Thermal Comfort, Weather-Type, and Consumer Behavior: Influences on Visitor Attendance at Four U.S. Metropolitan Zoos

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“We must understand today before we can successfully plan for tomorrow”
Research Purpose

• To highlight how weather can impact visitor attendance, particularly at large metropolitan zoological parks
Were you aware?

- Zoos and aquariums contributed over $16 billion to the U.S. economy in 2012, supported 142,000 jobs, and attracted 175 million visitors (AZA 2013)
Tourism is a Weather-Sensitive Industry
Impacts of Climate Variability on Tourism: Recent Headlines

"Fickle weather puts a damper on area golf"
St. Petersburg Times, 6 February 2003

"100-year drought causes municipals to close"
TravelGolf.com

"Golf courses tee up opposition to Las Vegas drought plan"
March 2003

- 52% of golf courses in the US identified climate variability as the reason for lower than expected rounds in 2000-01
  (World Golf Foundation, 2004)

- variations in weather identified as primary reason for positively (35%) and negatively (62%) affecting annual rounds played in 2003
  (National Golf Foundation, 2004)

Slide Courtesy of Dr. Daniel Scott, University of Waterloo
Down the Drain?

‘Water-front’ Resort - Lake Michigan
(Summer 2000)

‘Western drought shrinking Big Muddy’
April 2005, USA TODAY

‘Drought shrinking jewels of the desert’
Sept 2004, USA Today

‘It’s just like someone coming in a shutting down Ford or GM in Detroit’
North Dakota State Parks Manager

‘Weather threatens to dry up boating season’
July 2003, Chicago Tribune

Slide Courtesy of Dr. Daniel Scott, University of Waterloo
‘Lack of snow for 2 years leads to ski industry layoffs’
March 2003, Associated Press

‘Changing climate is forcing World Cup organizers to adapt’

‘Not enough snow creates mountain of problems for Forzani: sporting goods giant latest retailer to be stung by weather woes’
Jan. 2003, National Post

Slide Courtesy of Dr. Daniel Scott, University of Waterloo
Sea Level Rise and Coastal Tourism

- Impact of lost beach areas from 46 cm (18 inches) sea level rise by 2080 as high as $10.6 billion (Bin et al. 2007)

- Lost recreation value to local anglers
  - $15 million a year by 2030
  - $17 million a year by 2080 (Bin et al. 2007)

- Value of property at risk to sea level rise (four counties) over the next 75 years is $6.9 billion.

- Future insurance costs / insurability?

Source: Poulner and Halpin 2008

Slide Courtesy of Dr. Daniel Scott, University of Waterloo
Zoo Closing Wednesday Due To Weather

BY: Rod Hackney
Jan. 21, 2014

ASHEBORO—Due to the forecast for cold and windy conditions with the chance of frozen precipitation, the North Carolina Zoo will be closed to the public on Wednesday, January 22.

Predictions for Wednesday call for temperatures to remain below freezing with the chance of a rain and snow mixture. Under those conditions, most animals in the zoo's African region will remain in off-exhibit holding facilities through the day. Zoo staff will be asked to report to work as usual. A decision on Thursday's operations will be made Wednesday afternoon.

For information on daily operational status, the public can call the zoo's toll-free number at 1-800-488-0444 or visit the website at www.nczoo.org.

The zoo is an agency of the N.C. Department of Environment and Natural Resources, John E. Skvarla, III, Secretary; Pat McCrory, Governor.

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N. C. Zoo News Archives

Zoo Closing Wednesday And Thursday

BY: Rod Hackney
Feb. 11, 2014

ASHEBORO—Due to the forecast for a winter storm including freezing rain and snow, the North Carolina Zoo will be closed to the public Wednesday and Thursday, February 12-13.

Under these weather conditions, zoo officials are concerned for both visitors and staff. Employees are asked to follow the zoo's adverse weather policy on Wednesday and Thursday. A decision on Friday operations will be made Thursday afternoon.

