business planning (by implication only those factors you can alter or have an influence over to change can be accounted for as a variable in such models).
2. Weather, climate, and ocean forecasting are not sufficiently reliable or accurate (particularly long-term forecasts) to be factored into business forecasting as the time scale for business forecasting is not compatible with accurate weather forecasting.
3. Weather, climate, and ocean forecasting is imprecise: for many business forecasting purposes, it is not so much climate trends but the need to know accurately within an acceptable degree of certainty when a particular weather event is going to affect property or impact business.
4. Little perceived association exists between weather, climate, and ocean conditions and business health.
5. It is not possible to accurately budget for variations in weather, climate, and ocean conditions.
6. The recreation and tourism industry is influenced to a great extent by externalities that have greater visibility with the industry than weather, climate, and ocean conditions (terrorist activity is an example).
7. Weather, climate, and ocean data is not available in a readily usable form for business model data entry.
8. The required knowledge and skill levels to make the best use of weather, climate, and ocean data are absent in the recreation and tourism industry.
9. Climate related factors are considered unimportant in comparison to other factors used in business modeling and forecasting.

A primary reason for business forecasting is to set budgets within reliable and realistic limits. Weather, climate, and ocean data is not considered by the industry as having a significant ‘value’ in this regard. Business decisions are related to market place conditions rather than climatic conditions. A recurring sentiment about the format of weather, climate, and ocean information was that it was ‘too sophisticated’. Generally weather, climate, and ocean data was perceived to be a fairly static background parameter, which was of little practical value to annual or shorter-term budget setting. Warning mechanisms for severe weather conditions were held in high regard and were universally used, but the short timescales involved precluded the information being used for business modeling.

3.2.2 External Factors and Influences on the Recreation and Tourism Industry

The degree to which weather, climate, and ocean information is important to the industry must be compared with the importance of other factors, which are regarded by the industry as more relevant to business decisions.
The recreation and tourism industry is particularly sensitive to ‘externalities’, i.e., factors they cannot control but which determine business health, such as the 9/11 terrorist attacks and the assault on the cruise ship Achille Lauro in the Mediterranean in 1987. The latter event inflicted permanent damage on the Mediterranean cruise business but stimulated the internal U.S. cruise market. To some extent weather is regarded as an uncontrollable factor: one respondent commented that the “industry is at the mercy of the weather”. Little planning around weather or climate factors was evident in the businesses interviewed, with the exception of new build, grounds maintenance, landscape architecture, and some aspects of buildings management. This is a fundamentally different position from other weather and climate dependent industries such as agriculture. Weather is regarded as one of the many externalities that cannot be controlled.

Economic factors are a major influence on the tourism and recreation industry. To some extent, it can be argued that the industry is a “luxury” product which can be cut back when times are hard and, therefore, suffers in economic downturns. The global nature of tourism means that the U.S. industry is not just susceptible to economic downturns at home but also abroad, as demonstrated by the reduction in European and Japanese tourists when their economies were in recession.

Customer sentiment is a factor, which has an overwhelming influence on the tourism and recreation industry, sometimes in unpredictable and irrational ways. For instance, the initial impact of 9/11 caused a severe downturn in air travel with a consequent adverse impact on the tourism and recreation industry as a whole. In the longer term, air travel has recovered but is still down and car and train travel have increased. Internal U.S. air travel has picked up more than international air travel, despite the fact that international security is better than internally.

3.2.3 Changes to the Industry in the Aftermath of the Terrorist Attacks of September 11, 2001

One consequence of the 9/11 attacks impacting the recreation and tourism industry is diversion of funds from tourist related activities. An example of this was found in Brevard County, Florida, where the new emphasis on ‘homeland security’ has led to a re-orientation of funds. A brochure being prepared by the Brevard County Emergency Management Service (Florida) to warn tourists of hazards such as undertow currents, sunburn, and jellyfish has now been placed ‘on hold’ as funds have been re-directed to ‘homeland security’. In addition, an advertising campaign aimed at Floridians was funded to get local people back to the beaches as fewer visitors are flying into the area.

The aftermath of 9/11 affected the tourist industry in Arizona to a greater extent than changes being brought about by weather and climate. Phoenix is highly dependent on inward travel by air. Very steep declines in visitor numbers, greater than average, occurred after 9/11. Due to this dependency on air transport, the consequences of 9/11 affected the recreation and tourism business in most of Arizona to a larger extent than other states. One anomaly to this general situation was that Flagstaff (Arizona), which is more accessible by road (it is on Rte. 66 and I40), experienced an increase in post 9/11 occupancy rates. The meetings/conventions/business travel side was declining even before 9/11 and after the terrorist attacks declined even more steeply.

The extent to which 9/11 affected all economic sectors is further reflected by the fact that the Air Transport Association (ATA) has suspended producing regular air traffic demand
forecasts in the wake of 9/11, the situation being uncertain at present and the economic situation so volatile it has made forecasting virtually meaningless.

It was apparent through expert witness interviews that, since 9/11, companies are very concerned about “at risk situations”. Arizona, for example, is considered a “safe state” regarding weather and climate risk and is not prone to tornadoes or hurricanes or other severe weather conditions. This contributes to the overall risk profile of businesses located there. States such as Arizona are therefore advantaged and are beginning to show a discernable economic benefit in this now heightened security business environment.

Some anomalies are perceptible due to the 9/11 events. For example, cumulative occupancy rates for New York soon after 9/11 were very high as people found it difficult to get in and out of the city (airports were closed, rail services limited, and roads were clogged). However, this was a temporary phenomenon.

Prior to 9/11, business travel was 20-25% of the overall volume of travel journeys undertaken. However, the latest research shows that teleconferencing is picking up speed, with a consequent reduction in the number of business flights. This needs to be seen in the context that business travel was declining anyway prior to 9/11. Consumer confidence overall took a dive after 9/11, with increases in the unemployment rate of people previously engaged in the leisure and tourism industry.

It is interesting to note that climate induced preparedness plans are acting to inform IACVB members of how to write their response plans to terrorist attacks. Crisis management plans based on strategies for severe weather event emergency management have been requested from States such as Florida where preparedness against hurricanes is commonplace.

### 3.3 Applications of Weather, Climate, and Ocean Information in the Recreation and Tourism Industry

#### 3.3.1 Current Weather, Climate, and Ocean Data Usage and Potential

Figure 8 shows the current applications and needs for weather, climate, and ocean data at specific temporal and geographic resolutions based on the findings of the research. A number of respondents cited ‘popular’ data services such as ‘weather.com’, the Weather Channel, ‘Weather Underground’, etc., as being sources of information.

The investigation found limited perception of the financial benefits of operational use of weather, climate, and ocean information. Only in the following operational areas of the following did respondents overtly state financial implications:

- Construction;
- Golf course maintenance;
- Stadium pitch maintenance;
- Energy management in some large hotel groups; and
- Gaining insurance cover.

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125 TIA pers. comm.
126 IACVB, pers. comm.
There have been no definitive studies carried out to date quantifying the financial benefits of temporal or spatial scale weather information, but it is assumed they must be substantial. One theme from respondents during this research was that significant financial benefit would accrue from more accurate short-term information (this would help reduce the “window of disruption”) and long-term predictions (the information could be factored into business models).

It has been proposed that the innovative use of weather, climate, and ocean information will increase safety and productivity and improve the nation’s competitiveness leading to better standards of living. An example is that long-range predictions for the 1997-98 El Niño led California to conduct major mitigation efforts, leading to reduction in potential losses of about $1 billion. In addition, business opportunities being created by increased availability of weather and climate information in weather risk management has grown to an $8 million per year activity.

Weather and climate services are evolving in response to some contemporary realities:

- Time scales relevant to the private sector are expanding along with improvements in capacity for atmospheric observation, prediction, and information management. A new emphasis on monthly and seasonal prediction arises from the significant financial commitments now involved in hedging weather risks in energy and other markets, while the energy and agricultural industries, among others, have new interests in weather on the shorter time scales.
- Effective strategies for management of weather and climate related risk depend increasingly on integrating atmospheric observations and prediction with operational and financial models. The probabilistic approach to management of weather and climate risk is stimulating demand for more sophisticated and reliable information on climate and climate variability.
- Weather and climate services, both federal and private, are becoming more distributed as a consequence of advancing information technology and broader demand.

### 3.3.2 Weather, Climate, and Ocean Information in Business Decision Making

Business decisions currently being made by the recreation and tourism industry are detailed in figure 9.

Improved prediction and visualization of weather, climate, and ocean conditions at periods of 3 to 12 hours would benefit certain activities such as aviation, electrical energy generation, energy trading, pest control, and construction. Improving the accuracy of longer-range forecasts (e.g., 10 days) would allow enhanced forward planning for a number of activities. Additionally, linking seasonal climate forecasts with quantitative risk management models and strategies would benefit many economic activities.

128 Professor John A. Dutton, ‘Opportunities and Priorities in a New Era for Weather and Climate Services’.
### Interview Findings: Summary Table

<table>
<thead>
<tr>
<th>Company/Organization</th>
<th>Operational Decisions</th>
<th>W/C/O Data Needs to Support/Inform Decisions</th>
<th>Sources of W/C/O Data</th>
<th>Geographic Area of Interest</th>
<th>Temporal Resolution</th>
<th>Spatial Resolution</th>
</tr>
</thead>
<tbody>
<tr>
<td>Marriott Hotels</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Energy efficiency—degree days used (to calculate how much energy per sq. ft/m)</td>
<td>• Humidity levels (daily and seasonal averages)</td>
<td>• Engineering Society tables</td>
<td>• U.S./Canada</td>
<td>• Daily</td>
<td>• Property specific</td>
</tr>
<tr>
<td></td>
<td>• Determination of design load (dry air may make equipment fail)</td>
<td>• Temperature (min./max/daily per annum)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Type of paints used depends on humidity (oil-based or latex-based)</td>
<td>• Max. wind speed expected</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Comfort levels (e.g., temperature requiring heating if cold, or AC if hot weather)</td>
<td>• Likelihood of severe storms/flood</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Aim to have a ‘healthy environment’ for customers</td>
<td></td>
<td></td>
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</tr>
<tr>
<td></td>
<td>• Marriott has own safety criteria, e.g., on wind storm protection (will have to allow for max. wind speed) this determines the type of glazing and attachments for glass used</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>• If area prone to flooding, may have to design make modified design decisions (e.g., place hotel on pillars)</td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td></td>
<td>• Where hotels are on islands, Marriott may use weather data to determine evacuation if storms are forecast</td>
<td></td>
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</tbody>
</table>

Figure 8. Decisions Made in the Recreation and Tourist Industry Applying Weather, Climate, and Ocean Information
<table>
<thead>
<tr>
<th><strong>Company/Organization</strong></th>
<th><strong>Operational Decisions</strong></th>
</tr>
</thead>
</table>
| Fairmont Hotels         | • Aim to lessen the impact the hotel and its customers have on the environment, e.g., where hotel beach may be close to reefs, conservation advice may be posted in hotel  
• Skiing (e.g., Banff)—condition of snow  
• Aiming to be a carbon-neutral hotel chain—decisions as to how to achieve this being taken in conjunction with climate regimes of hotel locations and want to use this as a cost saving mechanism (property-level committees formed to make decisions) |
| Six Continents Hotels   | • Comfort levels—heating/cooling loads |
| HQ Purchasing and Services | |
| Starwood Environmental Risk | • Take safety precautions (limit property damage liability) |

<table>
<thead>
<tr>
<th><strong>W/C/O Data Needs to Support/Inform Decisions</strong></th>
</tr>
</thead>
</table>
| • Ocean data, particularly on the condition of reefs  
• Snowfall |
| • Degree days |
| • “Picture” presentation for all parameters |

<table>
<thead>
<tr>
<th><strong>Sources of W/C/O Data</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>• Various, e.g., Weather Channel</td>
</tr>
<tr>
<td>• Utility companies</td>
</tr>
</tbody>
</table>
| • NOAA  
• Insurance Brokers (CAT Alert) |

<table>
<thead>
<tr>
<th><strong>Geographic Area of Interest</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>• Canada</td>
</tr>
<tr>
<td>• Global</td>
</tr>
<tr>
<td>• Local</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Temporal Resolution</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>• Monthly, daily</td>
</tr>
<tr>
<td>• Daily</td>
</tr>
<tr>
<td>• Property-specific</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Spatial Resolution</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>• Property specific</td>
</tr>
</tbody>
</table>

**Figure 8. Decisions Made in the Recreation and Tourist Industry Applying Weather, Climate, and Ocean Information** (continued)
<table>
<thead>
<tr>
<th>Company/Organization</th>
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<th>Geographic Area of Interest</th>
<th>Temporal Resolution</th>
<th>Spatial Resolution</th>
</tr>
</thead>
<tbody>
<tr>
<td>Starwood Design Group</td>
<td>◆ Building material choices and tolerances (relies on consultants and insurers for information on codes and requirements)</td>
<td>◆ Temperatures, ◆ Wind ◆ Precipitation, extremes</td>
<td>?</td>
<td>Global</td>
<td>Monthly extremes</td>
<td>Local</td>
</tr>
<tr>
<td>Starwood Architecture and Construction</td>
<td>◆ Exterior conditions as they affect buildings ◆ Deciding when is the optimal time to build ◆ Landscaping ◆ To establish benchmark on contractors time to completion</td>
<td>◆ Temperatures ◆ Wind ◆ Rainfall (type and amount)</td>
<td>?</td>
<td>Global</td>
<td>Seasonal</td>
<td>Local</td>
</tr>
<tr>
<td>Starwood Sales</td>
<td>◆ Relies on individual hotel to detail sales ‘pitch’ requirements (financial forecasts are done at the hotel level)</td>
<td>◆ Varies according to location</td>
<td>?</td>
<td>Global</td>
<td>Seasonal</td>
<td>N/A</td>
</tr>
<tr>
<td>Starwood Public Relations</td>
<td>◆ ‘Type of ad campaign’ (location/weather oriented)</td>
<td>◆ Average temperatures ◆ Sunshine hours ◆ Hurricanes</td>
<td>?</td>
<td>Global</td>
<td>Seasonal</td>
<td>Local</td>
</tr>
<tr>
<td>Starwood Finance</td>
<td>◆ W/c variables not built into budgeting process ◆ Uses yield management model, no allowance made for w/c</td>
<td>◆ Hurricanes ◆ Floods</td>
<td>None</td>
<td>Global</td>
<td>Seasonal</td>
<td>N/A</td>
</tr>
</tbody>
</table>

Figure 8. Decisions Made in the Recreation and Tourist Industry Applying Weather, Climate, and Ocean Information (continued)
### Requirements of the U.S. Recreation & Tourism Industry for Climate, Weather, & Ocean Information

<table>
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<th>Spatial Resolution</th>
</tr>
</thead>
<tbody>
<tr>
<td>Starwood Acquisitions and Development</td>
<td>• In resort hotels, weather plays “an enormous role”, but not necessary to look at miniscule level of detail—is mostly intuitive</td>
<td>• Hurricanes</td>
<td>• ?</td>
<td>• Global</td>
<td>• Seasonal</td>
<td>• Local/ regional</td>
</tr>
</tbody>
</table>
| Starwood Engineering | • Tracking energy usage in 190 properties (per sq. ft. per occupied room)  
• Energy efficiency measurement to project energy needs  
• Comparative forecasting model (current energy usage vs. last year) | • Degree days (HDD and CDD)  
• Real time (working towards)  
• Simple formula data required  
• Cloud cover  
• RH  
• Solar incidence | • NOAA? | • Local | • Daily and annual  
• Hourly (desired) | • Local |
| Everguard Technical | • Calculate ‘Energy Index’ | • Degree days  
• NOAA  
• Own temperature sensors  
• CNN | • Local data for global coverage | • Av. weekly temp.  
• Real time  
• Hourly (desired) | • Local |
| The Sheraton Rittenhouse Square, Philadelphia | • Temperature setting (DD settings for each of the four corners of the hotel) | • CDD/HDD | • Weather Bureau in New York | • Local | • Daily | • Local |
| The Sheraton Rittenhouse Square, Philadelphia Sales and Marketing | • Comfort levels in hotel  
• Occasional severe weather affects in/out schedule of guests | • Degree days | • Weather.com | • City | • Daily | • Local |

*Figure 8. Decisions Made in the Recreation and Tourist Industry Applying Weather, Climate, and Ocean Information* (continued)
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<th>Geographic Area of Interest</th>
<th>Temporal Resolution</th>
<th>Spatial Resolution</th>
</tr>
</thead>
</table>
| Vail Mountain Lodge and Spa | • Weather is not a “deal breaker”  
• Snow  
• Sun | • Snow  
• Vail Resort | Local | Daily | Property specific |
| Disney World | • Report run-off (compliance with EPA requirements) | • Precipitation  
• Own monitoring stations | Local | Daily | Property specific |
| Kiawah Island Resorts, The Ocean Golf Course | • Decide on course maintenance actions (e.g., re-seeding, airification, chemical spraying, fertilizing  
• Run-off)  
• Rainfall  
• Hurricanes | • Satellite  
• Internet  
• NWS | Local | Weekly | Varies |
| Disney Cruises Safety Management Systems | • Safety main concern  
• Decide on re-routing or evacuation  
• Decision aid used: land-based HQ reviews situation inputs vessel’s coordinates in to software program  
• Plot charts at HQ  
• Tropical storms/hurricanes  
• Tropical and non-tropical systems  
• Sea temperature (occasionally)  
• Wave height  
• Wind speed | • NOAA  
• NHPC  
• “Hurri-track”  
• Internet  
• Local stations  
• Ships on-board monitoring systems  
• DTN  
• Customized weather reports by private forecaster  
• NOAA 7/8 day forecast | Varies | Varies widely, depending on threats  
At least once/day | Wide area coverage for general storm tracking  
Highest resolution possible for specific hurricanes |

Figure 8. Decisions Made in the Recreation and Tourist Industry Applying Weather, Climate, and Ocean Information (continued)
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</tr>
</thead>
</table>
| Windstar Cruises Nautical Operations | ● Advise vessels if HQ consulted (decisions taken by Capitan on board)  
◆ Ensure compliance with U.S. public health and safety requirements  
◆ Rescheduling, routing alterations, and sheltering actions  
◆ Issue warning to passengers of “bumpy ride”  
◆ Captain may discuss a number of options with HQ  
◆ On board - housekeeping dept. phone bridge daily for weather reports for passengers  
◆ Charting on vessel | ● Hurricanes  
◆ Tropical storms  
◆ Wave height  
◆ ‘Eye’ of hurricanes, direction, speed  
◆ Swell; ‘confused’ swell  
◆ State of the coast  
◆ Ocean temp. at surface  
◆ Cloud-base and type  
◆ Precipitation  
◆ Fog/visibility  
◆ Air temp.  
◆ Wind speed/direction  
◆ Barometric pressure | ● Weather-fax  
◆ Satellite (Station 12)  
◆ NOAA  
◆ CNN  
◆ NWS  
◆ NOS  
◆ Cable News  
◆ Coast Guard  
◆ NHC  
◆ Internet  
◆ 1-800 ROLL CALL - discontinued?  
◆ METEO  
◆ Other vessels in area | ● Caribbean  
◆ Alaska  
◆ Californi/Mexico coast | ● Hourly | ● Local  
● Regional |
| Princess Cruises Marine Operations | ● Plot charts on vessel  
◆ Tracking carried out only if bad weather is expected  
◆ HQ track vessel only if there is bad weather  
◆ Day-to-day operations and long-term planning carried out at HQ (itineraries planned 2 yrs. in advance) | ● Swell height  
◆ Sea temperature  
◆ Air temperature  
◆ Cloud cover (and type)  
◆ Barometric pressure (and tendency) | ● West and North Atlantic Satellite  
◆ Internet  
◆ Radio forecasts  
◆ National Oceanography Office | ● Overall weather to plan routes (not interested in local conditions) | ● Daily  
● Hourly only if required  
● Varies  
● 7 Days forecast (for cruising) | ● Regional |

