Adaptation Tools for Tourism
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Some remarks on adaptation

- In tourism sector major adaptation capacity lies by the tourists

- Adaptation Strategies of tourists
  - (Location and time conservatives) Stick to holiday location and time but adapt on site behavior
    - E.g. avoid outside activities at noon
    - E.g. do wellness in snow scarce winters.
  - (Holiday type conservatives) Change timing and/or destination of holidays but stick to holiday type
    - Change to more snow reliable ski areas
    - Postpone holidays to shoulder season. Change to regions with better climate
  - (Season conservatives) Change holiday type but stick to the season
    - E.g. stop skiing and make other type of holidays
  - (Fully flexible tourists)
Adaptation Strategies for destination areas

Destination areas have only limited adaptation capacity.

Alpine Skiing (against: loss in reliable snow conditions)
- Artificial snow making
  - With rising temperature less efficient
  - Resource intensive water and electricity
  - Already in use today
- Slope grooming, higher elevation ski resorts
- Concentration on summer tourism, all year tourism, invest in climate independent attraction

Beach Tourism (against: too warm climate)
- Shift of tourists to shoulder season
- Heat resistance of the hotel area (shading, air-conditions)
- Invest in climate independent attraction
Conclusion

-> Knowing the weather and climate sensitivities of demand really matters
WEDDA (WEather Driven Demand Analysis)

- WEDDA is a flexible toolbox with 10 years of incorporated R&D to estimate weather dependencies and weather risks of different sectors but also of individual enterprises or sites.

- WEDDA is a registered trade mark in the European Union and JOANNEUM RESEARCH looks for a partner in every European country, for two purposes:
  - Working only with the best available local weather forecasts
  - Selling the product to enterprises and business operations exposed to weather risk
  - For the time being we offer also a Europe wide service based on yr.no: https://www.wedda.eu/en/
Get your weather-dependant sales forecast in just 3 steps.*

Step 1
Register

Step 2
Accept the privacy policy

Step 3
Upload data

*After sending us your data on daily sales or visit/guest entries (for instance of the last 3 years) you will usually receive your first sales or entrance forecast within 10 working days. The forecast will be available to you online and will be updated on a daily basis.

Location Austria
Data is stored on servers located in Austria, thus we adhere to the strict data protection legislation of the Republic of Austria.

Security
All connections are protected with SSL.
The linkage of our demand models with short term weather forecasts or long term climatological forecasts leads to the following main applications of WEDDA

**Short term - WEDDA**
- Implementing short term forecasting-systems (e.g. attendance of public swimming pools, entrance to ski areas, shoe sales, ...)
- Quantifying the weather risks of a sector or an enterprise
- Determine business performance of a period subtracting the weather (& calendar) induced effects

**Long term – WEDDA – 4CPI (Climate proof investments)**
- Assessment of the potential effects of a changed climate on a sector or a business unit
Guiding principles of WEDDA

- High geographic (scalable) resolution
- Geo-referenced risks

Example: Value at Risk for ski areas associated to variability of natural snow cover
Guiding principles of WEDDA

- High temporal resolution
- Hourly, daily, … whatever suits best the customer’s need to understand and react to demand fluctuations

Example: predicted (green) and actual demand (black) of a public swimming pool
Guiding principles of WEDDA

- State of the art modeling
- Making use of latest developments in science

Example: modeling the nonlinear relationship between temperature and electricity demand in Italy
Typical curves by sector

- **Indoor sports**
  - Daily entrance climbing hall depending on temperature
Typical curves by sector

- Outdoor sports
  - Hiking
  - Visits to a park
Typical curves by sector

Outdoor water based leisure activities

- Public Pools
- Lakes
Delivery of Forecasts
Delivery of Forecasts

- daily
- as a mobile application
**Durchschnittliche Anzahl der Seilbahnfahrten**

<table>
<thead>
<tr>
<th>Seilbahn</th>
<th>Besucher</th>
<th>Durchschnitt*</th>
<th>Anteil am Jahresfahrten in %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bergfahrt</td>
<td>5.592</td>
<td>37.3</td>
<td>21%</td>
</tr>
<tr>
<td>Talfahrt</td>
<td>18.910</td>
<td>24%</td>
<td></td>
</tr>
<tr>
<td>Summe</td>
<td>34.792</td>
<td>22%</td>
<td></td>
</tr>
<tr>
<td>Wander**</td>
<td>3.072</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* Durchschnitt Winter der letzten Jahre (07/06-12/13)  
** Summe der täglichen absoluten Differenzen