In addition, the North Carolina Zoological Park Council meeting slated for Wednesday afternoon has also been cancelled.

For information on daily operational status, the public can call the zoo's toll-free number at 1-800-488-0444 or visit the website at www.nczoo.org.

The zoo is an agency of the N.C. Department of Environment and Natural Resources, John E. Skvarla, III, Secretary; Pat McCrory, Governor.

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N. C. Zoo News Archives
Weather impacts on visitor behavior:  
A spatio-temporal study of select metropolitan zoos
Background

- Weather can impact visitor attendance in substantive ways, and this research attempts to determine how biometeorologically-derived thermal comfort categories coincide with decisions to attend zoos.
## Zoo Summary Comparison

<table>
<thead>
<tr>
<th>Zoo</th>
<th>State</th>
<th>Data Period</th>
<th>Size (Acres)</th>
<th>CSA Title</th>
<th>2010 CSA Population</th>
<th>Visitor Rank (USA)</th>
<th>Annual Visitation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Atlanta</td>
<td>Georgia</td>
<td>September 2001 to June 2011 (n~3564)</td>
<td>40</td>
<td>Atlanta-Sandy Springs-Gainesville, GA-AL</td>
<td>5,618,431</td>
<td>25+</td>
<td>0.8 million</td>
</tr>
<tr>
<td>Indianapolis</td>
<td>Indiana</td>
<td>September 2001 to June 2011 (n~3564)</td>
<td>64</td>
<td>Indianapolis-Anderson-Columbus, IN</td>
<td>2,080,782</td>
<td>25+</td>
<td>1.0 million</td>
</tr>
<tr>
<td>Phoenix</td>
<td>Arizona</td>
<td></td>
<td>125</td>
<td>Phoenix-Mesa-Glendale, AZ</td>
<td>4,192,887</td>
<td>14</td>
<td>1.4 million</td>
</tr>
<tr>
<td>St. Louis</td>
<td>Missouri</td>
<td></td>
<td>90</td>
<td>St. Louis-St. Charles-Farmington, MO-IL</td>
<td>2,878,255</td>
<td>3</td>
<td>2.9 million</td>
</tr>
</tbody>
</table>
Data

• Period of Record

• Weather
  – Nearest ASOS weather station (hourly records)
  – Variables
    • Temperature, Humidity, Cloud Cover, Wind Speed, Elevation

• Attendance
  – Daily visitor counts obtained from gate admissions
Climate typologies
Biometeorological Indices

- Indices which assess how differing combinations of weather variables actually feel to a human
  - Physiologically Equivalent Temperature (PET)
  - Standard Effective Temperature (SET)
  - Predicted Mean Vote (PMV)

- Fanger, 1972; Hoppe, 1999; Gagge et al., 1986; Vanos et al., 2010; de Freitas, 1985; Staiger et al., 2011; Sprague & Munson, 1974; Davis et al., 2006; ASHRAE, 2001, 2004; de Dear, 1991, 1994, 1998, 2002; de Freitas et al., 2007; Hwang et al., 2007; Matzarakis, 1996; Lin et al., 2007, 2009; Matzarakis, 1996; Staiger et al., 2011; Matzarakis & Mayer 1996
The Munich Energy balance Model for Individuals (MEMI) is a thermo-physiological heat balance model

It is the basis for the calculation of the Physiologically Equivalent Temperature (PET)

\[ M + W + R + C + E_D + E_{Re} + E_{Sw} + S = 0 \]

- **M** = Metabolic rate
- **W** = Physical work
- **R** = Net radiation of the body
- **C** = Convective heat flow
- **E_D** = Imperceptible perspiration
- **E_{Re}** = Sum of heat flows for heating and humidifying inspired air
- **E_{Sw}** = Heat flow due to evaporation of sweat
- **S** = Storage heat flow for heating or cooling the body mass

Additional thermo-physiological parameters required in calculation:
- Heat resistance of clothing (clo units)
- Activity level (watts)