*Figure 8. Decisions Made in the Recreation and Tourist Industry Applying Weather, Climate, and Ocean Information (continued)*
<table>
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<th>Company/Organization</th>
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<th>Temporal Resolution</th>
<th>Spatial Resolution</th>
</tr>
</thead>
<tbody>
<tr>
<td>Princess Cruises</td>
<td>Captains have complete control and authority over their vessel, HQ in a supporting role when at sea</td>
<td>Tropical cyclones, Storm tracking, Forecasting and real time, Fronts locations and movement, highs, lows</td>
<td>Marine Weather.com, BOM national weather charts (Aust?), Own vision (e.g., for visibility), UK Met Office routing service (cross Atlantic)</td>
<td></td>
<td>2 Days for ocean passages, 24 Hours for Caribbean</td>
<td></td>
</tr>
<tr>
<td>Marine Operations (continued)</td>
<td>(Note: each Captain has their ‘favorite’ regarding Internet site, so difficult to generalize which web site most used)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>South Carolina Ports Operations</td>
<td>Decide to evacuate if severe weather approaching, Pollution/water quality</td>
<td>Storms and severe weather</td>
<td>DTN, Doppler radar, NWS</td>
<td>Local</td>
<td>Daily</td>
<td>Local</td>
</tr>
<tr>
<td>Port Canaveral Authority Environment Programs and Security</td>
<td>In association with USCG, may decide to close the port and/or evacuate if severe weather expected</td>
<td>Tides, Wind, Wave height, Rainfall, Water temp.</td>
<td>NWS, Radio, Faxes from Brevard County Office of Emergency Management (warnings if severe), Internet hurricane watch (subscription), Kennedy Space Center</td>
<td>Local</td>
<td>Daily, 4 Times/day if NWS plane tracking hurricane, 3-4 Hrs. if hurricane in vicinity</td>
<td>Local</td>
</tr>
</tbody>
</table>

Figure 8. Decisions Made in the Recreation and Tourist Industry Applying Weather, Climate, and Ocean Information (continued)
## Requirements of the U.S. Recreation & Tourism Industry for Climate, Weather, & Ocean Information

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<tbody>
<tr>
<td>Canaveral Pilots Association</td>
<td>◆ Evaluate observations&lt;br&gt;◆ May call a Disney vessel preparing to depart if weather may not be favorable (they do not send out widespread warnings)&lt;br&gt;◆ Coordinates with USCG and Port Authority if evacuation necessary and pilots have to be called in</td>
<td>◆ Fog&lt;br&gt;◆ Wind&lt;br&gt;◆ Hurricanes&lt;br&gt;◆ Tides</td>
<td>◆ Own observatories&lt;br&gt;◆ Cape Weather (USAF Station)&lt;br&gt;◆ Weather Channel&lt;br&gt;◆ DTN Intellicast&lt;br&gt;◆ TV&lt;br&gt;◆ Weather.com&lt;br&gt;◆ NOAA Weather Radio</td>
<td>◆ Local</td>
<td>◆ 3-4 Days&lt;br&gt;◆ 7 Days</td>
<td>◆ Local</td>
</tr>
<tr>
<td>Brevard County, Florida, Emergency Management Service</td>
<td>◆ Decide when to alert Fire Service and law enforcement service of potential fire hazard conditions&lt;br&gt;◆ Will be setting up a more interaction with hotels (e.g., web-based warnings)</td>
<td>◆ Hurricanes&lt;br&gt;◆ Tornadoes&lt;br&gt;◆ Precipitation&lt;br&gt;◆ Fire conditions&lt;br&gt;◆ Lightning events&lt;br&gt;◆ Rip tide&lt;br&gt;◆ Storm surge&lt;br&gt;◆ Wind</td>
<td>◆ NWS&lt;br&gt;◆ Radar (Baron Services)&lt;br&gt;◆ Satellite&lt;br&gt;◆ Internet&lt;br&gt;◆ Local Airport</td>
<td>◆ Local&lt;br&gt;◆ Regional</td>
<td>◆ Daily&lt;br&gt;◆ Real time</td>
<td>◆ Local&lt;br&gt;◆ Street level</td>
</tr>
<tr>
<td>‘Brevard Prepares’</td>
<td>◆ ‘Project Impact—Brevard Prepares’—emergency preparedness plan</td>
<td>◆ Water spouts&lt;br&gt;◆ Tornadoes&lt;br&gt;◆ Precipitation&lt;br&gt;◆ Temperature&lt;br&gt;◆ Lightning events&lt;br&gt;◆ Rip tide&lt;br&gt;◆ Storm surge&lt;br&gt;◆ Wind</td>
<td>◆ NWS&lt;br&gt;◆ Internet</td>
<td>◆ Local&lt;br&gt;◆ Regional</td>
<td>◆ Daily</td>
<td>◆ Local</td>
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Figure 8. Decisions Made in the Recreation and Tourist Industry Applying Weather, Climate, and Ocean Information (continued)
## Requirements of the U.S. Recreation & Tourism Industry for Climate, Weather, & Ocean Information

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</table>
| Beacon Hill Council Research | • W/c/o data not incorporated into business forecasting  
• Occasionally locational decisions (particularly post hurricane Andrew) | • Hurricanes | • Web | • Local | • 5-Day warning of hurricanes | • Local |
| Miami Convention and Visitor Bureau Research and Information | • Incorporation of w/c/o in ‘bid’ proposals | • Hurricane season incidence  
• Seasonal average temperature  
• High/low seasonal variability rainfall  
• Humidity | • University of Florida | • Local  
• Regional | • Hourly  
• Daily  
• Monthly | • Local |
| State of Florida | • Provides climate information on demand (not weather)  
• Produces ‘explanation’ report | • Temperature  
• Precipitation  
• Hurricane incidence | • NOAA (NCDC)  
• NOAA Regional Climate Center | • Local  
• Regional | • Monthly  
• Daily  
• Regional | • Local  
• Regional |
| Oceans Blue Foundation - Canada | • Project targeting meetings planners  
• Cruise ship initiative | • Precipitation  
• Temperature | • NOAA | • Regional | • Annual | • Regional |
| Air Transport Association (ATA) | • Many decisions dependent on weather conditions crucial to the air transport industry  
• Forecasts air traffic demand | • Thunderstorms | • Uses “other people’s forecasts” | • National | • Seasonal | • National |

**Figure 8. Decisions Made in the Recreation and Tourist Industry Applying Weather, Climate, and Ocean Information** (continued)
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</thead>
</table>
| Air Transport Association (ATA) | • Trend analysis of routing decisions  
• ‘Hub’ location analysis | • Fog  
• Overcast sky  
• Wind  
• Volcanic ash  
• Lightning | • NWS  
• Sensors on aircraft downloaded at Boulder, CO Center  
• Satellite | • National | • Hourly | • National |
| IAOPA | • Before flying, pilots must brief themselves using all available data to plan the flight | • Cloud cover/density  
• Visibility  
• Temperature  
• Wind | • Internet: ‘Flight Brief.com”  
• DTN  
• Meterologix  
• FAA | • National | • Daily | • National |
| IATA Flight Operations | • Above 49° Celsius—limitations to flying  
• To ensure compliance with International Civil Aviation Organization  
• Use weather data in crash investigations | • Temperature  
• Upper atmosphere wind  
• Moisture content  
• Jet stream  
• Turbulence  
• Volcanic eruptions  
• Wind sheer | • NOAA  
• FAA  
• UK Met Office  
• (World Area Forecast Center)  
• Air traffic control | • Regional  
• Local | • Real time  
• Forecast  
• 12 and 6 Hours | • Regional  
• Local |

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</table>
| FAA                  | Fly or no-fly decisions  
                      Safety conditions | Wind  
 Visibility  
 Cloud base  
 Temperature  
 Dew point  
 Icing conditions  
 Rainfall  
 Thunder storms  
 Fronts (freezing rain and snowfall echoes) | NWS  
 Control towers  
 WSI | Regional  
 Local | Daily  
 2 Hourly | Regional  
 Local |
| Phoenix Sky Harbor Quality Assurance and Training | Determine which runway to use  
 Airport closure  
 Advise flying conditions  
 Fly or no-fly decisions | Frontal passages (storm fronts, gust fronts, etc.)  
 Wind shear  
 Wind direction and speed  
 Micro-bursts  
 Sky conditions  
 Visibility  
 Barometric pressure | Own monitoring equipment  
 Terminal Doppler radar  
 Automated Surface Observing System  
 NWS | Local | 10-15 Minutes  
 Hourly | 40-50 Miles  
 10-15 Miles |
| Phoenix Sky Harbor Research and Statistics | Determine trends de-plane; in-plane and cargo movements | Cycles wet/dry years  
 Snowfall  
 Rainfall temperature  
 RH  
 Sunshine hours | Airport statistics  
 NOAA | Airport | Monthly  
 Annual | Airport |

Figure 8. Decisions Made in the Recreation and Tourist Industry Applying Weather, Climate, and Ocean Information (continued)
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</thead>
</table>
| Arizona Office of Tourism Research | - Weather (esp. winter) both within and outside AZ impacts tourism  
- Marketing (brochures) | - Temperature  
- Snowfall (N. AZ) | - Web  
- Regional  
- State | | Monthly  
- | State-wide |
| Arizona Hospitality and Research Resource Center, NAU | - Tracks visitor data; expenditure data; employment and gross sales tax; National Park monthly data and airport passenger throughput  
- Much weather-related tourism (although no empirical analysis on the relationship)  
- Concerned with health effects of climate change, e.g., Hunter Virus  
- Spring baseball training attracts many visitors and players  
- Preparation for estimated number of visitors (e.g., ‘Snowbirds’ declined in El Nino years)  
- AZ clean air quality—positive factor | - Snowfall  
- Flagstaff weather station | - State  
- Regional | | Monthly  
- | State |
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</table>
| Mesa Office of Economic Development (Megacorp) | • Quality of life issues (includes climate)  
• Site selection decisions  
• Regional Economic Development Strategy | • Av. daily temp.  
• Rainfall  
• Snowfall  
• CDD / HDD  
• Wind speed | • Web  
• NOAA  
• Regional Climate Center | • Regional  
• State | • Daily | • Regional  
• State |
| Phoenix, Arizona Convention and Visitors Bureau | • Phoenix—warm weather destination in winter | • Snowstorms  
• Temperatures  
• Sunshine hours | • Weather Channel  
• Farmers Almanac  
• Visual | • State  
• Local | • 3-4 Hourly  
• Monthly | • State  
• Local |
| Sandy & Babcock Architecture and Planning | • W/c data used in design criteria. (“Coast Level Limit” line is being adjusted due to predict sea level rise—design decisions will be made taking this into account.) | • Degree days; average monthly temperatures; average rainfall (information obtained from tourist information centers, consultants, clients, team members own knowledge) | • Chambers of Commerce  
• 10 Sites depending on location in the world | • Regional  
• Monthly  
• Regional |  

### Requirements of the U.S. Recreation & Tourism Industry for Climate, Weather, & Ocean Information

**Figure 8. Decisions Made in the Recreation and Tourist Industry Applying Weather, Climate, and Ocean Information (continued)**

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</table>
| Wimberly, Allison Tong & Goo (WAT&G), Architects, Planners, and Consultants | W/c data determines decisions in building technologies to be used and development strategies (e.g., in the Caribbean where it is hurricane-prone)  
- Design parameters for buildings dependent on shade/shadow, insulation values  
- Carry out shading/sun control studies using models of buildings to decide on design (can also use software products as decision aiding tools)  
- Wind effects of siting buildings in relation to weather conditions | Storm data  
- Shade/shadow data  
- Air characterizes (e.g., near coast salt content in the air)  
- Temperature ‘swings’ per year  
- Rainfall  
- Winds  
- Unusual weather patterns  
- Solar patterns  
- Design degree days (max./ min.) | Visitor Centers, Chambers of Commerce | Regional | Monthly | Regional |
| EDSA Planners, Landscape Architects, Graphic Designers | W/c data determines designs, species used in plantings and precautions taken in the case of severe weather events  
- Flood data (max. height of floods and max. velocity of floods as well as frequency) in particular determines design decisions | Sun/shade, hurricane and coastal conditions  
- Sun inclination during different seasons  
- Rainfall differences on micro scale  
- Temperature range  
- Winds (directional and severity) | Chambers of Commerce | Regional | Monthly | Regional |
### Requirements of the U.S. Recreation & Tourism Industry for Climate, Weather, & Ocean Information

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| Stowe Mountain Resort, Vermont | - Weather data used to make decisions if snowmaking is needed (and, hence, staff requirements)  
  - Data is used in marketing—snow/weather conditions made available to the public as part of marketing the resort on the basis of ‘skiing conditions’  
  - Most important criterion is snow level  
  - Also temperature and snowfall (has processed its own 5 year records to show trends) + uses web site “Snow Report”  
  - Weather data collected by the resort itself | - Precipitation, dew point  
  - Humidity  
  - Temperature  
  - Wind  
  - Sunlight  
  - Storm tracking  
  - Cloud cover  
  - Wind speed  
  - RH  
  - Barometric pressure  
  - Solar radiation | - Weather.com  
  - Inside baltimore.com  
  - The Weather Channel | - Local/site specific  
  - Daily (in season)  
  - Local |  
| Baltimore Ravens Ball Park | - Decisions on many grass/field management actions (e.g., nitrogen fertilizer can be washed away if applied just before a heavy rainstorm and thus become a pollution hazard);  
  - Decisions determined about disease management and the use of specific chemicals;  
  - The field is temperature-controlled for players to be able to play on in otherwise dangerous or non-conducive conditions;  
  - RH, temperature & sunlight all crucial in maintaining the field in wet or dry condition, and may determine the use of anti-dew agents | - Weather.com  
  - Inside baltimore.com  
  - The Weather Channel | - Local/site specific  
  - Daily (in season)  
  - Property specific |  

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</table>
| U.S. Sailing Association | • Crucial for safety decisions at sea and for coastal sailing and on inland waterways  
• May decide to cancel or go ahead with races | • Storm tracking  
• Ocean currents  
• Tide  
• Surface winds  
• Barometric pressure  
• Temperature | • ‘U.S. Sailing’ web links to NWS and other weather forecasting services | • Local and regional | • Hourly (or more frequent) | • Local |
| Dept. of Commerce Travel Industries Assn. Research and Technical Planning | • No business models incorporate w/c/o factors  
• 95% of business establishments in the sector are “Mom and Pop” businesses who do not use economic modeling | • None | • N/A | • N/A | • N/A | • N/A |
| Dept. of Commerce Travel Industries Association | • Promotion (brochures, etc.) | • Temperature  
• Hurricanes  
• Tornadoes  
• Flooding  
• Fire | • ? | • State level | • Seasonal | • State |
| IACVB Research | • Weather/climate tendencies—intuitive | • Av. temperature  
• Av. rainfall  
• Hurricanes | • ? | • National | • Annual | • National/state |
| National Association of Recreation Resource Planners (NARRP) | • Apparently no decisions made on the basis on w/c/o information, made be used in a subsidiary manner and mentioned in plans as ‘background information’ | • To date no requirement for w/c/o data—”but sounds as if we should”, President, NARRP | • None used | • N/A | • N/A | • N/A |

Figure 8. Decisions Made in the Recreation and Tourist Industry Applying Weather, Climate, and Ocean Information (continued)
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</table>
| Alliance of American Insurers (AAI) | • Premium and deduction level options (usually based on past experience/events)  
• Location important factor in insurance  
• Catastrophic loss modeling/risk assessment | • Hurricanes  
• Tornadoes  
• Flooods  
• Wind exposure  
• Hail storms | • ? | • Local/regional | • Annual/seasonal | • Local/regional |
| Tillinghast-Towers-Perrin | • Vulnerability of building structures in conjunction with prevailing weather conditions (and occasional events) incorporated into risk models  
• Generate stochastically a large number of possible scenarios based on data of past events (then judge the probability of an event damage to a property) | • Catastrophic or severe weather events | • Own library/statistical sources | • Local/regional | • Annual/seasonal | • Local/regional |
| Smith Travel Research | • Providers of travel statistics, hotel occupancy, background research to provide a baseline for the industry’s business decision-making process | • Do not collect w/c/o data per se but noted occupancy rates go up after weather induced and other disasters—can relate to specific weather events (e.g., Hurricane Andrew) | • None used | • N/A | • N/A | • N/A |

Figure 8. Decisions Made in the Recreation and Tourist Industry Applying Weather, Climate, and Ocean Information (continued)
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</thead>
<tbody>
<tr>
<td>Andersen Consulting Travel and Tourism Business Planning Hospitality Management Consultancy</td>
<td>- No business planning decisions dependent on w/c/o information</td>
<td>- None</td>
<td>- None used</td>
<td>- N/A</td>
<td>- N/A</td>
<td>- N/A</td>
</tr>
<tr>
<td>Green Globe 21 Travel and Tourism Business Planning</td>
<td>- No business planning decisions are currently directly made on the basis of w/c/o information, but as Green Globe encourages environmental approaches to the business, w/c/o conditions are implicitly considered in maintaining environments and controlling the impacts of the tourist industry particularly in sensitive areas</td>
<td>- None directly.</td>
<td>- None used</td>
<td>- N/A</td>
<td>- N/A</td>
<td>- N/A</td>
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</tbody>
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Figure 8. Decisions Made in the Recreation and Tourist Industry Applying Weather, Climate, and Ocean Information (continued)
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<th>Weather, Climate, and Ocean Data</th>
<th>Data Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>F</td>
<td>Determining rack rate and discount rates</td>
<td>Season (low/high) projections Occupancy forecast Discount rate scales</td>
<td>Past seasonal trends associated with weather</td>
<td>H, (P)</td>
</tr>
<tr>
<td>F</td>
<td>Maximizing RevPar</td>
<td>Low season/high season Occupancy forecast Discount structure</td>
<td>Seasonal trends at location identified with weather, weather conditions in source areas</td>
<td>H, P</td>
</tr>
<tr>
<td>F</td>
<td>Gaining optimal occupancy</td>
<td>Low season/high season Marketing/advertising DMO/agency effort and fees</td>
<td>Weather conditions in source areas</td>
<td>(P)</td>
</tr>
<tr>
<td>F</td>
<td>Setting budgets</td>
<td>Volume of business (income) Contingency</td>
<td>Predicted weather conditions at a location in 6 months</td>
<td>(P)</td>
</tr>
<tr>
<td>F</td>
<td>Determining reservation/cancellation policies</td>
<td>Deposit requirements Refund policy on cancellation due to weather conditions</td>
<td>Weather conditions at location leading to cancellations</td>
<td>(P)</td>
</tr>
<tr>
<td>F</td>
<td>Obtaining insurance/decide on level of self-insurance</td>
<td>Exposure/vulnerability/risk assessment</td>
<td>Past severe/hazard weather trends</td>
<td>H</td>
</tr>
<tr>
<td>F</td>
<td>Purchasing equipment</td>
<td>Specifications: ‘Fit for purpose’ and BAT Determine exposure to specific external conditions</td>
<td></td>
<td>H</td>
</tr>
<tr>
<td>F</td>
<td>Selecting suppliers</td>
<td>Vendor criteria (e.g., cost, reliability, quality, durability against weather conditions) Fit for purpose criteria</td>
<td></td>
<td>H</td>
</tr>
<tr>
<td>M</td>
<td>Attracting visitors</td>
<td>Marketing strategy, targeted direct advertising, visitor interests, visitor source(s), visitor trends</td>
<td>Snow reports, beach reports (rectify any ‘misleading’ weather, climate and ocean information’)</td>
<td>H, P</td>
</tr>
</tbody>
</table>

**Figure 9. Specific Recreation and Tourism Industry Issues and Information Requirements**
### Requirements of the U.S. Recreation & Tourism Industry for Climate, Weather, & Ocean Information

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<tbody>
<tr>
<td><strong>M</strong></td>
<td>Sending out Press Releases countering weather misinformation</td>
<td>Incorrect weather reports for specific areas or low resolution reports at leading to misleading information</td>
<td>Storm events, generalized synopses</td>
<td>P</td>
</tr>
<tr>
<td><strong>B</strong></td>
<td>Deciding where to site a new development or acquisition</td>
<td>Presence of competitors, Accessibility, Labor availability, Zoning (planning permission)</td>
<td>‘Quality of life’ data (e.g., climate) (implicit the weather will be “good” at an established resort)</td>
<td>H</td>
</tr>
<tr>
<td><strong>B</strong></td>
<td>Determining and complying with building regulations</td>
<td>Hire local consultants to identifying building codes (State Codes reflect prevailing environmental conditions)</td>
<td>[weather, climate and ocean conditions influence Code requirements]</td>
<td>H</td>
</tr>
<tr>
<td><strong>B</strong></td>
<td>Deciding on building materials</td>
<td>Compliance with building codes, Cheapest tender (and ‘fit for purpose’), Design criteria, Resilience to expected conditions</td>
<td>Maximum wind speed expected, storm incidence, min./max. temperatures</td>
<td>H, P</td>
</tr>
<tr>
<td><strong>B</strong></td>
<td>Maintaining buildings</td>
<td>Determining past weather events, Inspections, Estimation of life before replacement, Maintenance schedule</td>
<td>Temperature, precipitation, humidity, wind, insulation</td>
<td>H, P</td>
</tr>
<tr>
<td><strong>B</strong></td>
<td>Planting and maintenance of landscape</td>
<td>Environmental parameters, Desired visual effects, Sheltered/exposed location</td>
<td>Sun/shade, insulation, humidity, precipitation</td>
<td>H, P</td>
</tr>
<tr>
<td>Various</td>
<td>Regulatory compliance</td>
<td>Federal and State laws, Waste, water management</td>
<td>Run-off (sampling during the first 30 mins. of a precipitation event over ½ inch total)</td>
<td>H, SM, (P)</td>
</tr>
<tr>
<td><strong>E</strong></td>
<td>Determining energy loadings</td>
<td>Cold degree days, hot degree days, BIN data</td>
<td>Cold degree-days, hot-degree days</td>
<td>R-T, H</td>
</tr>
</tbody>
</table>

**Figure 9. Specific Recreation and Tourism Industry Issues and Information Requirements (continued)**
### Requirements of the U.S. Recreation & Tourism Industry for Climate, Weather, & Ocean Information

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</tr>
</thead>
</table>
| E                      | Maintaining comfort levels | Cold degree-days, hot-degree days  
Boiler/chiller efficiencies | Temperature, humidity | R-T, [SM], P |
| E                      | Fine tuning engineering systems | Engineering tables (e.g., BTU) | Cold degree-days, hot-degree days, humidity | R-T, P |
| E                      | Setting mechanical/ electrical engineering specifications | Determining cheapest tender  
Probable load forecasts/specs. for equipment | Cold degree-days, hot-degree days, humidity | H, P |
| S                      | Applying agri-products | Treatment required in accordance with grounds maintenance schedule and unforeseen conditions, e.g., infestations | Temperature, nature, and duration of precipitation events | P |
| R                      | Formulating internal environmental policies | Potential energy savings; resource use; ecotourism; environmental management systems | Weather, climate, and ocean data as they affect the natural environment | H, P |
| R                      | Ensuring health and safety of staff and guests | H&S Regulation requirements, well-being of guests/participants (management decision how far to go beyond specified minimum in visitor provision) | Temperature, precipitation, humidity, wind, insulation, severe events | H, P |
| R                      | Identifying risks to life, property, equity, reputation | Risk assessment | Severe weather events | H, P |
| R                      | Managing and mitigating risk | Identify risks and probability of occurrence  
Devise mitigation and management plan and procedure (for each location) | Weather, climate, and ocean data, severe weather events | H, P |
| R                      | Formulating emergency preparedness measures | Severe weather possibilities (tornados, hurricanes, floods, lightening strikes, gales)  
Vulnerability assessment | Severe weather events (e.g., 50 year incidence events) | H |

Figure 9. Specific Recreation and Tourism Industry Issues and Information Requirements (continued)
### Requirements of the U.S. Recreation & Tourism Industry for Climate, Weather, & Ocean Information

<table>
<thead>
<tr>
<th>Business Activity Area</th>
<th>Decisions and Tasks</th>
<th>Information Required</th>
<th>Weather, Climate, and Ocean Data</th>
<th>Data Type</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Sub-sector Category: Property: Hotels, Resorts, and Accommodation (continued)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>G</td>
<td>Planning daily guest activities</td>
<td>Outdoor recreation program and visits</td>
<td>Temperature, precipitation, humidity, wind, severe weather events</td>
<td>P</td>
</tr>
<tr>
<td>DMO</td>
<td>Whether or not to discount (offload stock)</td>
<td>Depends on weather at visitor source area (if good, they may have to discount more)</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Sub-sector Category: Insurance</strong></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>I</td>
<td>Deciding if a property is ‘insurable’</td>
<td>Regular exposure and vulnerability to natural hazards and weather ‘events’, condition of property, siting/exposure of property, periodicity of weather events and vulnerability to loss</td>
<td>Flooding, tsunamis, catastrophic storms, hurricanes, tornados, wind, lightning, hail storms, fire weather</td>
<td>H</td>
</tr>
<tr>
<td>I</td>
<td>Determining premiums</td>
<td>Estimation of ‘full commercial value’ of a property, risk assessment and vulnerability, catastrophe model determinations</td>
<td>Severe event type, characteristics, probability, periodicity</td>
<td>H</td>
</tr>
<tr>
<td>P</td>
<td>Determining deductions</td>
<td>Location, risk assessment, and vulnerability</td>
<td>Severe event type, probability, periodicity</td>
<td>H</td>
</tr>
<tr>
<td>Br</td>
<td>Inspecting properties</td>
<td>Assessment to determine if the property in ‘good order’ (to withstand weather, climate, and ocean conditions)</td>
<td>Severe event type, probability, periodicity</td>
<td>P</td>
</tr>
<tr>
<td>Br</td>
<td>Issuing ‘Cat Alerts’</td>
<td>Response to risk to property and/or lives as a result of weather, climate, and ocean event information received</td>
<td>Tropical storm systems, hurricanes, atmospheric conditions, etc.</td>
<td>R-T, P</td>
</tr>
<tr>
<td>I</td>
<td>Ensuring under-exposure of total potential liability</td>
<td>Probability of catastrophic events, total insured</td>
<td>Severe event type, probability, periodicity</td>
<td>H</td>
</tr>
</tbody>
</table>

*Figure 9. Specific Recreation and Tourism Industry Issues and Information Requirements (continued)*
## Figure 9. Specific Recreation and Tourism Industry Issues and Information Requirements (continued)

<table>
<thead>
<tr>
<th>Business Activity Area</th>
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<th>Information Required</th>
<th>Weather, Climate, and Ocean Data</th>
<th>Data Type</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Sub-sector Category: Sports Events</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>L</td>
<td>Submitting bids to host events/conferences/conventions/expositions</td>
<td>‘Reliability’ and stability (seasonal and daily) of weather, climate, and ocean conditions</td>
<td>Temperature, precipitation, humidity</td>
<td>H</td>
</tr>
<tr>
<td>O</td>
<td>Selecting venue for event (e.g., indoors, outdoors, region, State, City)</td>
<td>Sports and events promoters, conference sponsors and organizers assessment of site attributes</td>
<td>Temperature, precipitation, humidity</td>
<td>H</td>
</tr>
<tr>
<td>O</td>
<td>Scheduling of events (year, month, day, time)</td>
<td>Regular, traditionally held events, seasonal events</td>
<td>Temperature, precipitation, humidity</td>
<td>H</td>
</tr>
<tr>
<td>S</td>
<td>Snowmaking</td>
<td>If insufficient snow for skiing, snowboarding, etc.</td>
<td>Snowfall, temperature, wind chill</td>
<td>P, SM</td>
</tr>
<tr>
<td>S</td>
<td>Open or close the ski lift</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>S</td>
<td>Turning on underground pitch heating</td>
<td>Time of day (or night) pitch needs to be ready</td>
<td>Air temperature, ground temperature, wind chill</td>
<td>R-T, P</td>
</tr>
<tr>
<td><strong>Sub-sector Category: Maritime and Cruise Industry</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>H</td>
<td>Seasonal/yearly schedule</td>
<td>Passenger occupancy data on routes, profitability of routes/schedules</td>
<td>Temperature, precipitation, sea conditions, severe storms</td>
<td>H, P</td>
</tr>
<tr>
<td>H</td>
<td>Expansion into new areas</td>
<td>Security assessment, potential profitability, available ports</td>
<td>Temperature, precipitation, sea conditions, severe storms</td>
<td>H</td>
</tr>
</tbody>
</table>

*Figure 9. Specific Recreation and Tourism Industry Issues and Information Requirements (continued)*
### Requirements of the U.S. Recreation & Tourism Industry for Climate, Weather, & Ocean Information

<table>
<thead>
<tr>
<th>Business Activity Area</th>
<th>Decisions and Tasks</th>
<th>Information Required</th>
<th>Weather, Climate, and Ocean Data</th>
<th>Data Type</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td><strong>Sub-sector Category: Maritime and Cruise Industry (continued)</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>H</td>
<td>Route planning</td>
<td>Pre-determined route, course changes to be made in response to conditions at sea</td>
<td>Ocean temp. at surface, cloud-base and type precipitation, air temp., wind speed/ direction, barometric pressure, hurricanes, tropical storms, wave height, ‘eye’ of hurricanes, direction, speed, swell, ‘confused’ swell, state of the coast, fog/visibility</td>
<td>H, P, R-T</td>
</tr>
<tr>
<td>H, C</td>
<td>Safety</td>
<td>Weather advisories received, SOLAS requirements</td>
<td>Hurricanes, tropical storms, wave height, ‘eye’ of hurricanes, direction, speed, swell, ‘confused’ swell, state of the coast, fog/visibility</td>
<td>R-T, P</td>
</tr>
<tr>
<td>H</td>
<td>Pricing</td>
<td>Season, location, route, and duration of cruise</td>
<td></td>
<td>H, P</td>
</tr>
<tr>
<td>H</td>
<td>Vessel maintenance</td>
<td>Seasonal schedule</td>
<td></td>
<td>H</td>
</tr>
<tr>
<td>C</td>
<td>Port to go to</td>
<td></td>
<td>Tropical storms, high winds</td>
<td>R-T, P</td>
</tr>
<tr>
<td>H</td>
<td>Guest activities</td>
<td>Ship and shore activities and scheduling, issuing comfort warnings (particularly if there is a ‘confused swell’)</td>
<td>Temperature, precipitation, solar radiation, wind, sea temperature</td>
<td>R-T, P</td>
</tr>
<tr>
<td>H, C</td>
<td>Compliance with regulations</td>
<td></td>
<td></td>
<td>H, P</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Sub-sector Category: Aviation</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>C, H</td>
<td>‘Go’ or ‘No Go’ decisions</td>
<td>Preparation of aircraft, crew briefing, checking-in and security procedures, over-booking decisions on commercial flights</td>
<td>Storms, micro-bursts, frontal passages, cloud base, visibility</td>
<td>R-T, P</td>
</tr>
<tr>
<td>C</td>
<td>Preparing aircraft for take off</td>
<td>Weight loading and distribution, ‘Trimming’ aircraft in accordance with aircraft tables (factors include: loaded weight, air temperature, wind seed and direction, etc.), weather conditions</td>
<td>Temperature, wind, frontal conditions, barometric pressure, micro-bursts, visibility, severe weather proximity (e.g., thunderstorms)</td>
<td>R-T, P</td>
</tr>
<tr>
<td>C</td>
<td>Preparing aircraft for landing</td>
<td>Conditions at destination airport</td>
<td>Temperature, wind, precipitation, frontal conditions, barometric pressure, micro-bursts, visibility, severe weather proximity (e.g., thunderstorms)</td>
<td></td>
</tr>
</tbody>
</table>

*Figure 9. Specific Recreation and Tourism Industry Issues and Information Requirements (continued)*
### Business Activity Area

<table>
<thead>
<tr>
<th>Decisions and Tasks</th>
<th>Information Required</th>
<th>Weather, Climate, and Ocean Data</th>
<th>Data Type</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Sub-sector Category: Aviation (continued)</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>C</strong> How much fuel to load</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>H</strong> Route planning</td>
<td>Routing around thunderstorms, severe weather conditions</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>H, C</strong> De-icing requirements</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td><strong>H</strong> Ensuring safety</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td><strong>H</strong> Tying down aircraft</td>
<td>High winds expected</td>
<td>Wind speed</td>
<td></td>
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<tr>
<td><strong>H</strong> Moving light aircraft to shelter</td>
<td>Hail storms expected</td>
<td>Storm severity, content (e.g., hail), and tracking</td>
<td></td>
</tr>
<tr>
<td><strong>Sub-sector Category: Emergency Management</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Formulation of emergency plans</td>
<td>Specific threats, vulnerability (specific areas, communities, properties, etc.)</td>
<td></td>
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<tr>
<td>Mitigation measures</td>
<td>Vulnerability and risk assessment</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Provisions (issuance of warnings, supplies, services, etc.)</td>
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<tr>
<td><strong>Sub-sector Category: Global Concerns</strong></td>
<td></td>
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<tr>
<td>Greenhouse gas emissions</td>
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<tr>
<td>Safeguarding reputation risk</td>
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<tr>
<td>Participating in Hotel Industry Environmental Initiatives (e.g., IHEI, etc.)</td>
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</tbody>
</table>

**Figure 9. Specific Recreation and Tourism Industry Issues and Information Requirements (continued)**
## Requirements of the U.S. Recreation & Tourism Industry for Climate, Weather, & Ocean Information

<table>
<thead>
<tr>
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<tr>
<td><strong>Sub-sector Category: Global Concerns (continued)</strong></td>
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<tr>
<td>Globalization and harmonization across Group Regions (e.g., Hotel Groups)</td>
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<tr>
<td>Recession of economies in visitor source areas</td>
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<tr>
<td>Cross border liability Issues</td>
<td></td>
<td></td>
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<tr>
<td>Shareholder/stakeholder pressure</td>
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<td></td>
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<tr>
<td>Consumer pressure</td>
<td></td>
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</tbody>
</table>

**Key:**

*Decision taken by (department/responsible position):*

- **F** Finance
- **E** Engineering
- **S** Grounds Managers
- **B** Insurance broker
- **O** Events organizers
- **M** Marketing
- **R** Risk management
- **P** Policy holder
- **H** Headquarters or ‘home base’
- **L** Local economic development councils, conventions and visitor bureaus, tourist councils, etc.
- **B** Buildings
- **G** Guest services
- **I** Insurer
- **C** Captain (vessel skipper, aircraft pilot)

**Data type:**

- **H** Historic
- **R-T** Real time
- **P** Predicted
- **SM** On-site monitoring

Parentheses = former use

*Figure 9. Specific Recreation and Tourism Industry Issues and Information Requirements*
An assessment has been carried out linking decision processes based on quantitative models that compared the traditional approach for incorporating weather information in decision making and a new approach in which four-dimensional fields of metrological variables (as predicted by federal forecast centers) are initially converted by private sector firms into impact variables and decision aids specific to an industry. These are then incorporated numerically into the decision process of individual enterprises (NRC 1998). The implications of this are:

- Federal forecast centers and private sector groups computing impact variables will be more tightly linked than currently and will be engaged in what is essentially a joint venture.
- Meteorologists will be more intimately involved in designing the decision process and less in forecasting the weather.
- Education for meteorologists will be more related to business and financial motivations, methods, and modeling.

The opportunities for weather and climate information companies to work with clients are expanding as attention is more focused on specific businesses.

### 3.4 User Recommendations

The following recommendations are based on suggestions verbally communicated during the course of expert witness interviews and from deductions resulting from the evidence collected by this process. The following list of recommendations is not exhaustive but reflects recurring priority areas:

1. Re-design of the NOAA web site to be more easily navigable and to industry enquirers guiding them clearly to the data that they require;
2. Storage of download data for industry sub-sectors via dedicated portals (e.g., to engineers in hotels or to grounds managers at golf courses);
3. More interaction between NOAA and industry; this could be via focus groups/joint working groups or standing committees with industry. This would facilitate direct communication with industry sub-sectors and operational areas to better understand the information requirements and current gaps in weather, climate, and ocean information needs;
4. Increased communications with the recreation and tourism industry are needed to enable NOAA to communicate to industry the potential business benefits of enhanced data capability and incorporate this into their business forecasting, planning, and budgeting operations;
5. Improved marketing and advertising of NOAA data direct to potential individual users and industry associations so that those in need of information know where this can be accessed (for example, landscape architects should not have to rely on Chambers of Commerce for climate information);
6. Enhanced spatial resolution of information: increasing the number of monitoring stations in each state is necessary as weather events are often highly localized and the current spatial distribution gives inaccurate readings when applied on a larger scale;

7. Enhance temporal predictive capability, especially for severe weather events;
8. Development of a ‘farmers almanac’-type of easily understandable information as it applies specifically to industry sub-sectors;
9. Supply of data in a format suitable for input into business forecast models;
10. For general weather forecasts, greater accuracy over the medium term (1-2 months) and at the longer term (6 months): greater specificity is needed;
11. Improved presentation for the ‘lay’ person (i.e., non-meteorologists);
12. Provision of additional parameters of practical application to a wider range of professionals. For example, landscape architects need sun angles at different times of year;
13. Determine best practice models and case studies of where weather, climate, and ocean data are being used cost effectively to inform business decisions and publish on the Internet and in printed form; and
14. Greater coordination across NOAA with other relevant initiatives (e.g., Climate Indices for the Economy).\(^{130}\)

One of the main shortfalls to greater uptake of NOAA information is the spatial coverage currently offered. Several respondents expressed a need for coverage at a higher resolution (possibly on a grid of 10–20 miles covering the country as many significant ‘weather events’ are localized). In particular, large theme parks require information at this level to comply with EPA regulations. Figure 9 details the overall requirements for weather, climate, and ocean information to inform specific assessments and decisions in the recreation and tourism industry.