Corresponding heat flows and controlling meteorological parameters:
- Air temperature → **C**, **E_{Re}**
- Air humidity → **E_D**, **E_{Re}**, **E_{Sw}**
- Wind velocity → **C**, **E_{Sw}**
- Mean radiant temperature → **R**
RayMan Biometeorological Model

Matzarakis, Rutz & Mayer (2000)
RayMan Model
Modelling mean radiant temperature
Estimation of thermal indices

Geo factors
- topography
- buildings
- vegetation

Topography
- Buildings data, vegetation data
- Input of horizon limitation
- Import of fish-eye photographs

Required data
- air temperature $T_a$
- vapour pressure $VP$
- wind speed $v$
- clothing
- activity

Climatic factors
- clouds
- albedo
- Bowen ratio

Output
- sunshine duration
- shade
- short and longwave radiation fluxes
- mean rad. temp. $\text{mT}_r$

Human energy balance

Thermal indices
- Predicted Mean Vote PMV
- Physiological Equivalent Temperature PET
- Standard Effective Temperature SET*

Figure 3. Structure of the human-biometeorological model RayMan, version 1.3
Heat Balancing (MEMI): Summer

\[ T_a = 30 \, ^\circ C, \; T_{mrt} = 60 \, ^\circ C, \; RH = 50\%, \; v = 1.0 \, m/s, \; PET = 43 \, ^\circ C \]

Internal heat production: 258 W
Respiratory heat loss: -27 W

Mean skin temperature: 36.1 \, ^\circ C
Imperceptible Perspiration: -11 W

Body core temperature: 37.5 \, ^\circ C
Sweat evaporation: -317 W

Skin wettedness: 53 %
Convection: -143 W

Water loss: 525 g/h
Net radiation: +240 W

Body Parameters: 1.80 m, 75 kg, 35 years, 0.5 clo, walking (4 km/h)

Table 1 Examples of physiological equivalent temperature (PET) values for different climate scenarios. \( T_a \) air temperature, \( T_{mrt} \) mean radiant temperature, \( v \) air velocity, VP water vapour pressure

<table>
<thead>
<tr>
<th>Scenario</th>
<th>( T_a ) ((^\circ C))</th>
<th>( T_{mrt} ) ((^\circ C))</th>
<th>( v ) (m/s)</th>
<th>VP (hPa)</th>
<th>PET ((^\circ C))</th>
</tr>
</thead>
<tbody>
<tr>
<td>Typical room</td>
<td>21</td>
<td>21</td>
<td>0.1</td>
<td>12</td>
<td>21</td>
</tr>
<tr>
<td>Winter, sunny</td>
<td>-5</td>
<td>40</td>
<td>0.5</td>
<td>2</td>
<td>10</td>
</tr>
<tr>
<td>Winter, shade</td>
<td>-5</td>
<td>-5</td>
<td>5.0</td>
<td>2</td>
<td>-13</td>
</tr>
<tr>
<td>Summer, sunny</td>
<td>30</td>
<td>60</td>
<td>1.0</td>
<td>21</td>
<td>43</td>
</tr>
<tr>
<td>Summer, shade</td>
<td>30</td>
<td>30</td>
<td>1.0</td>
<td>21</td>
<td>29</td>
</tr>
</tbody>
</table>

P. Hönpe (1999)
# RayMan Inputs

## Clothing Values (CLO)

<table>
<thead>
<tr>
<th>Season</th>
<th>CLO</th>
</tr>
</thead>
<tbody>
<tr>
<td>Winter</td>
<td>1.1</td>
</tr>
<tr>
<td>Shoulder Seasons</td>
<td>0.8</td>
</tr>
<tr>
<td>Summer</td>
<td>0.3</td>
</tr>
</tbody>
</table>

## Physical Input

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>37</td>
</tr>
<tr>
<td>Gender</td>
<td>Female</td>
</tr>
<tr>
<td>Effort</td>
<td>145W</td>
</tr>
<tr>
<td>Height</td>
<td>1.65m</td>
</tr>
<tr>
<td>Weight</td>
<td>63kg</td>
</tr>
</tbody>
</table>
## Biometeorological Classification