3.5 Further Research

A significant finding of the current investigation is the lack of information and studies into the effects of weather, climate, and ocean conditions on the recreation and tourism industry as a whole. It was acknowledged by the industry representative organizations that it would be informative to undertake research projects in the following areas:

1. Correlation analyses between specific weather, climate, and ocean conditions and operational responses in the recreation and tourism industry.
2. Demonstration projects to show the return on investment of weather, climate, and ocean information input into selected business models (this would be beneficial as respondents in the investigation found it hard to visualize how weather, climate, and ocean data would benefit their business forecasting processes and outcomes);
3. Improved business models to incorporate environmental forecast variables to aid companies in business decisions
4. Assessment of training needs for skills building and to enable cross sector uptake and application of weather, climate, and ocean information

\(^{130}\) NOAA’s “Environomics” program seeks to better understand the impact of weather and climate on socio-economic sectors. The program looks at relationships between climate and economic sectors using climate indices which enhance the understanding of how year-to-year variations and trends in weather and climate affect specific sectors. The effects of climate on corn and soybean yield and on residential energy needs were released in 2001. This approach should be extended to the recreation and tourism sector and evaluations made as to the extent to which increased information can lead to economic benefits for the industry as a whole (the indices are being developed by the National Climatic Data Center).
“Good climate information is now widely available in many forms, including electronic dissemination on the Internet. Still many challenges remain. As with all knowledge-intensive processes, the mere generation of information is not enough. Information also has to be transmitted to end-users and put in a form that is relevant to them. And end-users must have the technical, institutional, and financial capacity, as well as the incentive, to use it effectively.”

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Travel Industries Association of America (2002) ‘The Geotourism Study: Phase I Executive Summary,’ Research Department, TIA.


USDA Forest Service Research and Development, ‘Outdoor Recreation in the United States, Results from the National Survey on Recreation and the Environment (NSRE).’


Viner, David & Maureen Agnew, ‘Climate Change and Its Impacts on Tourism,’ Climate Research Unit (CRU), University of East Anglia, Norwich, UK, July 1999.


Appendix A

Interview Results
The following tables summarize the information derived from responses to the interviews of expert witnesses carried out between November 2001 and February 2002. Due to the extensive range and diversity of the recreation and tourism industry, a sample of significant business subsectors, industry organizations and interest groups was selected (see Appendix C for the participating organizations and Appendix B for the interview guidelines). Eighty-five productive interviews were undertaken.

This study is a small but representative sample of the U.S. recreation and tourism industry. Weather, climate, and ocean data use were discussed during the course of the interviews, as well as barriers to the further use of such information. Some relevant topic areas that were not included in the original study specifications arose and were investigated during the research, and were of considerable value in gaining an insight into, and understanding of, the operations of the industry. The study results shown in the following tables are both quantitative and qualitative. They provide detailed information on the current use of climate, weather and ocean data, how data is accessed, and future requirements. To maintain respondents’ confidentiality, details of the expert witness interviews have been submitted to NOAA in a separate document. The presentation below is a distillation of the information in the responses.

The majority of respondents represent private companies in various business areas including hotels and resorts, hospitality industry consultancies, cruise lines, ports and marinas, theme parks, sports stadia, golf courses, the aviation industry, insurance providers, economic councils, and industry representative organizations. The geographic locations of the respondents cover the U.S. and the Caribbean. However, a particular focus was made on the contrasting states of Florida, Arizona and California and on the hotels and resorts sector as examples of the industry as a whole. The major trends identified through the investigation are described below.

◆ Table 7, Appendix A, illustrates an overriding requirement across the industry for daily weather, climate, and ocean information (quoted by a quarter of respondents). Monthly information was the next most demanded temporal interval, closely followed by ‘hourly.’ The majority of respondents requiring hourly data indicated that this was only during times of weather threat (e.g. conditions such as hurricanes, severe storms, etc.) in order to manage emergency preparedness processes. The hourly temporal scale is therefore primarily event-driven. The other major operational purpose for hourly and daily information is maintaining comfort levels in buildings. Distinction needs to be made between respondents’ use of hourly and daily data for, on the one hand, historic purposes, and on the other, forecast or predictive applications. In addition, there is an increasing requirement for real-time data at localized scales.

◆ Many respondents described the geographic scale of the information they required as “local.” While this is a somewhat imprecise spatial measure, it serves to give some notion of the extent to which data needs to be provided. This often means the area covered by local radio or bounded by some natural feature (e.g. a valley, a coastal area, a mountain, etc.) (see table 7, Appendix A).
◆ The means by which the majority of respondents access weather, climate, and ocean information is, not surprisingly, via the Internet (27 percent). However, a considerable proportion (18 percent) indicated that they monitor and collect their own weather, climate, and ocean data (see table 7, Appendix A).
◆ Table 8, Appendix A, shows that although there are many uses to which weather, climate, and ocean data are put, the vast majority of the respondents indicated that they use these data essentially for risk management and mitigation purposes. A fifth of respondents indicated that they are particularly concerned with preparing for severe weather conditions that may affect their property or compromise the safety of their staff and clientele. Regulatory compliance also featured as one of the main purposes to which weather, climate, and ocean information is applied, along with emergency preparedness (in the form of strategic safety planning), resource management, route planning (in the case of the marine transport and cruise industries—which also has safety implications), and purposes related to the design of properties. Virtually no reference was made to using these data for business planning functions or business forecasting, apart from a general acceptance that the recreation and tourism industry is often seasonal in character.
◆ The most quoted sources of weather, climate, and ocean information were NOAA (either directly or indirectly), and respondents’ own data sources (table 9, Appendix A). In keeping with the response that local weather data is of the most use, “local Weather bureaus” rated equally with the NWS for the most often used access points. Some caution needs to be exercised when evaluating these results as the majority of respondents indicated they access multiple sources of weather, climate, and ocean information; hence the results shown in the table total over 100 per cent.
◆ Of the specific parameters of weather, climate, and ocean data used, temperature data received the highest percentage response amounting to 20 percent (see table 10, Appendix A). However, information on wind speed (13 percent), storm tracking (11 percent), cloud cover (9 percent), precipitation (9 percent), and cooling and heating degree-days (6 percent) also received a noteworthy number of responses.
◆ The majority of respondents were accessing sources of weather, climate, and ocean data free of charge. Those organizations subscribing to private services either did not know or were unwilling to provide information on the cost of services to their organizations. DTN (including DTN Intellicast and DTN Marine) was the most popular of the subscription services, but private, tailored consultancy forecast services were almost equally well represented as a source of information (see table 10, Appendix A).
◆ Twenty percent of representatives surveyed indicated that they manipulated data for the purposes of regulatory compliance; this was primarily related to run-off regulations and safety considerations. The second most frequent application of data was via bespoke consultancy services for specified purposes; these often included risk assessment from weather hazards (such as hurricanes), watering regimes for grounds/course maintenance purposes and weather, and climate assessments for bidding for event proposals such as the hosting of the Super Bowl (see table 11, Appendix A). This may suggest that there are additional types of products and models that could be made available through existing suppliers of weather and climate data for a range of business-specific purposes (see table 10, Appendix A).
◆ Table 11, Appendix A lists the comments on the current provision and accessibility of weather, climate, and ocean data and indicates that there are areas where information is required but is not yet available. Many respondents offered suggestions for modifications and recommendations for improvements in a number of different weather products.
### Table 7. Background Information on Interview Respondents

<table>
<thead>
<tr>
<th>Recreation and Tourism Subsector</th>
<th>No. Interviews</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hotels/Resorts <em>(Note 1)</em></td>
<td>19</td>
</tr>
<tr>
<td>Sporting Facilities</td>
<td>2</td>
</tr>
<tr>
<td>Theme Parks</td>
<td>1</td>
</tr>
<tr>
<td>Cruise Lines</td>
<td>3</td>
</tr>
<tr>
<td>Ports/Marinas</td>
<td>5</td>
</tr>
<tr>
<td>Airports</td>
<td>3</td>
</tr>
<tr>
<td>Convention and Visitors Bureaus</td>
<td>4</td>
</tr>
<tr>
<td>Chambers of Commerce &amp; Economic Councils</td>
<td>2</td>
</tr>
<tr>
<td>Insurers &amp; Insurance Bureaus</td>
<td>3</td>
</tr>
<tr>
<td>Industry Organizations</td>
<td>14</td>
</tr>
<tr>
<td>NGOs</td>
<td>4</td>
</tr>
<tr>
<td>Architects/Planners <em>(Note 2)</em></td>
<td>2</td>
</tr>
<tr>
<td>Landscape Architects</td>
<td>1</td>
</tr>
<tr>
<td>Consultancies <em>(Note 3)</em></td>
<td>10</td>
</tr>
<tr>
<td>Retail</td>
<td>2</td>
</tr>
<tr>
<td>Real Estate</td>
<td>2</td>
</tr>
<tr>
<td>Research Centers</td>
<td>4</td>
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<tr>
<td>Other</td>
<td>4</td>
</tr>
<tr>
<td><strong>Total number of interviews—85</strong></td>
<td></td>
</tr>
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</table>

<table>
<thead>
<tr>
<th>Nature of Company/Organization</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Private Corporation</td>
<td>45.8</td>
</tr>
<tr>
<td>Industry Organization</td>
<td>20.3</td>
</tr>
<tr>
<td>Government</td>
<td>3.5</td>
</tr>
<tr>
<td>Local Government</td>
<td>16.9</td>
</tr>
<tr>
<td>Nongovernmental Organization</td>
<td>6.8</td>
</tr>
<tr>
<td>Institute of Higher Education/Research Center</td>
<td>5.1</td>
</tr>
<tr>
<td>Other</td>
<td>1.7</td>
</tr>
<tr>
<td><strong>Total number of organizations—59</strong></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Company/Organization Size</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>10 Employees or Less</td>
<td>13.6</td>
</tr>
<tr>
<td>10-50 Employees</td>
<td>35.6</td>
</tr>
<tr>
<td>50-100 Employees</td>
<td>3.4</td>
</tr>
<tr>
<td>100-500 Employees</td>
<td>18.6</td>
</tr>
<tr>
<td>500 or More Employees</td>
<td>28.8</td>
</tr>
<tr>
<td><strong>Total Responses—59</strong></td>
<td></td>
</tr>
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</table>

<table>
<thead>
<tr>
<th>Annual Revenue</th>
<th>Percentage</th>
</tr>
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<tbody>
<tr>
<td>Less than $1 million</td>
<td>13.6</td>
</tr>
<tr>
<td>$1 million-$5 million</td>
<td>42.4</td>
</tr>
<tr>
<td>$5 million-$50 million</td>
<td>23.7</td>
</tr>
<tr>
<td>$50 million-$500 million</td>
<td>6.8</td>
</tr>
<tr>
<td>$500 million or more</td>
<td>13.6</td>
</tr>
<tr>
<td><strong>Total Responses—59</strong></td>
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</table>
### Table 7. Background Information on Interview Respondents (continued)

<table>
<thead>
<tr>
<th>Business Area</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Accommodations-Hotels</td>
<td>8.9</td>
</tr>
<tr>
<td>Resorts</td>
<td>5.4</td>
</tr>
<tr>
<td>Theme Park</td>
<td>1.8</td>
</tr>
<tr>
<td>Golf Course</td>
<td>1.8</td>
</tr>
<tr>
<td>Cruise Lines</td>
<td>5.4</td>
</tr>
<tr>
<td>Ports &amp; Marinas</td>
<td>5.4</td>
</tr>
<tr>
<td>Airports</td>
<td>1.8</td>
</tr>
<tr>
<td>Industry Organizations</td>
<td>21.4</td>
</tr>
<tr>
<td>Convention &amp; Visitor Centers</td>
<td>5.4</td>
</tr>
<tr>
<td>Chambers of Commerce &amp; Economic Councils</td>
<td>3.6</td>
</tr>
<tr>
<td>Insurance Brokers &amp; Insurers</td>
<td>1.8</td>
</tr>
<tr>
<td>Architects, Landscape Architects &amp; Planners</td>
<td>5.4</td>
</tr>
<tr>
<td>Consultancies</td>
<td>10.7</td>
</tr>
<tr>
<td>Retailers</td>
<td>1.8</td>
</tr>
<tr>
<td>Property Real Estate Agents</td>
<td>1.8</td>
</tr>
<tr>
<td>Nongovernmental Organizations</td>
<td>7.14</td>
</tr>
<tr>
<td>Research Centers</td>
<td>7.14</td>
</tr>
<tr>
<td>Emergency Management Offices</td>
<td>1.8</td>
</tr>
<tr>
<td>Other</td>
<td>1.8</td>
</tr>
<tr>
<td><strong>Total Responses—56</strong></td>
<td></td>
</tr>
</tbody>
</table>

*Note 1:* 13 of the 19 hotel/resort interviews were of Starwood personnel, as this group constituted the main case study of the investigation; two were from a Starwood franchise hotel.

*Note 2:* Architects and planners specializing in hotel and resort development.

*Note 3:* Consultancies interviewed were those specializing in the recreation and tourism sector, or specialist groups of large consultancies working in this sector.
### Temporal Boundaries

<table>
<thead>
<tr>
<th>Time Interval</th>
<th>Actual No. Respondents</th>
</tr>
</thead>
<tbody>
<tr>
<td>10-15 minutes</td>
<td>1</td>
</tr>
<tr>
<td>Hourly</td>
<td>11</td>
</tr>
<tr>
<td>3-4 hours</td>
<td>1</td>
</tr>
<tr>
<td>6-12 hours</td>
<td>2</td>
</tr>
<tr>
<td>Daily</td>
<td>25</td>
</tr>
<tr>
<td>2 days</td>
<td>1</td>
</tr>
<tr>
<td>3-4 days</td>
<td>1</td>
</tr>
<tr>
<td>5 days</td>
<td>1</td>
</tr>
<tr>
<td>7 days</td>
<td>2</td>
</tr>
<tr>
<td>Weekly</td>
<td>4</td>
</tr>
<tr>
<td>Monthly</td>
<td>12</td>
</tr>
<tr>
<td>Seasonal</td>
<td>9</td>
</tr>
<tr>
<td>Annual</td>
<td>6</td>
</tr>
<tr>
<td>Long-term (more than 1 year)</td>
<td>1</td>
</tr>
<tr>
<td>None</td>
<td>5</td>
</tr>
</tbody>
</table>

*Total Responses: 55*

### Geographic Boundaries

<table>
<thead>
<tr>
<th>Area Type</th>
<th>Actual No. Respondents</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Acre or less</td>
<td>2</td>
</tr>
<tr>
<td>1-100 Acres</td>
<td>2</td>
</tr>
<tr>
<td>City</td>
<td>1</td>
</tr>
<tr>
<td>County</td>
<td>0</td>
</tr>
<tr>
<td>State</td>
<td>6</td>
</tr>
<tr>
<td>Regional</td>
<td>18</td>
</tr>
<tr>
<td>National</td>
<td>6</td>
</tr>
<tr>
<td>Global</td>
<td>7</td>
</tr>
<tr>
<td>Local</td>
<td>26</td>
</tr>
<tr>
<td>Varies</td>
<td>1</td>
</tr>
<tr>
<td>None</td>
<td>4</td>
</tr>
</tbody>
</table>

*Total Responses—55*

### Data Source

<table>
<thead>
<tr>
<th>Source</th>
<th>Actual No. Respondents</th>
</tr>
</thead>
<tbody>
<tr>
<td>Consultancy Service/Direct to PC</td>
<td>6</td>
</tr>
<tr>
<td>Fax</td>
<td>2</td>
</tr>
<tr>
<td>Internet</td>
<td>27</td>
</tr>
<tr>
<td>Own/Neighbors’ Monitoring Station</td>
<td>18</td>
</tr>
<tr>
<td>Utility Company</td>
<td>1</td>
</tr>
<tr>
<td>Insurance Broker</td>
<td>1</td>
</tr>
<tr>
<td>Chamber of Commerce</td>
<td>3</td>
</tr>
<tr>
<td>Short-wave Radio</td>
<td>3</td>
</tr>
<tr>
<td>Other (TV, Public Broadcast Radio, Electronic Feed, Newspaper,)</td>
<td>9</td>
</tr>
<tr>
<td>None</td>
<td>4</td>
</tr>
</tbody>
</table>

*Total Responses—55*

**Table 7. Background Information on Interview Respondents (continued)**
Table 8. Main Uses of Climate, Weather, and Ocean Data

<table>
<thead>
<tr>
<th>Uses</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Energy Load Forecasting</td>
<td>5.5</td>
</tr>
<tr>
<td>Energy Demand Forecasting</td>
<td>7.3</td>
</tr>
<tr>
<td>Establish Seasonal Rates/Prices</td>
<td>5.5</td>
</tr>
<tr>
<td>Reducing/Transferring Risk</td>
<td>3.6</td>
</tr>
<tr>
<td>Seasonal Business Forecasting</td>
<td>5.5</td>
</tr>
<tr>
<td>Calculation of Degree Days</td>
<td>5.5</td>
</tr>
<tr>
<td>Establishing “Normal” Weather Conditions</td>
<td>5.5</td>
</tr>
<tr>
<td>Providing Information to Customers</td>
<td>10.9</td>
</tr>
<tr>
<td>Planning Procurement/Storage Volumes</td>
<td>1.8</td>
</tr>
<tr>
<td>Planning Emergency Response</td>
<td>7.3</td>
</tr>
<tr>
<td>Preparing for Severe Weather Conditions</td>
<td>20.0</td>
</tr>
<tr>
<td>Regulatory Compliance</td>
<td>12.7</td>
</tr>
<tr>
<td>Routing Vessels &amp; Aircraft</td>
<td>10.9</td>
</tr>
<tr>
<td>Staffing Level Requirements</td>
<td>3.6</td>
</tr>
<tr>
<td>Environmental/Resource Management</td>
<td>10.9</td>
</tr>
<tr>
<td>Planning Guest Activities</td>
<td>9.1</td>
</tr>
<tr>
<td>Property Design, Materials, Construction Parameters</td>
<td>10.9</td>
</tr>
<tr>
<td>Planning Safety Strategies</td>
<td>10.9</td>
</tr>
<tr>
<td>Marketing &amp; Bid Proposals</td>
<td>9.1</td>
</tr>
<tr>
<td>None</td>
<td>7.3</td>
</tr>
</tbody>
</table>

*Note 4: Sum of percentages is over 100% because weather, climate and ocean data is used for more than one purpose by many organizations.*
<table>
<thead>
<tr>
<th>Sources of Climate/Weather/Ocean Data</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Meteorologix</td>
<td>1.7</td>
</tr>
<tr>
<td>AccuWeather</td>
<td>1.7</td>
</tr>
<tr>
<td>DTN Intelllicast</td>
<td>6.9</td>
</tr>
<tr>
<td>DTN Marine</td>
<td>1.7</td>
</tr>
<tr>
<td>Weather.com</td>
<td>6.9</td>
</tr>
<tr>
<td>Weather Channel</td>
<td>6.9</td>
</tr>
<tr>
<td>NOAA (Nonspecific)</td>
<td>19.0</td>
</tr>
<tr>
<td>NOAA National Weather Service</td>
<td>17.2</td>
</tr>
<tr>
<td>NOAA National Hurricane Prediction Center</td>
<td>6.9</td>
</tr>
<tr>
<td>NOAA Climate Prediction Center</td>
<td>1.7</td>
</tr>
<tr>
<td>NOAA National Ocean Service</td>
<td>1.7</td>
</tr>
<tr>
<td>Weather Fax</td>
<td>3.4</td>
</tr>
<tr>
<td>NOAA Weather Radio</td>
<td>5.2</td>
</tr>
<tr>
<td>“Satellite”/”Radar” (Nonspecific)</td>
<td>13.8</td>
</tr>
<tr>
<td>Internet/Web (Nonspecific)</td>
<td>12.1</td>
</tr>
<tr>
<td>Naval Oceanographic Office</td>
<td>1.7</td>
</tr>
<tr>
<td>SST Chart</td>
<td>1.7</td>
</tr>
<tr>
<td>Private Contractors/Meteorologists/Climatologists</td>
<td>3.4</td>
</tr>
<tr>
<td>Local Weather Bureau</td>
<td>17.2</td>
</tr>
<tr>
<td>Airports</td>
<td>8.6</td>
</tr>
<tr>
<td>Public Sources (Radio, TV, Newspapers, Internet)</td>
<td>3.4</td>
</tr>
<tr>
<td>CNN</td>
<td>3.4</td>
</tr>
<tr>
<td>Lodge Net</td>
<td>1.7</td>
</tr>
<tr>
<td>On-Command Video</td>
<td>1.7</td>
</tr>
<tr>
<td>Snow Report</td>
<td>1.7</td>
</tr>
<tr>
<td>Convention and Visitor Bureau</td>
<td>1.7</td>
</tr>
<tr>
<td>Chambers of Commerce/Economic Development Office</td>
<td>5.2</td>
</tr>
<tr>
<td>Insurance Broker</td>
<td>1.7</td>
</tr>
<tr>
<td>Utility Companies</td>
<td>1.7</td>
</tr>
<tr>
<td>Canadian Hydrographic Service</td>
<td>1.7</td>
</tr>
<tr>
<td>CIMSS</td>
<td>1.7</td>
</tr>
<tr>
<td>USCG</td>
<td>1.7</td>
</tr>
<tr>
<td>Marine Weather.com</td>
<td>1.7</td>
</tr>
<tr>
<td>METEO</td>
<td>1.7</td>
</tr>
<tr>
<td>(DTN) Flightbrief</td>
<td>1.7</td>
</tr>
<tr>
<td>FAA</td>
<td>3.4</td>
</tr>
<tr>
<td>Own Data Source</td>
<td>19.0</td>
</tr>
<tr>
<td>Farmers’ Almanac</td>
<td>1.7</td>
</tr>
<tr>
<td>Tailored Services</td>
<td>3.4</td>
</tr>
<tr>
<td>Other</td>
<td>13.8</td>
</tr>
<tr>
<td><strong>Total Responses—58</strong></td>
<td></td>
</tr>
</tbody>
</table>

Table 9. Sources, Types, Services, and Costs of Climate/Weather/Ocean Data from Respondents
### Types of Climate/Weather/Ocean Data Used

<table>
<thead>
<tr>
<th>Data Type</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Temperature (Real Time)</td>
<td>3.6</td>
</tr>
<tr>
<td>Temperature (Daily)</td>
<td>49.1</td>
</tr>
<tr>
<td>Temperature (Monthly)</td>
<td>5.5</td>
</tr>
<tr>
<td>Temperature (Annual)</td>
<td>1.8</td>
</tr>
<tr>
<td>Temperature (Seasonal)</td>
<td>3.6</td>
</tr>
<tr>
<td>Dew Point</td>
<td>3.6</td>
</tr>
<tr>
<td>Barometric Pressure</td>
<td>9.1</td>
</tr>
<tr>
<td>Cloud Conditions</td>
<td>14.5</td>
</tr>
<tr>
<td>Solar Radiation, Sun/Shade</td>
<td>20.0</td>
</tr>
<tr>
<td>Precipitation</td>
<td>34.5</td>
</tr>
<tr>
<td>Snow Conditions</td>
<td>14.5</td>
</tr>
<tr>
<td>Storm Tracking</td>
<td>1.8</td>
</tr>
<tr>
<td>Relative Humidity</td>
<td>10.9</td>
</tr>
<tr>
<td>Fog/Visibility</td>
<td>10.9</td>
</tr>
<tr>
<td>Severe Weather Conditions</td>
<td>43.6</td>
</tr>
<tr>
<td>Frontal Passages</td>
<td>7.3</td>
</tr>
<tr>
<td>Wind Speed/Direction</td>
<td>40.0</td>
</tr>
<tr>
<td>Wind shear/micro-bursts</td>
<td>3.6</td>
</tr>
<tr>
<td>Lightening/Thunderstorms</td>
<td>10.9</td>
</tr>
<tr>
<td>Storm Surge</td>
<td>5.5</td>
</tr>
<tr>
<td>Water Spouts</td>
<td>1.8</td>
</tr>
<tr>
<td>Ocean/Sea Temperatures</td>
<td>7.3</td>
</tr>
<tr>
<td>Rip Tides</td>
<td>9.1</td>
</tr>
<tr>
<td>Swell</td>
<td>5.5</td>
</tr>
<tr>
<td>Wave Height</td>
<td>5.5</td>
</tr>
<tr>
<td>Fire Weather</td>
<td>3.6</td>
</tr>
<tr>
<td>Other</td>
<td>5.5</td>
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</tbody>
</table>

**Total Responses—55**  
(No. 6)

### Climate/Weather Services Purchased

<table>
<thead>
<tr>
<th>Service</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Meteorlogix</td>
<td>2.7</td>
</tr>
<tr>
<td>AccuWeather</td>
<td>2.7</td>
</tr>
<tr>
<td>DTN Intellicast</td>
<td>10.8</td>
</tr>
<tr>
<td>DTN Marine</td>
<td>2.7</td>
</tr>
<tr>
<td>SST Chart</td>
<td>2.7</td>
</tr>
<tr>
<td>Lodge nNet</td>
<td>2.7</td>
</tr>
<tr>
<td>On-Command Video</td>
<td>2.7</td>
</tr>
<tr>
<td>Snow Report</td>
<td>2.7</td>
</tr>
<tr>
<td>Insurance Broker (part of a package of consultancy services)</td>
<td>2.7</td>
</tr>
<tr>
<td>Private Contractors/Meteorologists/Climatologists</td>
<td>10.8</td>
</tr>
<tr>
<td>Software</td>
<td>8.1</td>
</tr>
<tr>
<td>None</td>
<td>54.1</td>
</tr>
</tbody>
</table>

**Total Responses—37**

Table 9. Sources, Types, Services, and Costs of Climate/Weather/Ocean Data from Respondents (continued)
### Cost of Climate/Weather/Ocean Services

<table>
<thead>
<tr>
<th>Cost of Climate/Weather/Ocean Services</th>
<th>Actual No. Respondents</th>
</tr>
</thead>
<tbody>
<tr>
<td>$1,000 or less per year</td>
<td>1</td>
</tr>
<tr>
<td>$1,000-$5,000 per year</td>
<td>3</td>
</tr>
<tr>
<td>$5,000-$10,000 per year</td>
<td>2</td>
</tr>
<tr>
<td>$10,000-$50,000 per year</td>
<td></td>
</tr>
<tr>
<td>$50,000 or more per year</td>
<td>49</td>
</tr>
<tr>
<td>No Estimates Available</td>
<td></td>
</tr>
</tbody>
</table>

*Total Responses—6*

Notes 5 & 6: Sum of percentages are over 100% because many organizations access more than one source and multiple weather, climate, and ocean parameters.

Note 7: Tailored weather forecasting, severe weather warning, and bespoke software services include TORO Irrigation, Hurritrack, Hurricane Watch, PCW Weather, Baron Services, State Meteorologist, and independent weather consultants.

Table 9. Sources, Types, Services, and Costs of Climate/Weather/Ocean Data from Respondents (continued)
### Table 10. Manipulation of Weather, Climate, and Ocean Data

<table>
<thead>
<tr>
<th>Uses</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Calculations of heating/cooling degree-days; ‘Bin’ levels; BTUs (for maintenance of comfort levels)</td>
<td>9.1</td>
</tr>
<tr>
<td>Calculations from historic data (e.g., probabilities of specific weather events such as hurricanes, floods, etc.) for insurance purposes</td>
<td>1.8</td>
</tr>
<tr>
<td>Estimate Occupancy/RevPar (Hotels/Resorts) <em>(Note 8)</em></td>
<td>5.5</td>
</tr>
<tr>
<td>Estimation of the risk of specific weather events (to plan appropriate emergency preparedness and health and safety considerations)</td>
<td>5.5</td>
</tr>
<tr>
<td>Calculation of run-off associated with specific precipitation events (compliance with EPA regulations)</td>
<td>20.0</td>
</tr>
<tr>
<td>Calculation of the quantity of snow needed to be made for ski runs (if there is a shortfall in snowfall)</td>
<td>3.6</td>
</tr>
<tr>
<td>Estimate of nonproductive days (for drafting building/construction contracts)</td>
<td>3.6</td>
</tr>
<tr>
<td>Estimate of seasonal visitation or attendance at events (e.g. ‘snowbird’ movements; spring training attendance)</td>
<td>3.6</td>
</tr>
<tr>
<td>Calculations of expected weather severity and frequency (applied to building design and materials tolerances)</td>
<td>1.8</td>
</tr>
<tr>
<td>Calculation of sun/shade, microscale temperature differences (e.g. frost pockets); “average” conditions for plantings in designing resorts and external environment</td>
<td>3.6</td>
</tr>
<tr>
<td>Planning optimal time for treatments and resource management (grounds management; when to apply agri-products)</td>
<td>3.6</td>
</tr>
<tr>
<td>Calculation of the amount of irrigation required</td>
<td>3.6</td>
</tr>
<tr>
<td>Calculation of the amount of heating required via underground systems to soften cold hard pitches (e.g. football pitch)</td>
<td>1.8</td>
</tr>
<tr>
<td>Route planning calculations (e.g. cruise lines, transportation, and aviation subsectors)</td>
<td>9.1</td>
</tr>
<tr>
<td>Calculations for configuring aircraft</td>
<td>5.5</td>
</tr>
<tr>
<td>Estimating arrival times based on calculations including weather conditions (e.g. wind speed/direction, additional time factors to avoid weather conditions)</td>
<td>3.6</td>
</tr>
<tr>
<td>Manipulation of data by consultants/use of specialist software packages (e.g., TORO Irrigation, Hurritrack, Hurricane Watch, PCW Weather, and bespoke services of state meteorologists/climatologists, and independent consultants such as Baron Services)</td>
<td>12.7</td>
</tr>
<tr>
<td>No known use/data manipulation</td>
<td>7.3</td>
</tr>
</tbody>
</table>

*Note 8:* This estimation is based on ‘seasonal’ data rather than calculated on a day-by-day or week-by-week response to prevailing weather conditions.
<table>
<thead>
<tr>
<th>Requirements of the U.S. Recreation &amp; Tourism Industry for Climate, Weather, &amp; Ocean Information</th>
</tr>
</thead>
<tbody>
<tr>
<td>Data presentation should be graphical and in pictures.</td>
</tr>
<tr>
<td>Data is needed in degree-days (CDD &amp; HDD).</td>
</tr>
<tr>
<td>Real time data for temperature, wind, and precipitation.</td>
</tr>
<tr>
<td>More granularity of NOAA/NWS data points are needed.</td>
</tr>
<tr>
<td>NOAA needs to better publicize its services and all the information it has available.</td>
</tr>
<tr>
<td>Considerable improvements to NOAA’s Internet site for ease of navigation. (“The National Weather Service has too much data on its Web site that you cannot quickly get to what you want.”)</td>
</tr>
<tr>
<td>There is no standard for snow reporting; i.e., detailed information needs to be made available through the National Weather Service.</td>
</tr>
<tr>
<td>Better accuracy of lightning prediction; improved projections of winter storms, and solar radiation data.</td>
</tr>
<tr>
<td>Real time lightning data—at street-level resolution.</td>
</tr>
<tr>
<td>Enhanced reliability of data streaming/supply (there is a tendency for NOAA to go on and off the air intermittently). Variations in stations’ data and technical problems, such as close-downs, create gaps in the data set. (“Quality issues” need to be rectified—greater reliability of source data for computer-based programs is needed.)</td>
</tr>
<tr>
<td>NOAA should not regard itself as a potential sole supplier. Most weather-sensitive operators gather information from a number of sources.</td>
</tr>
<tr>
<td>NOAA produces far too sophisticated data. (Many end-users engage consultants or other service providers to tailor NOAA’s weather, climate, and ocean information products to their needs.)</td>
</tr>
<tr>
<td>Should be more user friendly data, more data available on a worldwide Web basis, and more comparative data.</td>
</tr>
<tr>
<td>Additional coverage beyond the limits of the continental United States (e.g., the Bahamas and the Caribbean) is needed.</td>
</tr>
<tr>
<td>Variable spatial resolution is required (e.g., when tracking a tropical storm, a very wide area of coverage is needed from the mid-Atlantic to mid-Gulf of Mexico to Cape Fear and the mid-Carolinas; also, when tracking a specific hurricane, access is required to the highest resolution available).</td>
</tr>
<tr>
<td>The temporal resolution required varies greatly according to specific needs. Although daily forecasts are generally useful, in the hurricane season 7- to 8-day forecasts are necessary (particularly for the marine transport and cruise industry).</td>
</tr>
<tr>
<td>There is a need for better probability/projections/estimates in forecasting: specialized hourly information during times of severe storms, on conditions such as tidal surges, sea state, and wave height.</td>
</tr>
<tr>
<td>Climate change conditions and microclimatic effects (e.g., around San Diego, the urban heat island effect has led to stronger winds than previously).</td>
</tr>
<tr>
<td>Rip tide conditions; storm surge and tide data are necessary to apply to models, carry out preliminary damage assessments (e.g. may utilize storm wave values).</td>
</tr>
<tr>
<td>Real-time monitoring of wind conditions.</td>
</tr>
</tbody>
</table>

Table 11. Recommendations of Expert Witnesses for Modifications/Additions to Available Weather, Climate, and Ocean Data (Recommendations and Opinions Taken from Interviewee Comments)
NOAA should actively encourage all hotel, motel, and accommodation facilities to have Weather Radio connected to in-house TV systems and linked to satellite subscriber facilities. (A radio should be constantly tuned into a given frequency and activated remotely when severe weather warnings are given by an audible tone and a computer voice describing the type of weather likely to be experienced).

Wider coverage of high-resolution actual and forecast weather data, (particularly upper atmosphere winds and temperature) and air moisture content.

Convective storms are a problem in the United States in summer: accurate prediction of thunderstorms within a 6-hour window is needed, (currently thunderstorms can be predicted with an acceptable level of accuracy approximately 1 hour before they arrive; satellite data and lightning detection provide only observations of events as they occur, not prediction of events). Baseline criteria must be over 90% surety.

The nature of long-range (e.g., 6-month) forecasting is too probabilistic. (It may take the form of a numerical value, such as predicting in 6 months time, there may be, on a scale of 1 to 5, a likelihood of getting a hurricane.) Surety level need to be improved.

Sun/shade effects are needed, particular at coastal locations, e.g., the inclination of the sun during different seasons.

Accurate high spatial resolution forecast and trends analysis of the amount of precipitation at individual locations (e.g., “a difference of 30 inches of rainfall can be found on different sides of quite small islands, even if data points are only 20 miles apart”).

Additional on-the-ground weather stations are needed.

Higher resolution wind speed data on a local basis and higher resolution forecasts describing atmospheric conditions generally are needed.

Greater accuracy in long-term as well as short-term forecasts, with more information on the likely deviations from these forecasts. and an easily understood method of expressing the confidence level of forecasts is needed.

Weather fronts and the nature of the precipitation likely (light showers or heavy rain).

Studies on “normal weather” and deviations or extremes of temperature and precipitation.

More electronically accessible data and more standardized data from various geographic locations.

Improved long-and short-term forecasting accuracy. Increased availability of historic/archive weather data for cities.

Web-based, historical series going back 100+ years

Table 11. Recommendations of Expert Witnesses for Modifications/Additions to Available Weather, Climate, and Ocean Data (Recommendations and Opinions Taken from Interviewee Comments) (continued)
Appendix B

NOAA Recreation and Tourism Sector: Guidelines for Interviews Form

Background Information:
Company/Organization: __________________________________________________________
Date (MM/DD/YYYY): ____________________________________________________________
Respondent’s Name: _____________________________________________________________
Title/Position: _________________________________________________________________
Phone #: _________________________________________________________________________
Fax #: __________________________________________________________________________
E-mail Address: _________________________________________________________________
Website: _________________________________________________________________________

Nature of Company:
☐ Private Corporation
☐ Public Corporation
☐ Limited Liability Company
☐ Trade Association
☐ Government
☐ Partnership
☐ Other: ________________________________________________________________

Geographic Scope of Business Activities:
Is your business in the recreation or tourism sector?
☐ Recreation
☐ Tourism

Recreation activity (list activities):

Tourism (list locations or state whether USA-wide or global)

State (List States): ____________________________________________________________
Region: ___________________________________________________________________
National: __________________________________________________________________
International (List Countries): _____________________________________________
Size of Organization:
- 10 Employees or Fewer
- 10-50
- 50-100
- 100-500
- 500 or more

Annual Turnover:
- Less than $1 million
- $1 million-$5 million
- $5 million-$50 million
- $50 million-$500 million
- $500 million or more

Principal Business Areas
1. What, if anything, does your organization specialize in? (e.g. activity trips such as canoeing, climbing, scuba diving, historical tours, mystery weekends, etc.)
2. Is this a business growth area? Y ____ N ____
3. Does your business concentrate on outdoor activities?
4. Are these seasonal activities (i.e. weather dependent)?
5. Tour operator; Cruise line; Travel Agent; Ecotourism; Hotel; Tourism Support
Other _____________________________________________________________

Use of Weather/Climate Data (Please use as much space as you wish to respond to the open-ended questions. If responding on hard copy, attach a sheet and indicate the number of the question being answered)
1. Describe how your organization uses climate/weather data.
2. Who in your organization is responsible for obtaining weather/climate data?
3. To whom in your organization is weather/climate data distributed?
4. What are your organization’s current sources for weather-related data?
5. What types of data does your organization use (i.e. storm tracking, ocean currents, temperature, cloud cover, wind speed, atmospheric conditions, etc.)?
6. What types, if any, weather-related services does your organization purchase?
7. What is the cost of any weather-related services that your organization purchases?
   How much does your organization spend in total on purchasing weather/climate information ($/per annum)?
8. What are the temporal boundaries of the data you use? (Check all that apply)
   - Up-to-the-minute
   - Hourly
   - Daily
   - Weekly
   - Monthly
   - Seasonal
   - Long-term (More than One Year in Advance)
9. What are the geographic boundaries of the data you use? (Check all that apply.)

- 1 acre or less
- 1-100 acres
- City
- County
- State
- National
- Global

10. In which geographic areas do you operate?

11. How do you obtain the weather and climate data you use? (Check all that apply)

- Service
- Fax
- Internet
- Television
- Radio
- Other: ________________________________

Through an:
Agency:
- Trade association
- Local press

12. Do you manipulate the data you obtain to make it more usable to your organization? If so, please describe.

13. Can you estimate the dollar value of the data you use?

14. What modifications or additions could be made to available climate/weather data to increase its value to your organization?

15. Does your organization/company insure against adverse weather events?

16. If so is this a separate liability insurance or part of a general insurance package?

17. From which supplier does your organization purchase this information?

18. Does weather/climate impact your business? Y N

19. If so, how?

20. On a 1 to 5 point-scale, how would you rate the importance of climate/weather data to your business (5 = most important)?