Table 9.2  Ranges of the physiological equivalent temperature (\(PET\)) for different grades of thermal perception by human beings and physiological stress on human beings; internal heat production: 80 W, heat transfer resistance of the clothing: 0.9 clo (According to Matzarakis and Mayer 1996)

<table>
<thead>
<tr>
<th>PET</th>
<th>Thermal perception</th>
<th>Grade of physiological stress</th>
</tr>
</thead>
<tbody>
<tr>
<td>4°C</td>
<td>Very cold</td>
<td>Extreme cold stress</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Strong cold stress</td>
</tr>
<tr>
<td>8°C</td>
<td>Cold</td>
<td>Moderate cold stress</td>
</tr>
<tr>
<td></td>
<td>Cool</td>
<td>Slight cold stress</td>
</tr>
<tr>
<td>13°C</td>
<td>Slightly cool</td>
<td>Slight cold stress</td>
</tr>
<tr>
<td>18°C</td>
<td>Comfortable</td>
<td>No thermal stress</td>
</tr>
<tr>
<td>23°C</td>
<td>Slightly warm</td>
<td>Slight heat stress</td>
</tr>
<tr>
<td>29°C</td>
<td>Warm</td>
<td>Moderate heat stress</td>
</tr>
<tr>
<td>35°C</td>
<td>Hot</td>
<td>Strong heat stress</td>
</tr>
<tr>
<td>41°C</td>
<td>Very hot</td>
<td>Extreme heat stress</td>
</tr>
</tbody>
</table>
### Attendance Day Typologies

<table>
<thead>
<tr>
<th>Descriptor</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prime</td>
<td>above 2 s.d.</td>
</tr>
<tr>
<td>Excellent</td>
<td>1 to 2 s.d.</td>
</tr>
<tr>
<td>Marginal</td>
<td>-1 to +1 s.d.</td>
</tr>
<tr>
<td>Poor</td>
<td>Below -1 s.d.</td>
</tr>
</tbody>
</table>
Poor Attendance Days

- Very Cold: 85% (ATL), 87% (INDY), 54% (PHX), 1% (STL)
- Cold: 14% (ATL), 7% (INDY), 8% (PHX), 2% (STL)
- Cool: 13% (ATL), 11% (INDY), 6% (PHX), 3% (STL)
- Slightly Cool: 13% (ATL), 11% (INDY), 6% (PHX), 3% (STL)
- Neutral: 5% (ATL), 5% (INDY), 3% (PHX), 2% (STL)
- Slightly Warm: 0% (ATL), 1% (INDY), 0% (PHX), 0% (STL)
- Warm: 0% (ATL), 0% (INDY), 0% (PHX), 0% (STL)
- Hot: 0% (ATL), 0% (INDY), 0% (PHX), 0% (STL)
- Very Hot: 0% (ATL), 0% (INDY), 0% (PHX), 0% (STL)

Cities: ATL, INDY, PHX, STL
Weather Nuances: the difference between success and failure?
Spatial Synoptic Classification (SSC)

• A multi-disciplinary weather classification method

Kalkstein, 1996; Crowe 1971; Kalkstein et al., 1987; Hondula et al., 2012
### Synoptic Scale Classification (SSC)

http://sheridan.geog.kent.edu/ssc.html

<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dry Polar (DP)</td>
<td>Dry air usually from polar regions; coldest temperatures during the year</td>
</tr>
<tr>
<td>Dry Moderate (DM)</td>
<td>Mild and dry air; often found when a traditional air mass is moderated</td>
</tr>
<tr>
<td>Dry Tropical (DT)</td>
<td>Dry air representing the hottest and driest conditions of the year</td>
</tr>
<tr>
<td>Moist Polar (MP)</td>
<td>Cloudy, humid, and cool weather types</td>
</tr>
<tr>
<td>Moist Moderate (MM)</td>
<td>Variable in its seasonality; considerably warmer than moist polar conditions</td>
</tr>
<tr>
<td>Moist Tropical (MT)</td>
<td>Warm and humid air; often oppressive conditions</td>
</tr>
<tr>
<td>Transitional (TR)</td>
<td>Air mass transition from one to another</td>
</tr>
</tbody>
</table>