<table>
<thead>
<tr>
<th></th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
</table>

21. Is it becoming more or less important to your business (or no change)?

22. Perception of the importance of weather/climate information—is it becoming increasingly or less important?
23. Does global warming/climatic change influence your need for weather/climate information?
24. Does the organization have the necessary staff skills to make good use of weather/climate data and its analysis?
25. If weather/climate data is important to your business, how is it important (e.g., is it used to inform the decision-making process, risk assessment, marketing strategy, etc.)?
26. In what form is weather/climate data most useful to you?
27. Along with other factors that influence your business, rank the level of importance of weather/climate, i.e.,

<table>
<thead>
<tr>
<th>Issue, (e.g., terrorism, inflation, road conditions, shark presence)</th>
<th>Rank (1, 2, 3, etc., decreasing level of importance, i.e., 1=most important)</th>
</tr>
</thead>
<tbody>
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</tr>
</tbody>
</table>
Appendix C

Organizations Contacted

Telephone Interviews

Leisure/Recreation
Baltimore Ravens, PSINet Stadium

Hotels
Starwood
— Corporate Public Relations
— Environmental Risk Safety
— Risk Management
— Acquisitions and Development
— Sales
— Public Relations
— Finance
— Engineering
— Architecture & Construction

The Sheraton, Rittenhouse Square, Philadelphia (Starwood franchise)
— Sales and Marketing

Six Continents Hotels
HQ Purchasing & Services

Fairmont Hotels & Resorts
Environment

Marriott Hotels
Engineering for International Hotels

Holiday Inn Sully Beach, Charleston, SC
(Six Continents Group)

Vail Mountain Lodge and Spa

Stowe Mountain Resort
Communications

Theme Parks
Disney World

Golf Course
Kiawah Island Resorts, The Ocean Golf Course
— Golf Operations
Turtle Point, Kiawah Island

Cruise Lines
Princess Cruises
Marine Operations

Windstar Cruises
Nautical Operations

Disney Cruise Lines
Safety Management Systems, Quality Assurance Dept.

Ports
South Carolina Ports
— Operations

Port Canaveral Authority
— Environmental Programs
— Security

Canaveral Pilots Association
Port Operations

Airports
Phoenix Sky Harbor
— Department of Aviation
— FAA

Convention and Visitor Centers
Arizona Office of Tourism
Research

Miami Convention and Visitors Bureau
— Research and Information
— Sales

Phoenix Convention & Visitors Bureau

Chambers of Commerce and Economic Councils
The Beacon Hill Economic Council, Florida
Research

Megacorp
Mesa Office of Economic Development

Insurance Brokers and Insurers
AON
Requirements of the U.S. Recreation & Tourism Industry for Climate, Weather, & Ocean Information

Alliance of American Insurers (AAI)
Association of British Insurers

Industry Organizations
NARRP
ICAVB, Research
DOC–TIA
— Research & Technological Planning
AHLA
Information Center
American Society of Travel Agents (ASTA)
Research
International Council of Aircraft Owner and Pilot Associations (IAOPA)
FAA
Air Transport Association (ATA)
— Meteorology
IATA
Flight Operations
Northwest Cruise Line Association
US Sailing Assn.

NGOs
IHEI
Green Globe
UNEP Tourism Initiative
Oceans Blue Foundation-Canada
— Meetings Initiative

Architects & Planners
WAT&G (Newport Beach, CA)
Sandy & Babcock International

Landscape Architects
EDSA

Consultancies
Andersen Consulting
— Hospitality Knowledge Services
PricewaterhouseCoopers
Hospitality and Leisure
AmEx Consulting Services
Smith Travel Research
DK Shifflet & Associates
Everguard Technical Services

Retailers
LL Bean
Public Relations Department
National Marine Manufacturers Association

Property
James Lang LaSalle Hotels

Research Centers/Universities
GWU Dept International Tourism
GWU Aviation Department
Florida State University
Department of Oceanography & Atmospheric Sciences
University of Northern Arizona (Flagstaff)
Hospitality Research Center

Emergency Management
Brevard County (FL) Emergency Management Service

Miscellaneous
Organization of American States

Correspondence
Appendix D

Tourism Development Risk Factors

◆ Demand variables:
  — Economic conditions in major outbound markets
  — Changing travel fashions
  — Seasonality
  — Overall business environment
  — Tour operator interest
  — Relative cost of travel to the destination
  — Transportation access

◆ Oversupply prompting price wars/reduced occupancies

◆ Political conflicts, safety problems, terrorism

◆ Health concerns

◆ Economic instability resulting in inflation, recession, foreign exchange fluctuations and shortages, repatriation difficulties, cost overruns, etc. and damaging the overall business climate

◆ Cost overruns resulting from inaccurate cost estimates, implementation delays, changes in project scope, cost increases in labor, import taxes, and construction materials

◆ Implementation delays that cause repayment difficulties and loan rescheduling, e.g., poor project management, unrealistic timetables, difficulty obtaining locally made construction materials and/or import licenses, and project scope changes

◆ Inappropriate fit between hotel product-market/operator

◆ Government support that is expected but not received, such as infrastructure, investment grants and incentives, training, and tourism promotion

◆ Natural disasters: Earthquakes, hurricanes, flooding, landslides, etc.

◆ Environmental concerns: Pollution, overcrowding, coastal erosion, water supply.

◆ Environmental and social issues

◆ Land Use: Where no strategic tourism development plan exists, special studies, which examine the more regional impacts of a project may be required by IFC. This can involve a wide range of environmental and social topics where, overall, the scale of such an exercise can be significant, especially on a small project.

◆ Sewage and Wastewater Disposal: This is a concern in several tourism investments. IFC projects located where sewage treatment facilities are nonexistent or inadequate must install on-site sewage treatment plants or, at a minimum, pretreat before discharge. Completion dates for providing or upgrading municipal sewage installations are often not reliable.

◆ Water Supply: Where sponsors draw water from the ground or surface water, they should demonstrate that their extraction rates are sustainable and will not negatively impacts other users. Community relationships may require hotels to share such water with the local population.

◆ Fire and Safety: Sponsor compliance with IFC’s fire and safety guidelines has become a serious issue, where sponsors do not fulfill their obligations. Independent audits of the design, specification and construction of life safety features within the building must be required.

◆ Squatters and Rezoning: Derelict hotel buildings and sites located in over-populated areas often have squatters who must be rehoused. In other instances, changes in planning or land use may require current users to be relocated so they can continue their activities within the community.
# Appendix E

<table>
<thead>
<tr>
<th>Web Site Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Agricultural Weather</td>
<td></td>
</tr>
<tr>
<td>2. Alberta Hail Project Meteorological and Barge-Humphries Radar Archive</td>
<td></td>
</tr>
<tr>
<td>3. Alberta Weather Conditions and Forecasts</td>
<td></td>
</tr>
<tr>
<td>4. Atmospheric Environment Service</td>
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<tr>
<td>5. British Columbia Weather Conditions and Forecasts</td>
<td></td>
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<tr>
<td>6. Canada Centre for Remote Sensing (CCRS)</td>
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<tr>
<td>7. Canadian Global Energy and Water Cycle Experiment Program</td>
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<tr>
<td>8. Canadian Institute for Climate Studies</td>
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<tr>
<td>9. Canadian Meteorological and Oceanographic Society</td>
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<tr>
<td>10. Canadian Society of Agrometeorology</td>
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<tr>
<td>11. Climate and Atmospheric Research Directorate (CARD)</td>
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<tr>
<td>12. Cryospheric System (CRYSYS)</td>
<td></td>
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<tr>
<td>13. Current Weather and Tides–PEI</td>
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<tr>
<td>14. Earth Observations Lad/York Ontario (BOREAS)</td>
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<td>15. Environment Canada</td>
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<tr>
<td>16. Environment Canada Atlantic Region</td>
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<tr>
<td>17. Freese-Notis Weather.Net</td>
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</tr>
<tr>
<td>18. Manitoba Weather Conditions and Forecasts</td>
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<tr>
<td>19. MSNBC Weather: Canada</td>
<td></td>
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<tr>
<td>20. National Weather Conditions Summary</td>
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<tr>
<td>21. New Brunswick Weather Conditions and Forecasts</td>
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<tr>
<td>22. Nova Scotia Weather Conditions and Forecasts</td>
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<tr>
<td>23. Ontario Weather</td>
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<tr>
<td>24. PEI Weather Conditions and Forecasts</td>
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<tr>
<td>25. Public Weather Forecasts</td>
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<tr>
<td>26. Quebec Weather Conditions and Forecasts</td>
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<tr>
<td>27. Radar/Satellite Images</td>
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<tr>
<td>28. Saskatchewan Weather Conditions and Forecasts</td>
<td></td>
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<tr>
<td>29. The Old Farmers Almanac–For Five Regions of Canada</td>
<td></td>
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<tr>
<td>30. The Weather Network On-Line</td>
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<tr>
<td>31. Weather–SW Ontario on Detroit Radar Loop</td>
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<tr>
<td>32. Weather Channel</td>
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<td>33. Weather Office</td>
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<td>34. Weather Sense</td>
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<tr>
<td>35. Weather Wizard–Weather Station</td>
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<tr>
<td>36. Weathertec Services</td>
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</tbody>
</table>
# Appendix F

## Recreation Activities

### Aquatic Activities

#### Sports

<table>
<thead>
<tr>
<th>Kayaking</th>
<th>Diving</th>
<th>Wake Boarding</th>
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</thead>
<tbody>
<tr>
<td>Canoeing</td>
<td>Scuba Diving</td>
<td>Jet Skiing</td>
</tr>
<tr>
<td>Rowing</td>
<td>Free Diving</td>
<td>Wind Surfing</td>
</tr>
<tr>
<td>Rafting</td>
<td>Snorkeling</td>
<td>Parasailing</td>
</tr>
<tr>
<td>Tubing</td>
<td>Motor Boating</td>
<td>Fishing/Spear Fishing</td>
</tr>
<tr>
<td>Surfing</td>
<td>Sailing</td>
<td>Spelunking</td>
</tr>
<tr>
<td>Swimming</td>
<td>Boat Racing</td>
<td>Water Polo</td>
</tr>
</tbody>
</table>

#### Cruises

<table>
<thead>
<tr>
<th>Cold Weather Ocean Liners (e.g., Alaska)</th>
<th>Private Yacht Cruises/Charter Boats</th>
<th>Beaches</th>
</tr>
</thead>
<tbody>
<tr>
<td>Warm Weather Ocean Liners (e.g., Caribbean)</td>
<td>River Cruises</td>
<td>Beach Resorts (Full-Service Resorts)</td>
</tr>
<tr>
<td>Banana Boat/Freighter Cruises (Inexpensive Working Boat Vacations)</td>
<td>World Tour Cruises</td>
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<tr>
<td></td>
<td>Boat Tours (Day Tours)</td>
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<tr>
<td></td>
<td>Submersible Tours</td>
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</tbody>
</table>

### Terrestrial Activities

#### Recreational/Amateur Sports

<table>
<thead>
<tr>
<th>Archery</th>
<th>Flying Disks</th>
<th>Lacrosse</th>
</tr>
</thead>
<tbody>
<tr>
<td>Badminton</td>
<td>Football (American)</td>
<td>Martial Arts</td>
</tr>
<tr>
<td>Baseball</td>
<td>Gymnastics</td>
<td>Racquetball</td>
</tr>
<tr>
<td>Softball</td>
<td>Horse Racing Polo</td>
<td>Running</td>
</tr>
<tr>
<td>Basketball</td>
<td>Rodeo</td>
<td>Rugby</td>
</tr>
<tr>
<td>Boxing</td>
<td>Other Equestrian Events (e.g., Dressage)</td>
<td>Soccer</td>
</tr>
<tr>
<td>Cycling</td>
<td>Volleyball</td>
<td>Squash</td>
</tr>
<tr>
<td>Fencing</td>
<td>Weightlifting</td>
<td>Tennis</td>
</tr>
<tr>
<td>Field Hockey</td>
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<td>Triathlon</td>
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</tbody>
</table>

#### Extreme Sports

<table>
<thead>
<tr>
<th>Adventure Racing</th>
<th>Motocross</th>
<th>Scooters Skateboarding</th>
</tr>
</thead>
<tbody>
<tr>
<td>BMX</td>
<td>Mountain Biking</td>
<td>Sky Surfing</td>
</tr>
<tr>
<td>Inline Skating</td>
<td>Mountain Boarding</td>
<td>Street Luge</td>
</tr>
<tr>
<td>Land Sailing</td>
<td>Sand Boarding</td>
<td></td>
</tr>
</tbody>
</table>
### Winter Sports

- Biathlon
- Curling
- Dog Sledding
- Ice Boating
- Ice Climbing
- Ice Hockey/Ice Skating
- Luge/Bobsledding
- Cross Country Skiing
- Skiing
- Snow Boarding
- Snowmobiling
- Snowshoeing
- Speed Skating

### Outdoor Activities

- Camping
- Canyoning
- Caving
- Climbing
- Hiking
- Mountaineering
- Orienteering
- Paintball
- Visiting National Parks

### Events

#### Highland Games (Celtic/Scottish Festivals)

- Olympic Games
- Lumberjack Games
- Strongman Competitions

### Games

- Billiards
- Darts
- Foosball (Table Soccer)
- Gambling
- Miniature Golf
- Snooker
- Table Tennis

### Arial Activities

- Air Shows/Aerobatics
- Ballooning
- BASE Jumping
- Bungee Jumping
- Gliding/Soaring
- Hang Gliding
- Paragliding
- Sky Diving

### Cultural Activities

#### Amusement and Theme
- Parks
- Boardwalks
- Roller Coasters
- Water Parks
- Wild Life Reservations
- Zoos
- Animals
- Art
- Cooking
- Crafts
- Dance
- Farmers Market
- Flower and Garden
- Music
- Renaissance
- Street Market/Flea Market

#### Festivals and Fairs

- Gardens
- Historical Gardens
- Mazes

#### Beauty and Fitness

- Pageants
- Cooking Schools

- Museums

- Theatre/Spectacle
  - Ballet
  - Circus
  - Fireworks
  - Magic Shows
  - Opera
  - Plays
  - Puppet Shows
### Seasonal

| Christmas Tree Farms | Fruit/Vegetable Picking (e.g., Apples, Pumpkins) | Leaf Peepers (Fall Foliage) |

### Automotive

| Amateur Racing | Auto Shows | Off Roading |
| Dune Buggies | Go-Karts | Rving |
| Hovercraft | Monster Truck Raleigh |

### Tours and Theme Holidays

| Adventure Vacations (e.g., Outward Bound, NOLS) | Culinary/Gastronomic Holidays | Religious/Self-Awareness Pilgrimages and Vacations |
| Air Tours (Balloon, Helicopter, Plane) | Dance Holidays | Safaris (Animal Observation/Interaction) |
| Antiques Tours | Dude Ranches | Scenic Bus Tours |
| Art/Architecture | Eco-Tours | Ski Resorts |
| Archeology/Paleontology | Gambling Vacations | Sports Tours |
| Automotive/Motorcycle Tours | Heritage Tours | Theatre Holidays (e.g., Opera, Ballet, Orchestra, Theatre) |
| Beach Resorts | Historical Tours | Volunteer/Conservation Vacations |
| Cruises (See Aquatic Activities for more detail) | Hunting | |
| | Murder/Mystery | |
| | Paranormal Phenomena | |
| | Prospecting/Mining | |

### Hobby Conventions and Shows

| Amateur Ham Radio | Collecting (e.g., Stamps, Coins) | Kites |
| Antiques | Computers/Technology/Electronics | Magic |
| Art/Architecture | Crafts | Models (e.g., Miniatures, Replicas, Remote Control) |
| Astronomy | Dolls/Doll Houses | Pets/Animal Shows and Competitions |
| Auto Shows | Fire Arms/Hunting | Photography |
| Beachcombing | Fish/Aquariums | Rocks, Gems and Minerals |
| Bell Ringing | Flower and Garden Shows | Role-Playing Games/Board Games |
| Birding | Genealogy | Video Games |
| Books | Home Brewing |
| Chess | |

### Fire Arms

| Hunting/Game Reserves | Skeet and Trap Parks |

### Hobby Conventions and Shows

| Amateur Ham Radio | Collecting (e.g., Stamps, Coins) | Kites |
| Antiques | Computers/Technology/Electronics | Magic |
| Art/Architecture | Crafts | Models (e.g., Miniatures, Replicas, Remote Control) |
| Astronomy | Dolls/Doll Houses | Pets/Animal Shows and Competitions |
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| Bell Ringing | Flower and Garden Shows | Role-Playing Games/Board Games |
| Birding | Genealogy | Video Games |
| Books | Home Brewing |
| Chess | |

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Appendix G

Recreation and Tourism Economic Data

Sample Tourist Flow Maps for three states
(Number of Interstate Personal Trips into Destination State)

Arizona

Interstate Personal Trips to State of Destination: 8.23 million

California

Interstate Personal Trips to State of Destination: 16.60 million
Requirements of the U.S. Recreation & Tourism Industry for Climate, Weather, & Ocean Information

Interstate Personal Trips to State of Destination: 28.94 million
Appendix H

Trade Associations/Industry Organizations

National Level Associations


The American Hotel & Lodging Association (AH&LA) is the largest hotel and lodging association in the world, with members ranging across all segments of the lodging industry—from economy properties to five-star resorts (13,000 property members worldwide, representing more than 1.7 million guest rooms).

Travel Industry Association of America, 1100 New York Avenue, NW, Suite 450, Washington, DC 20005-3934, Phone (202) 408-8422, Fax (202) 408-1255 www.tia.org

The Travel Industry Association of America (TIA), in existence since 1941, is the Washington, DC-based, nonprofit association that represents and speaks for the common interests and concerns of all components of the U.S. travel industry. The recognized leader in promoting and facilitating increased travel to and within the United States in order to make America the world’s number one tourism destination. The authoritative and recognized source of research, analysis, and forecasting for the entire industry and its primary spokesperson to the domestic and international media.

Travel and Tourism Research Association, P.O. Box 2133, Boise, ID 83701, Phone (208) 429-9511, Fax (208) 429-9512, www.ttra.com

TTRA is an international network of more than 800 travel and tourism research and marketing professionals from a wide variety of backgrounds. (Categories are listed on the membership application form.) Organized in 1970 and joined together in a nonprofit venture, members learn from one another and develop systems that help them grow professionally.

Hospitality Financial & Technology Professionals (HFTP), 11709 Boulder Lane, Suite 110, Austin, TX 78726, Phone (512) 249-5333, Fax (512) 249-1533, http://www.hftp.org/

Hospitality Financial & Technology Professionals (HFTP) is the society for financial and MIS professionals in the hospitality industry. More than 4,300 members from around the world enjoy the many benefits HFTP offers.


Largest international association of hospitality sales and marketing professionals.

Club Managers Association of America (CMAA), 1733 King Street, Alexandria, Virginia 22314, Phone (703) 739-9500, Fax (703) 739-0124, http://www.cmaa.org

The Club Managers Association of America (CMAA) is the professional Association for managers of membership clubs. CMAA has more than 5,000 members who manage more
than 3,000 countries, city, athletic, faculty, yacht, town and military clubs. The objectives of
the association are to promote and advance relations among persons connected with the
management of clubs and other associations of similar character, to encourage the education
and advancement of its members, assist club officers and members, through their managers,
and to secure the utmost in efficient and successful operations.

**United States Tour Operators Association (USTOA),** 275 Madison Avenue, Suite 2014,
New York, NY 10016, Phone (212) 599-6599, Fax (212) 599-6744, [www.ustoa.com](http://www.ustoa.com)

United States Tour Operators Association (USTOA) is a professional association
representing the tour operator industry. They are composed of companies whose tours and
packages encompass the entire globe and who conduct business in the U.S.

**American Resort Development Association,** Washington Office, 1201 15th Street, NW,
Suite 400, Washington, D.C. 20005, Phone (202) 371-6700, Fax (202) 289-8544,
[www.arda.org](http://www.arda.org)

The American Resort Development Association (ARDA) is the Washington, D.C.-based
trade association representing the vacation ownership and resort development industries.
Established in 1969 as the American Land Development Association, ARDA today has close
to 1,000 members, ranging from privately held companies to major corporations, in the U.S.
and overseas.

**Outdoor Amusement Business Association, Inc.,** 1035 S. Semoran Blvd., Suite 1045A,
Winter Park, FL 32792, Phone (407) 681-9444, Fax (407) 681-9445, [www.oaba.org](http://www.oaba.org)

The largest North American trade association with close to 5,000 members has been a leader
in the development of amusement ride standards and state legislation regarding such devices.

**“Green” Hotels Association,** P. O. Box 420212, Houston, TX 77242-0212, Phone (713)
789-8889, Fax (713) 789-9786, [www.greenhotels.com](http://www.greenhotels.com)

“Green” Hotels are properties whose management is eager to institute programs that save
water and energy and reduce solid waste and help Save Our Planet!

**State-Level Associations**

**Alaska Hospitality Alliance,** 330 E. 4th Avenue, Suite 201, Anchorage, AK 99501, Phone
(907) 929-4242, Fax (907) 222-2995, [http://home.gci.net/~akhma/](http://home.gci.net/~akhma/) Executive Vice President,
Karen R. Rogina, Phone (907) 222-2992

As partners in the Alaska Hospitality Alliance, ARBA (Alaska Restaurant & Beverage
Association) and AKH&MA (Alaska Hotel & Motel Association) work together to develop
and sustain a hospitality industry-friendly business environment in Alaska, ensuring the best
possible opportunity for Alaska’s food and beverage and lodging operations to flourish.

**Alabama Hospitality Association,** 61 B Market Place, Montgomery, AL 36117, Phone
(334) 244-1320, Fax (334) 244-9800 fax, [http://www.stayandplayalabama.com/](http://www.stayandplayalabama.com/)
Arkansas Hospitality Association, 603 S. Pulaski, P.O. Box 3866, Little Rock, Arkansas 72203, Phone (501) 376-2323, Fax (501) 376-6517, http://www.arhospitality.org/movie.htm

The Arkansas Hospitality Association is the official voice of the Arkansas Restaurant Association, the Arkansas Lodging Association, and the Arkansas Travel Council (which includes all travel-oriented businesses). In addition, the Arkansas Hospitality has membership categories for educators, students, and associate vendors.


Established in 1938, AZHMA is the 10th largest affiliate of the American Hotel & Motel Association with 560 Arizona hotels, motels, and vendors. Over half the guest rooms in Arizona are represented.

California Hotel & Lodging Association, P.O. Box 160405, 414 29th Street, Sacramento, CA 95816, Phone (916) 444-5780 or (916) 444-5848, http://www.chma.com

The California Hotel & Lodging Association, with more than 1,550 members representing more than 182,000 guestrooms, is the largest and most influential state lodging trade association in the world. CH&LA’s history of service to California’s lodging industry reaches back 106 years.

Colorado Hotel & Lodging Association, 730 17th Street, Suite #920 Denver, CO 80202, Phone (303) 297-8335, Fax (303) 297.8104, http://www.coloradolodging.com/

Connecticut Lodging Association, 731 Hebron Avenue, Glastonbury, CT 06033, Phone (860) 657-2259, Fax (860) 657-8241


The Hotel Association of Washington, D.C. was established in 1906 as a nonprofit trade association. The Hotel Association represents the interests of over eighty member hotels in the District of Columbia on a variety of governmental and public affairs issues.

Delaware Hotel & Lodging Association, PMB 115, 251 N. DuPont Highway, Dover, DE 19901, Phone (866) 757-0637, Fax 866) 757-4602

Florida Hotel & Motel Association, Hospitality Square, 200 Theyst College Ave., P.O. Box 1529, Tallahassee, Florida 32302-1529, Phone (850) 224-2888, Fax (850) 222-3462, http://www.flahotel.com/

The Florida Hotel & Motel Association was founded in 1912 to facilitate better communications and foster professionalism within the growing Florida lodging industry. One of the three largest lodging associations in the country, FH&MA has more than 1,100 members and is governed by a 70-member Board of Directors which represents both the large, franchised chains and independent lodging owner/operators in Florida.
Georgia Hospitality and Travel Association, 600 Theyst Peachtree Street, Suite 1500, Atlanta GA, 30308, Phone (404) 873-4482, Fax (404) 874-5742, http://www.ghta.com

Georgia Hospitality and Travel Association represents over 2,300 businesses in the lodging, food service, licensed beverage, and travel industries and provides Georgia’s entire hospitality industry with a strong voice in governmental affairs, an affordable source of continuing education, opportunities for professional development, and promotes travel, tourism, and dining in Georgia. GHTA is a private sector, not-for-profit professional trade association founded in 1977 by merging five independent travel industry associations.

Hawaii Hotel Association, 2250 Kalakaua Avenue #404-4, Honolulu, HI 96815, Phone (808) 923-0407, Fax (808) 924-3843, http://www.hawaiihotels.org

The Hawaii Hotel Association (HHA) is a statewide trade association of hotels, hotel management firms, hotel owners, suppliers, and other related firms and individuals. Established in 1947, this nonprofit organization’s original membership consisted of 16 hotels to represent the interest of the state’s lodging industry. Today, the membership consists of over 180 hotels, representing 50,900 rooms.

Iowa Lodging Association, 9001 Hickman Road, Suite 220, Des Moines, IA 50322, Phone (515) 278-8700, Fax (515) 278-0245, http://www.iowalodgingassociation.org

Idaho Lodging & Restaurant Association, 1005 Hoff Building, P.O. Box 1822, Boise, ID 83701, Phone (208) 344-6877, Fax (208) 344-9563.

Hotel Motel Association of Illinois, 27 East Monroe, Suite 1200, Chicago, IL 60603, Phone (312) 346-3135, http://www.hmai.org

Indiana Hotel & Lodging Association, 200 South Meridian, Suite 350, Indianapolis, IN 46225, Phone (317) 673-4207, Fax (317) 673-4210 http://www.indianahotels.org

Kansas Restaurant and Hospitality Association (KRHA), 359 South Hydraulic, Wichita, KS 67211, Phone (316) 267-8383, Fax (316) 267-8400 Fax, http://www.krha.org

The Kentucky Hotel & Lodging Association, PO Box 1183, 207 Shelby St., Frankfort, KY 40602, Phone (502) 875-1115, Fax (502) 875-7536, http://www.kyhotelmotel.com

Louisiana Hotel & Lodging Association, 203 Carondelet Street, Suite 415, New Orleans, LA 70130-3145, Phone (504) 525-9326, Fax (504) 525-9327

Massachusetts Lodging Association, 7 Liberty Square, Boston, MA 02109, Phone (617) 720-1776, Fax (617) 720-1305 http://www.massachusettslodging.com

Maryland Hotel & Motel Association, 584 Bellerive Drive, Suite 3D, Annapolis, Maryland 21401, Phone (410) 974-4472, Fax (410) 757-3809, http://www.mdlodging.org

Maine Innkeepers Association, 305 Commercial Street, Portland, ME 04101, Phone (207) 773-7670, http://www.maineinns.com

The MHMRA represents over 725 hotels, motels, resorts, and bed and breakfasts, comprising over 43,525 guest rooms. MHMRA membership also includes categories for allied suppliers, convention and visitor bureaus, colleges and universities, students, attractions and transportation operators, and sustaining members.

Hospitality Minnesota, 305 East Roselawn Avenue, St. Paul, MN 55117-2031, Phone (651) 778-2400, Fax (651) 778-2424, http://www.hospitalitymn.com

Hospitality Minnesota represents nearly 4,000 hospitality businesses across Minnesota, the vast majority of which are small, family-owned operations.


Mississippi Hotel & Motel Association, http://www.mshotel.com

Montana Innkeepers Association, P.O. Box 1272, Helena, MT 59624, Phone (406) 449-8408, Fax (406) 442-8018, http://www.montanainnkeepers.com

North Carolina Hotel & Motel Association, P. O. Box 30457, Crabtree Valley Station, Raleigh, NC 27622-9998, Phone (919) 821-7125, Fax (208) 692-3461

Nebraska Hotel & Motel Association, Inc., 1111 Lincoln, Mall, Suite 308, Lincoln, NE 68508, Phone (402) 476-1528, Fax (402) 476-1259, http://www.nebraskahma.com

NH Lodging & Restaurant Association, P.O. Box 1175, 14 Dixon Avenue, Suite 208, Concord, NH 03302-1175, Phone (603) 228-9585, Fax (603) 226-1829, http://www.nhbra.com

New Jersey Hotel & Motel Association, 196 Theyst State Street, Trenton, NJ 08608, Phone (609) 278-9000, Fax (609) 393-9891, http://www.njhma.com/

The NJH/MA is the most powerful and influential force in the hotel industry. They provide a forum for hoteliers to exchange experiences, represent the lodging industry in government affairs, and promote tourism into and within the state.

New Mexico Lodging Association, 811 St. Michael Drive, Suite 107, Santa Fe, NM 87505, Phone (505) 983-4554, Fax (505) 982-9359, http://www.nmhotels.com

Nevada Hotel & Lodging Association, 2901 El Camino Avenue, Suite 202, Las Vegas, Nevada 89102-4201, Phone (702) 878-9272, Fax (702) 878-5009, http://www.nvhotels.com

New York State Hospitality & Tourism Association, 11 North Pearl Street, 11th Floor, Albany, NY 12207, Phone (518) 465-2300, Fax (518) 465-4025, http://www.nyshta.org
NYSH&TA is the oldest state lodging association in the country. Founded in 1887 in Saratoga Springs, NYSH&TA originally represented New York State’s lodging industry. Today the association includes members from nearly all segments of the tourism industry.

**Ohio Hotel & Lodging Association**, 692 N. High Street, Suite 212, Columbus, OH 43215, Phone (614) 461-6462, Fax (614) 224-4714, [http://www.ohla.org](http://www.ohla.org)

**Ohio Hotel & Lodging Association**, http://www.oklahomahotels.org/


**Oregon Lodging Association**, 775 Summer Street, N.E., Salem, OR 97301-1282, Phone (503) 986-0000, Fax (503) 986-0001, [http://www.oregonlodging.com](http://www.oregonlodging.com)

**Pennsylvania Travel Council**, 902 N. Second Street, Harrisburg, PA 17102, Phone (717) 232-8880, Fax (717) 232-8948, [http://www.patravel.org](http://www.patravel.org)

**Rhode Island Hospitality & Tourism Association**, 1206 Jefferson Blvd., Warwick, RI 02886, Phone (401) 732-4881, Fax (401) 732-4883, [http://www.rihospitality.com](http://www.rihospitality.com)

**Hospitality Association of South Carolina**, 3612 Landmark Drive, Suite B, Colombia, 29204, Phone (803) 765-9000, Fax (803) 252-7136, [http://www.schospitality.org](http://www.schospitality.org)

**Tennessee Hotel & Lodging Association**, 644 Theyst Iris Drive, Nashville, TN 37204-9131, Phone (615) 385-9970, Fax (615) 385-9957, [http://www.thla.net](http://www.thla.net)

The Tennessee Hotel & Lodging Association (TH&LA) is a not-for-profit trade association representing the Tennessee lodging industry and its allied industries. Currently in its 75th year of operation, TH&LA ranks 13th in size in American Hotel & Lodging Association (AH&LA) federation. TH&LA represents more than 300 properties with over 40,000 rooms with a total membership of over 450 businesses.

**Texas Hotel & Motel Association**, 1701 Theyst Avenue, Austin, TX 78701, Phone (800) 856-4328, Fax (512) 480-0773, [http://www.texaslodging.com](http://www.texaslodging.com)

**Utah Hotel & Lodging Association**, P.O. Box 147420, Salt Lake City, UT 84114-7420, Phone (801) 538-1030, [http://www.utah.com/lodge](http://www.utah.com/lodge)

**Virginia Hospitality & Travel Association**, 2101 Libbie Avenue, Richmond, VA 23230-2621, Phone (804) 288-3065, Fax (804) 285-3093, [http://www.vhta.org](http://www.vhta.org)

**Vermont Lodging & Restaurant Association**, Three Main Street, Suite 106, Burlington VT 05401, Phone (802) 660-9001, [http://www.visitvt.com](http://www.visitvt.com)

**Washington State Hotel & Lodging Association**, 13540 Linden Ave, Seattle, WA 98133, Phone (877) 906-1001, Fax (206) 306-1006, [http://www.stayinwashington.com](http://www.stayinwashington.com)

**Wisconsin Innkeepers Association**, 1025 S. Moorland Road, Suite 200, Brookfield, WI 53005, Phone (262) 782-2851, Fax (262) 782-0550, [http://www.lodging-wi.com](http://www.lodging-wi.com)

**Theyst Virginia Hospitality & Travel Association**, P.O. Box 3974, Charleston, WV 25339-3974, Phone (304) 347-3900, Fax (304) 347-9692, [http://www.wvhta.com](http://www.wvhta.com)
Wyoming Lodging & Restaurant Association, 211 Theyst 19th Street, Cheyenne, WY 82001, Phone (307) 634-8816, http://www.wlra.org

City Level Associations
Hotel Association of New York City, 437 Madison Avenue, 36th Floor, New York, NY 10022-7398, Phone (212) 754-6700, Fax (212) 754-0243, http://www.hanyc.org/

The Hotel Association is very much a part of the rich fabric of New York City. Established in 1878, it is one of the nation’s oldest professional trade associations. Its founders’ goals were to establish an association that would support their industry with the highest quality services and resources available. The association is the industry’s voice and has traditionally represented New York City’s hotels in virtually every type of situation, ranging from tourism to legislation to labor negotiations. Today, the Hotel Association of New York City boasts more than 170 member hotels representing more than 60,000 rooms and more than 30,000 employees. The membership includes all of New York’s leading hotels in addition to more than 100 allied members who are the major hotel suppliers in the United States.

Caribbean Associations
Caribbean Tourism Organization, Sir Frank Walcott Building Culloden Road, St. Michael, Barbados, Phone + (246) 427-5242 (Call (516) 594-4100, Kristin will help arrange interview), Fax + (246) 429 3065, www.doitcaribbean.com

The Caribbean Tourism Organization (CTO) is an international development agency and the official body for promoting and developing tourism throughout the Caribbean.

Caribbean Hotel Association, 1000 Ponce de León Ave., 5th Floor, San Juan, Puerto Rico 00907, Phone (787) 725-9139, Fax (787) 725-9108, www.caribbeanhotels.org

The Caribbean Hotel Association is a Federation of 35 national hotel associations, from Bermuda in the North to Guyana in the South, from Barbados in the East to Mexico and Belize in the West. More than 1,000 member hotels represent 110,000+ rooms, from the small guest houses to the mega-resorts. The allied members: airlines, trade and consumer press, and hotel and restaurants suppliers, among many, account for more than 700 members.

International Associations
The International Ecotourism Society, P.O. Box 668, Burlington, VT 05402, Phone (802) 651-9818, Fax (802) 651-9819

The International Hotels Environment Initiative (IHEI), The Prince of Wales International Business Leaders Forum (IBLF), 15-16 Cornwall Terrace, Regent’s Park, London, NW1 4QP, United Kingdom, Phone +44 (0)20 7467 3600, Fax +44 (0)20 7467 3610, www.ihei.org

The International Hotels Environment Initiative (IHEI), a program of the International Business Leaders Forum, was established in 1992 by chief executives of the world’s leading hotel groups, all aiming to bring about continuous improvement in the environmental performance of the global hotel industry. CEOs and senior executives from 11 international hotel chains form the Council of the IHEI, providing leadership and funding. Its members
represent over 68 brands, 11,200 hotels on five continents, and almost two million hotel rooms. IHEI initiatives have raised awareness of responsible business practices among the international hotel industry, tour operators, government bodies, trade and business media, academia, consumers, and suppliers to the hospitality industry.

**International Council On Hotel, Restaurant and Institutional Education**, 3205 Skipwith Road, Richmond, VA 23294-4442, Phone (804) 747-4971, Fax (804) 747-5022, [http://chrie.org/](http://chrie.org/)

Founded in 1946, the International Council on Hotel, Restaurant, and Institutional Education is the global advocate of hospitality and tourism education for schools, colleges, and universities offering programs in hotel and restaurant management, foodservice management, and culinary arts.

**Hotel & Catering International Management Association**, 191 Trinity Road, London, SW17 7HN, UK, Phone +44 (0)20 8772 7400, Fax +44 (0)20 8772 7500, [www.hcima.org](http://www.hcima.org)

The HCIMA is the professional body for the international hospitality industry. With members in excess of 20,000 in more than 100 countries, the Hotel and Catering International Management Association –(HCIMA) is recognized throughout the world. Established in 1971, HCIMA’s global influence brings together individuals from all sectors of the hospitality industry--hotels, contract catering, restaurants, fast food, pubs and clubs, hospitals, education, armed forces, and the teaching profession.

**International Hotel & Restaurant Association**, 251, rue du Faubourg, St-Martin 75010 Paris, France, Phone 33 (0) 1 44 89 94 00, Fax 33 (0) 1 40 36 73 30, [www.ih-ra.com](http://www.ih-ra.com)

Chief Executive Officer, Alain-Philippe Feutré

Representing over 750,000 establishments in more than 150 countries, IH&RA provides a voice at the international level for an industry which comprises more than 300,000 hotels and 8 million restaurants world-wide, employs 60 million people, and contributes US$950 billion to the global economy.

**World Travel & Tourism Council**, 1-2 Queen Victoria Terrace, Sovereign Court, London E1W 3HA, Phone (+44) 870 727 9882, Fax (+44) 870 728 9882, [www.wttc.org](http://www.wttc.org), [http://www.wttc.org/ecres/pdfs/a111.pdf](http://www.wttc.org/ecres/pdfs/a111.pdf)

The World Travel & Tourism Council (WTTC) is the global business leaders’ forum for travel and tourism. Its members are Chief Executives from all sectors of industry, including accommodation, catering, entertainment, recreation, transportation, and other travel-related services. Founded in April 1990.

**Cruise Line Associations**

**Cruise Lines International Association (CLIA)**, 500 Fifth Avenue, Suite 1407, New York, New York 10110, Phone (212) 921-0066, Fax (212) 921-0549, [http://www.cruising.org/index0.htm](http://www.cruising.org/index0.htm)
The official trade organization of the cruise industry, Cruise Lines International Association (CLIA) also works in partnership with nearly 20,000 affiliated travel agencies throughout North America to ensure the highest caliber of cruise sales expertise and service for cruise vacationers.

**The World Ocean & Cruise Liner Society**, P.O. Box 92-B, Stamford, CT 06904 (USA), Phone (203) 329-2787, Fax (203) 329-2787, [http://www.oceancruisenews.com](http://www.oceancruisenews.com)

The World Ocean & Cruise Liner Society is the oldest and largest cruise organization of its kind.

**IACVB**
Unlike most countries, the United States has no national tourism office, so the IACVB has taken it upon themselves to run an international “Pow Wow,” which has attracted tour operators from all over the world to come and talk to U.S. suppliers. The IACVB now has offices overseas. They market the United States under the “See America” branding and try to brand everything associated with this campaign under the See America banner. The IACVB is represented in all the large travel shows and conventions around the world and organizes the U.S. pavilion.