Adapted from: Kalkstein et al., 1987
<table>
<thead>
<tr>
<th>Month</th>
<th>Jan I-10</th>
<th>Jan II-20</th>
<th>Jan Z1-end</th>
<th>Feb I-10</th>
<th>Feb II-20</th>
<th>Feb Z1-end</th>
<th>Mar I-10</th>
<th>Mar II-20</th>
<th>Mar Z1-end</th>
<th>Apr I-10</th>
<th>Apr II-20</th>
<th>Apr Z1-end</th>
<th>May I-10</th>
<th>May Z1-end</th>
<th>Jun I-10</th>
<th>Jun II-20</th>
<th>Jun Z1-end</th>
<th>Jul I-10</th>
<th>Jul II-20</th>
<th>Jul Z1-end</th>
<th>Aug I-10</th>
<th>Aug II-20</th>
<th>Aug Z1-end</th>
<th>Sep I-10</th>
<th>Sep II-20</th>
<th>Sep Z1-end</th>
<th>Oct I-10</th>
<th>Oct II-20</th>
<th>Oct Z1-end</th>
<th>Nov I-10</th>
<th>Nov II-20</th>
<th>Nov Z1-end</th>
<th>Dec I-10</th>
<th>Dec II-20</th>
<th>Dec Z1-end</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>18.4</td>
<td>22.2</td>
<td>15.9</td>
<td>20.3</td>
<td>17.6</td>
<td>15.3</td>
<td>17.8</td>
<td>16.0</td>
<td>14.4</td>
<td>16.7</td>
<td>13.9</td>
<td>14.1</td>
<td>12.2</td>
<td>9.8</td>
<td>8.4</td>
<td>6.5</td>
<td>4.4</td>
<td>4.2</td>
<td>3.9</td>
<td>3.6</td>
<td>4.7</td>
<td>4.1</td>
<td>3.6</td>
<td>9.9</td>
<td>6.5</td>
<td>4.5</td>
<td>10.6</td>
<td>6.8</td>
<td>4.9</td>
<td>3.4</td>
<td>8.1</td>
<td>7.2</td>
<td>11.9</td>
<td>7.5</td>
<td>3.8</td>
</tr>
</tbody>
</table>
SSC ‘Climatology’
SSC ‘Prime’ Visitor Days

- Dry Moderate
- Dry Polar
- Dry Tropical
- Moist Moderate
- Moist Polar
- Moist Tropical
- Transition

Locations:
- ATLANTA
- INDIANAPOLIS
- PHOENIX
- SAINT LOUIS
Prime versus excellent
Important Takeaways

• Many findings are intuitive...
  – However the quantification of such intuition is anything but intuitive!

• Sensitivity to nuances in weather-attendance relationships
  – The value-added product

• Geography matters!
Strategies for Resilience
Climate, Weather, and Tourism Initiative

Tourism destinations and their individual tourism businesses are all vying for the expenditures and vitality that tourists bring to their respective locations. But, in making travel choices, these vacationers have considerations besides distance, cost, and timing. They are also considering the daily or weekly weather and other climate factors when determining both where to go and the extent to which they enjoyed their travel experience. The World Tourism Organization, in meetings addressing weather, climate, and tourism noted that weather and climate are perhaps the most important influence on the choice of leisure travel destinations. Wind, humidity, temperature, drought, storm conditions, snow conditions, water temperature, and degree of sunshine are a few of the factors that affect the visitors’ decisions, satisfaction, and spending—that important economic “bottom line” for tourism businesses and tourism destinations.