[http://www.tourism.uiuc.edu/tourismfact/InLinks/InLinks_index.htm#Tourism_Associations_and_Organizations](http://www.tourism.uiuc.edu/tourismfact/InLinks/InLinks_index.htm#Tourism_Associations_and_Organizations)

[http://www.unlv.edu/Tourism/assoc.html](http://www.unlv.edu/Tourism/assoc.html)
Appendix I

Cendant
Corporate Offices: One Sylvan Way, Parsippany, NJ 07054

Six Continents Hotels
Americas Headquarters: Six Continents Hotels, Three Ravinia Drive, Suite 2900, Atlanta GA 30346

Marriott International
Corporate Offices: Marriott International, Marriott Drive Washington, D.C. 20058

Choice Hotels International
Corporate Offices: 10750 Columbia Pike, Silver Spring, MD 20901

Hilton Hotels Corporation
Executive Offices: Hilton Hotels Corporation, 9336 Civic Center Drive, Beverly Hills, California 90210

Best Western International
Executive Offices: 6201 North 24th Parkway, Phoenix, AZ 85016-2023

Accor
Corporate Headquarters: 33, Avenue du Maine, 75755 Paris Cedex 15 France
North America Headquarters: 14651 Dallas Parkway, Dallas, Texas 75254

Starwood Hotels & Resorts Worldwide, Inc.
Corporate Headquarters: Starwood Hotels & Resorts Worldwide, Inc, 1111 Westchester Avenue, White Plains, NY 10604

Carlson Hospitality Worldwide
Corporate Offices: P.O. Box 59159, Minneapolis, MN 55459

Hyatt Hotels & Resorts
Executive Offices: Hyatt Hotels Corporation, 200 West Madison Street, Chicago, IL 60606

MeriStar Hotels & Resorts, Inc.
Corporate Offices:
1010 Wisconsin Avenue, N.W., Washington, D.C. 20007

Wyndham International, Inc.
Corporate Offices, 1950 Stemmons Freeway, Suite 6001, Dallas, Texas 75207

U.S. Franchise Systems, Inc.
Corporate Offices: 13 Corporate Square, Suite 250, Atlanta, GA 30329

La Quinta Inn & Suites
Corporate Offices: 909 Hidden Ridge, Suite 600, Irving, TX 75038

Prime Hospitality Corp.
Corporate Offices: 700 Route 46, East, Fairfield, NJ 07007
Appendix J

Main Cruise Lines
American Cruise Lines
One Marine Park
Haddam, CT 06438
860-345-3311 Office
860-345-4265 Fax
http://www.americancruiselines.com

Carnival Cruise Lines
3655 NW 87th Avenue
Miami, FL 33178-2428
305-599-2600 Office
800-327-5782 Groups
http://www.carnival.com

Celebrity Cruises, Inc.
1050 Caribbean Way
Miami, FL 33132
305-539-6000 Office
800-437-3111 Reservations
800-437-4111 Groups
800-211-4789 Brochures
305-375-0711 Fax
http://www.celebrity-cruises.com

Costa Cruise Lines
World Trade Center Building
80 SW 8th Street
Miami, FL 33130-3097
Tel.: 305-358-7325
Fax: 305-375-0676
http://www.costacruises.com

Crystal Cruises
2049 Century Park East, Suite 1400
Los Angeles, CA 90067
310-785-9300 Sales
310-785-0011 Fax
http://www.crystalcruises.com

Cunard Line
6100 Blue Lagoon Drive, Suite 400
Miami, FL 33126
305-463-3000 Office
800-7-CUNARD Toll Free
305-463-3010 Fax
http://www.cunardline.com

First European Cruises
95 Madison Avenue, Suite 1203
New York, NY 10016
212-779-7168 Office
800-313-3110 Toll Free Fax
212-779-0948 Fax
http://www.first-european.com

Holland America Line
300 Elliott Avenue West
Seattle, WA 98119
206-281-3535 Office
http://www.hollandamerica.com

For the ninth year in a row, Holland America Line has been voted “best overall cruise value” by the World Ocean and Cruise Liner Society.
MSC Italian Cruises
420 Fifth Avenue, 8th Floor
New York, NY 10018-2702
http://www.mscnusasusa.com

Norwegian Coastal Voyage Inc./Bergen Line Services
405 Park Avenue
New York, NY 10022
212-319-1300 Office
212-319-1390 Fax
http://www.coastalvoyage.com

Norwegian Cruise Line
7665 Corporate Center Drive
Miami, FL 33126-1201
800-327-7030 Reservations
305-436-4000 Miami
305-436-4120 Fax
http://www.ncl.com

Orient Lines, Inc.
1510 SE 17th Street, Suite 400
Ft. Lauderdale, FL 33316
954-527-6660 Office
954-527-6657 Fax
http://www.orientlines.com

Princess Cruises
10100 Santa Monica Boulevard
Suite 1800
Los Angeles, CA 90067
310-553-1770 Office
800-421-1700 Groups
310-277-6175 Fax
http://www.princesscruises.com

Radisson Seven Seas Cruises
600 Corporate Dr., Suite 410
Ft. Lauderdale, FL 33334
954-776-6123 Office
800-477-7500 Toll Free
954-772-3763 Fax
http://www.rssc.com

Regal Cruises
300 Regal Cruises Way
Palmetto, FL 34221
941-721-7300 Office
941-723-0900 Fax
http://www.regalcruises.com

Renaissance Cruises
350 East Las Olas Boulevard
Ft. Lauderdale, FL 33302
(954) 463-0982 Office
http://www.renaissancecruises.com

Royal Caribbean International
1050 Caribbean Way
Miami, FL 33132
305-539-6000 Office
305-374-7354 Fax
http://www.royalcaribbean.com

Royal Olympic Cruises
805 Third Avenue
New York, NY 10022
212-688-7555 Office
888-662-6237 Fax
www.royalolympiccruises.com

Seabourn Cruise Line
6100 Blue Lagoon Drive, Suite 400
Miami, FL 33126
305-463-3000 Office
305-463-3010 Fax
http://www.seabourn.com

Silversea Cruises, Ltd.
110 E. Broward Boulevard
Ft. Lauderdale, FL 33301
954-522-4477 Office
954-522-4499 Fax
http://www.silversea.com

For an unprecedented fifth consecutive year, Silversea has been voted “World’s Best Small Ship Cruise Line” in the Annual Condé Nast Traveler Readers’ Choice Awards (1996-2000)

Windstar Cruises
300 Elliott Avenue West
Seattle, WA 98119
206-281-3535 Office
206-286-3229 Fax
http://www.windstarcruises.com
Appendix K

The official web site of National Council of State Tourism Directors
http://www.tourstates.com/

Alabama
Tel: Main #:1-800-ALABAMA,
Local #: (334) 242-4169,
Fax #: (334) 242-4554 or (334) 264-7060
401 Adams Ave. P.O. Box 4927,
Montgomery, AL 36103-4927,
http://www.touralabama.org/index-FL.htm

Alaska
Alaska Travel Industry Association
2600 Cordova Street, Ste. 201
Anchorage, AK 99503
http://www.travelalaska.com/homepage.html

Arizona
http://www.arizonaguide.com/home/index.asp

Arkansas
Tel.: 1-800-NATURAL
Arkansas Department of Parks and Tourism,
One Capitol Mall
Little Rock, Arkansas 72201
http://www.arkansas.com/

California
Fax #: (916) 322-3402
P.O. Box 1499
Sacramento, CA 95812-1499
http://gocalif.ca.gov/index2.html

Colorado
Tel.: 1-800-COLORADO
Colorado Tourism Office
1625 Broadway, Ste. 1700
Denver, CO 80202
http://www.colorado.com/

Connecticut
Tel.: 1-800-CT-BOUND
Local #: (860) 270-8080
Fax #: (860) 270-8077
Connecticut Office of Tourism, Department of Economic and Community Development,
505 Hudson Street
Hartford, CT 06106
http://www.ctbound.org/

Delaware
Tel.: Main #:1-866-2-VISITDE
(1-866-284-7483),
Local #: (302) 739-4271,
Fax #: (302)739-5749
Delaware Tourism Office, 99 Kings Highway,
Dover, DE 19901
http://www.visitdelaware.net/

Florida
Tel. Local #: (850) 488-5607
Fax #: (850) 224-2938
661 East Jefferson Street, Suite 300
Tallahassee, Florida 32301
http://www.flausa.com/index.php

Georgia
Tel.: Main #:1-800-VISITGA
(1-800-847-4842),
Local #: (404)651-8578
Georgia Department of Industry, Trade & Tourism, P.O. Box 1776
Atlanta, GA 30301-1776
http://www.georgia.org/

Hawaii
Tel.: Local #: (808) 973-2255
Fax #: (808) 973-2253
Hawaii Tourism Authority
Hawaii Convention Center
1801 Kalakaua Avenue
Honolulu, Hawaii 96815
http://www.hawaii.gov/tourism/
Idaho
Tel.: 1-800-842-5858
Local #: (208) 334-2470
Fax #: (208) 334-2631
Idaho Department of Commerce, Tourism Division
700 West State Street
P.O. Box 83720
Boise, ID 83720-0093
http://www.visitid.org/

Illinois
Tel.: Main #:800-2CONNECT (800-406-6418),
Local #: (312) 814-4733
100 West Randolph Street, Suite 3-400,
Chicago, IL 60601
http://www.enjoyillinois.com

Indiana
Tel.: Main #:1-888-ENJOY-IN,
Fax #: (317) 233-6887
Indiana Tourism Division, Indiana Department of Commerce
One North Capitol, Suite 700
Indianapolis, IN 46204-2288
http://www.indianatourism.com

Iowa
Tel.: Main #: 888-472-6035
Local #: (515) 242-4705
Fax #: (515) 242-4718
Iowa Department of Economic Development, Iowa Tourism Office,
200 East Grand Avenue
Des Moines, IA 50309
http://www.traveliowa.com

Kansas
http://www.travelks.com

Kentucky
Tel.: Main #: 800-225-8747
http://www.kentuckytourism.com/intro.html

Louisiana
Tel.: Local #: (225) 342-8100,
Fax #: (225) 342-8390
http://www.louisianatravel.com/

Maine
Tel.: Main #: 888-624-6345
Local #: (334) 242-4169
Fax #: (334) 242-4554 or (334) 264-7060
325B Water Street
Hallowell, ME 04347-1341
http://www.visitmaine.com

Maryland
Tel.: Main #:1-800-MD-IS-FUN
DBED, Division of Tourism, Film and the Arts, 217 East Redwood Street, 9th Floor,
Baltimore, MD 21202
http://www.mdisfun.org

Massachusetts
Tel.: Main #: 1-800-227-MASS
Local #: (617) 973-8500
Fax #: (617) 973-8525
Massachusetts Office of Travel & Tourism,
10 Park Plaza, Suite 4510
Boston, MA 02116
http://www.massvacation.com

Minnesota
Tel.: Main #: 1- 800-657-3700,
Local #: (651) 296-5029
Minnesota Office of Tourism
100 Metro Square, 121 7th Place E.
St. Paul, MN 55101
http://www.exploreminnesota.com/

Mississippi
Tel.: Local #: (601) 359-3449
Fax #: (601) 359-2832
Mississippi Division of Tourism Development, P.O. Box 849
Jackson, MS 39205
http://www.mississippi.org/
Missouri
Tel.: Main #: 1-800-877-1234
Local #: (573) 751-4133
Fax #: (573) 751-5160
Missouri Division of Tourism, P.O. Box 1055, Jefferson City, MO 65102
http://www.missouritourism.org/

Nebraska
Tel.: Main #: 1-800-228-4307
Nebraska Division of Travel and Tourism, P.O. Box 98907
Lincoln, NE 68509-8907
http://www.visitnebraska.org/tourism.html

Nevada
Tel.: Main #: 1-800-NEVADA-8
Local #: (775) 687-4322
Fax #: (775) 687-6779
Nevada Commission on Tourism
401 North Carson Street
Carson City, NV 89701
http://www.travelnevada.com/

New Hampshire
Tel.: Main #: 1-800-FUN-IN-NH
(1-800-386-4664)
Fax #: (603) 271-6870
State of New Hampshire Division of Travel and Tourism Development
172 Pembroke Road, P.O. Box 1856,
Concord, New Hampshire 03302-1856
http://www.visithh.gov/

New Jersey
Tel.: Main #: 1-800-VISITNJ
Local #: (609) 777-0885
New Jersey Commerce and Economic Growth Commission
20 W. State Street, P.O. Box 820
Trenton, NJ 08625
http://www.state.nj.us/travel/

New Mexico
Tel.: Main #: 1-800-733-6396 ext. 0643
http://www.newmexico.org/

New York
Tel.: Main #: 1-800-CALL-NYS
Local #: (518) 474-4116
New York State Division of Tourism,
Empire State Plaza
Main Concourse, Rm. 110
Albany, NY 12220
http://www.iloveny.com/

North Carolina
Tel.: Main #: 1-800-VISIT NC
Local #: (919) 715-5900
Fax #: (919) 733-2616
North Carolina Division of Tourism,
Raleigh, NC
http://www.visitnc.com/

North Dakota
Tel.: Main #: 1-800-HELLO-ND
North Dakota Tourism,
Liberty Memorial Building,
604 East Boulevard
Bismarck, ND 58505-0825
http://www.ndtourism.com/

Ohio
Tel.: Main #: 1-800-BUCKEYE
Ohio Division of Travel and Tourism
http://www.ohiotourism.com/

Oklahoma
Tel.: Main #: 1-800-652-6552
Local #: (405) 521-2406
Fax #: (405) 521-3992
Oklahoma Travel & Tourism Division
PO Box 52002
Oklahoma City, OK 73152-2002
http://www.travelok.com/

Oregon
Tel.: Main #: 1-800-547-7842
Local #: (503) 986-0000
Fax #: (503) 986-0001
Public Relations Department
Oregon Tourism Commission
775 Summer Street NE
Salem, OR 97301-1282
http://www.traveloregon.com/
Pennsylvania
Tel.: Main #: 1-800-VISITPA
Local #: (717) 232-8880 or (717) 787-5453,
Fax #: (717) 232-8948
Pennsylvania Travel Council
902 N. Second Street
Harrisburg, PA 17102
http://www.patravel.org/
http://www.experiencepa.com/

Rhode Island
Tel.: Main #: 1-800-556-2484
Local #: (401) 222-2601
Fax #: (401) 273-8270
Rhode Island Tourism Division
One West Exchange Street
Providence, RI 02903
http://www.visitrhodeisland.com/

South Carolina
Tel.: Local #: (803) 734-0169
Fax #: (803) 734-1163
http://www.discoversouthcarolina.com/

South Dakota
Tel.: Main #: 1-800-S-DAKOTA
Local #: (605) 773-3301
Fax #: (605) 773-3256
Capitol Lake Plaza
711 East Wells Avenue
c/o 500 East Capitol Avenue
Pierre, SD 57501-5070
http://www.travelsd.com/

Tennessee
Tel.: Main #: 1-800-GO2TENN
Local #: (615) 741-2159
Tennessee Department of Tourist
Development
320 Sixth Avenue N., 5th Floor
Rachel Jackson State Office Bldg.
Nashville, TN 37243
http://ndweb.state.tn.us/cgi-bin/nd_CGI_50/bfTourism/PgSplash

Texas
Tel.: Local #: (512) 462-9191
Fax #: (512) 936-0089
Texas Economic Development Tourism
Division
P.O. Box 12728, Austin, TX 78711
http://www.txed.state.tx.us/tourism/

Michigan
Tel.: Main #:1- 888-78-GREAT
Local #: (517) 373-0670
Fax #: (517) 373-0059
Travel Michigan (official name of the
State Bureau of Tourism)
201 N. Washington Square, Second Floor
Lansing, Michigan 48913
http://travel.michigan.org/

Montana
Tel.: Main #:1-800-VISIT MT
(800-847-4868), Local #: (406) 444-2654,
Fax #: (406) 444-1800
Montana Department of Commerce
1424 9th Avenue, P.O. Box 200533
Helena, Montana 59620-0533
http://www.visitmt.com/

Utah
Tel.: Main #: 1-800-200-1160
Local #: (801) 538-1370
Utah Travel Council, Council Hall
300 North State Street
Salt Lake City, UT 84114
http://www.dced.state.ut.us/travel/

Vermont
Tel.: Main #: 1-800-VERMONT
Local #: (802) 828-3683
Fax #: (617) 973-8525
Vermont Department of Tourism and
Marketing
6 Baldwin St. Drawer 33
Montpelier, VT 05633-1301
http://www.1-800-vermont.com/
Virginia
Tel.: Main #: 1-800-321-3244
Virginia Tourism Corporation
901 E. Byrd St.
Richmond, VA 23219
http://www.virginia.org/

Washington
Tel.: Main #: (360) 725-5052
Local #: (360) 725-5069
Fax #: (360) 753-4470
Washington State Tourism,
P.O. Box 42500
Olympia, WA 98504-2500
http://www.experiencewashington.com/

West Virginia
Tel.: Main #: 1-800-CALL-WVA
(1-800-225-5982)
Local #: (304) 558-2200
West Virginia Division of Tourism
2101 Washington St., E.
Charleston, WV 25305
http://www.callwva.com/

Wisconsin
Tel.: Main #: 1-800-432-TRIP
(1-800-432-8747),
Local #: (608) 266-2161
Fax #: (617) 973-8525
Wisconsin Department of Tourism
201 West Washington Avenue
PO Box 7976
Madison, WI 53707-7976
http://www.travelwisconsin.com/

Wyoming
Tel.: Local #: (307) 777-2877
Fax #: (307) 777-7777
Wyoming Business Council—Tourism,
I-25 at College Drive
Cheyenne, WY 82002
Weather, Climate, and Ocean Sensitive Recreation and Tourism Operations

Property: Hotels, Resorts, and Accommodations

- Determining rack rate and discount rates
- Maximizing RevPar
- Gaining optimal occupancy
- Setting budgets
- Determining reservation/cancellation policies
- Obtaining insurance/decide on level of self-insurance
- Purchasing equipment
- Selecting suppliers
- Attracting visitors
- Sending out Press Releases countering weather misinformation
- Deciding where to site a new development or acquisition
- Determining and complying with building regulations
- Deciding on building materials
- Maintaining buildings
- Planting and maintenance of landscape
- Regulatory compliance
- Determining energy loadings
- Maintaining comfort levels
- Fine tuning engineering systems
- Setting mechanical/electrical engineering specifications
- Applying agri-products
- Formulating internal environmental policies
- Ensuring health and safety of staff and guests
- Identifying risks to life, property, equity, reputation
- Managing and mitigating risk
- Formulating emergency preparedness measures
- Planning daily guest activities
- Whether or not to discount (offload stock)

Insurance

- Deciding if a property is ‘insurable’
- Determining premiums
- Determining deductions
- Inspecting properties
- Issuing ‘Cat Alerts’
- Ensuring under-exposure of total potential liability

Sports Events

- Submitting bids to host events/conferences/conventions/expositions

- Selecting venue for event (e.g., indoors, outdoors; region, state, city)
- Scheduling of events (year, month, day, time)
- Snowmaking
- Open or close the ski lift
- Turning on underground pitch heating

Maritime and Cruise Industry

- Seasonal/yearly schedule
- Expansion into new areas
- Route planning
- Safety
- Pricing
- Vessel maintenance
- Port to go to
- Guest activities
- Compliance with regulations

Aviation

- ‘Go’ or ‘No Go’ decisions
- Preparing aircraft for takeoff
- Preparing aircraft for landing
- How much fuel to load
- Route planning
- De-icing requirements
- Ensuring safety
- Tying down aircraft
- Moving light aircraft to shelter

Emergency Management

- Formulation of emergency plans
- Mitigation measures
- Provisions (issuance of warnings, supplies, services, etc.)

Global Concerns

- Greenhouse gas emissions
- Safeguarding reputation risk
- Participating in hotel industry Environmental initiatives (e.g., IHEI, etc.)
- Globalization and harmonization across group regions (e.g., hotel groups)
- Recession of economies in visitor source areas
- Cross border liability issues
- Shareholder/stakeholder pressure
- Consumer pressure