In addition to the workshop and publications under this initiative, the Center’s activities in this initiative include a presentation at the National Weather Service and RENCI Summit on Decision Support Services and Technology and a joint research effort on recreational businesses and weather with faculty from the University of North Carolina at Wilmington.
Center for Sustainable Tourism

Weather and Climate Resources for the Tourism Industry:
Weather and climate variables have major impacts on business, especially the outdoor reliant tourism industry. Getting started and finding what you will need for analysis often proves as daunting as doing the analysis itself. Below is a table of internet resources to give you and your business a jump-start to success.

<table>
<thead>
<tr>
<th>Resource</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. <a href="http://www.weather.com/">http://www.weather.com/</a></td>
<td>One stop shopping: general weather, forecasts, analysis, videos, &amp; local weather text alerts</td>
</tr>
<tr>
<td>Location of weather stations near you</td>
<td>Clickable map of official governmental weather stations in the southeast United States, including both daily and hourly data stations</td>
</tr>
<tr>
<td><a href="http://rc-climate.ncsu.edu/map/">http://rc-climate.ncsu.edu/map/</a></td>
<td>Clickable map detailing hourly automated weather stations (ASCOS) throughout the United States</td>
</tr>
<tr>
<td>Online retailers for weather equipment</td>
<td></td>
</tr>
<tr>
<td><a href="http://www.ambientweather.com/">http://www.ambientweather.com/</a></td>
<td>Weather stations &amp; personal/business weather devices*</td>
</tr>
<tr>
<td><a href="http://www.weatherconnection.com/">http://www.weatherconnection.com/</a></td>
<td>Weather stations, radios, &amp; portable weather devices*</td>
</tr>
<tr>
<td><a href="http://www.allabout.com/">http://www.allabout.com/</a></td>
<td>Portable, hand-held weather instruments*</td>
</tr>
<tr>
<td>Weather data clearinghouses</td>
<td></td>
</tr>
<tr>
<td><a href="http://www.ncdc.noaa.gov/usnea.html">http://www.ncdc.noaa.gov/usnea.html</a></td>
<td>Government organization which houses all historical weather data and contains links to information sources</td>
</tr>
<tr>
<td><a href="http://acis.serec.com/">http://acis.serec.com/</a></td>
<td>User-friendly tool which accesses historical weather data**</td>
</tr>
<tr>
<td><a href="http://www.wunderground.com/">http://www.wunderground.com/</a></td>
<td>Freely accessible historical data</td>
</tr>
</tbody>
</table>

Southeast U.S. regional weather analysis
http://www.sarec.com
Southeast Regional Climate Center provides data, consulting, research, & climate information relating to the region.

Special-need forecasting & analysis
http://drought.unl.edu/dm/monitor.html
National & regional analysis of drought conditions
http://waterwatch.usgs.gov/new/
Stream flow analysis & flood stage monitoring
http://www.epic.mcep.noaa.gov/
Forecast products 6 to 90 days in advance
http://www.hpc.mcep.noaa.gov/index.html
National Weather Service precipitation analysis homepage

Severe weather
http://www.stormtrackts.com/
Lightning strike monitoring data and services**
http://www.ncl.noaa.gov/
National Weather Service site monitoring hurricane activity
http://www.stormpulse.com/
Private site tracking hurricanes & other severe weather*

*Private for-profit company  
**Login required
Center for Sustainable Tourism

10 steps to help your business become weather savvy:

Learning how your business is affected by the weather allows you several insights into your market and your clients. Using a solid method helps your analysis become more robust and accurate, justifying managerial decisions for your organization. Viewing weather as a positive asset to connect to your market will ultimately help cut costs and raise revenues.

1. Keep a daily log book or spreadsheet of attendance and weather at your site

The best step to any analysis—data creation. Begin by noting attendance and weather conditions during your business hours. If you already have historical attendance data but not weather data, see the Center for Sustainable Tourism online weather links to help you fill the void.

2. Have the right tools for the right analysis

At the simplest form you need two tools, one inside and one outside! Your inside tool is the analyses and keeps the data; this is either a log book or a computer with a spreadsheet program and graphics. Your outside tools are the way you measure the weather. If you are located in a large city or an area that already has a good weather station, your work has been done for you—just go on the internet for data. If not, you need to purchase some inexpensive weather instrumentation for your site. See the Center for Sustainable Tourism’s online weather links document for retailers to meet your needs.

3. Engage with clients about the weather effect

Even the best intentioned researcher with powerful computing resources will tell you there are confounding variables and random variations to consider. With this in mind, it is not sufficient to simply draw conclusions between attendance and weather variables. Schedules, circumstance, or indirect marketing can affect attendance at your business. Engage with clients, ask them: “How comfortable were you with the weather?” “How could it be better?” “What are your ideal preferences?” Mark this down in your log book under a “comments” section for future determinations.

4. Understand weather variables and weather indices that may have great impact on your attendance

Begin by listing the aspects of the weather that you think will affect the enjoyment and attendance of your tourism activity the most. Good starter variables include high and low temperatures, cloud cover, and precipitation. Your business will probably have other, more specific, weather variables that interest you. See the “weather variable” documents within the Tourism Climate Series at the Center for Sustainable Tourism for more ideas.

5. Brainstorm the storms

Think about how business opportunities are positively and negatively affected by the weather. What weather simply happens business versus what you plan for in advance? Not only what variables, but what outdoor experiences cause people to flock to your site or run away to other activities? Attendances are confounded by other social factors; however, personal enjoyment and comfort are not. Know what conditions may create lasting impressions of the experience and plan to do something about it!

6. Focus on the demands and needs of YOUR clients, not just general consumers

Responses to weather and weather events vary based upon expectations. While there might be a good fit model for a general population which responds in expected ways, this may not work for you—get to know your client base and how they react. For example, a coastal storm may cause beach goers to evacuate, but if you work with advanced surfers this may benefit your business and you need to be ready. Ask yourself: “Are my clients weather resistant?” That Tuesday women’s golf group shows rain or shine, so be prepared.

7. Know your microclimate

Simply put, microclimates are areas which are not always responsive to weather conditions that are different from the surroundings. Some exist in varying sizes, but an example is a shady park versus a sunny city street. Does your location display microclimate tendencies? If so, you may be able to benefit—justified to receipt claims of warmer conditions, more golf days, sunnier skies, better waves, more snow, or enhanced wind starting conditions can give your business a competitive advantage and a marketing edge.

8. Plan for weather liabilities

The outdoor nature of tourism and recreation includes risks, and you and your business need to be aware of these risks. Don’t simply pass the buck to clients for their own well-being taking an active role in determining the weather conditions that will affect their comfort and health to prevent unforeseen accidents. Invest in lightning detection equipment, know the exceptions required for recreation and keep heat indices in mind, report icy conditions, look for rip currents, document unfavorable winds. A little research and prevention now will save you and your business a lot of pain and money later.

9. Think regionally

Analyze the spatial breadth of your visitors and analyze the weather over the entire region. Just because it is raining at your competition’s site, it doesn’t mean you are going to get a washout. Keep this in mind and use weather as a demand-pull factor to your advantage.

10. Forecast

Weathermen forecast the weather. Now it is your turn to forecast your attendance (hopefully with better accuracy!) Take what you have learned to help you determine that “based upon the weather,” you should have greater or fewer people in attendance. This can help you avoid stock-outs, prevent understaffed situations, and add one more week’s profit to your seasonal business. And maybe it will also allow you to go home a little early and enjoy that bad weather if need be!
How can this research be applied to tourism businesses?

The Immediacy of Social Media

- While weather impacts attendance flows at tourism locations, so do promotions and advertisement.

- It is seen in the data that if the weather is not extreme, its impact can be strategically overcome.

Solution:

- Automatic social-media price promotions based upon business-specific weather triggers
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“We must understand today before we can successfully plan for tomorrow”

• Thank you for your time!

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