**Gemessene 14 Uhr Temperatur in Grad Celsius**

<table>
<thead>
<tr>
<th>Kennzahl</th>
<th>02/03 bis 12/13</th>
<th>13/14</th>
</tr>
</thead>
<tbody>
<tr>
<td>Durchschnitt</td>
<td>3.7</td>
<td>4.8</td>
</tr>
<tr>
<td>Minimum</td>
<td>-4.9°</td>
<td>-4.8°</td>
</tr>
<tr>
<td>Maximum</td>
<td>16.7°***</td>
<td>11.3°***</td>
</tr>
</tbody>
</table>

*** 25. Februar 2008, **** 27. Februar 2014

**Niederschlagsmenge in Millimeter**

<table>
<thead>
<tr>
<th>Kennzahl</th>
<th>02/03 bis 12/13</th>
<th>13/14</th>
</tr>
</thead>
<tbody>
<tr>
<td>Summe</td>
<td>94.8°</td>
<td>136.2</td>
</tr>
<tr>
<td>Maximum</td>
<td>31.9°***</td>
<td>24.9°***</td>
</tr>
</tbody>
</table>

* Durchschnittliche Niederschlagsmenge im Februar  
** 28. Februar 2013, *** 17. Februar 2014

14 Uhr Temperatur Winter 13/14

**WETTERRBÄUENIGTE PERFORMANCE**

- Die wetterbereinigten Daten geben Aufschluss über Einflüsse, die nicht durch meteorologische und kalendarische Kreisgrößen beschrieben werden können.  
- Damit ergibt sich für die Seilbahn Bergfahrt in Summe ein Plus von 14%.

**Risikomaß Winter 13/14 (Value at Risk)**

<table>
<thead>
<tr>
<th>Seilbahn</th>
<th>Value at Risk</th>
<th>Besucher 13/14</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bergfahrt</td>
<td>12 -100</td>
<td>16.077***</td>
</tr>
<tr>
<td>Talfahrt</td>
<td>14 -97</td>
<td>21.237****</td>
</tr>
<tr>
<td>Summe</td>
<td>26.550</td>
<td>37.918***</td>
</tr>
<tr>
<td>Wander***</td>
<td>2.650</td>
<td>5.194</td>
</tr>
</tbody>
</table>

* mit einer Wahrscheinlichkeit von 95% liegt die Besucherzahl über dem entsprechenden Wert  
** Summe der täglichen absoluten Differenzen  
*** entspricht dem drittbesten Winter Ergebnis seit dem Beginn der Aufzeichnungen im Jahr 2007  
**** entspricht dem zweitbesten Winter Ergebnis seit dem Beginn der Aufzeichnungen im Jahr 2007

**Veränderung in % gegenüber dem Durchschnitt**

<table>
<thead>
<tr>
<th>Bergfahrten</th>
<th>Talfahrten</th>
<th>Summe</th>
</tr>
</thead>
<tbody>
<tr>
<td>14%</td>
<td>13%</td>
<td>9%</td>
</tr>
</tbody>
</table>

**Wetterbereinigte Daten (Potential)**

** Monitor business development independent of weather fluctuations**

- for ex post assessment and business reporting
Considered effects in this presentation

**Summer**
- Tourists stick to month
- Tourists stick to season
- In region and months with mean temperature bigger than 29 °C can successfully adapt to too hot climate
- Period 2035-2065
- RCP SSP/RCP4.5

**Winter**
- Tourist stick to season and activity
- Tourists stick to season
- Change in summer overnight stays when tourists stick to season
- Period 2035-2065
- RCP SSP/RCP4.5
Impacts on touristic stream summer

Changes when tourists stick to month and activity

Changes when tourists stick to season and activity
Impacts on touristic stream summer

Climate Potential under current climate

Climate potential under future climate

Potential for summer tourism for period base
- less than 2.35
- 2.35 to 2.68
- 2.68 to 3.36
- 3.36 to 3.91
- 3.91 to 4.21
- 4.21 to 4.47
- 4.47 to 4.71
- bigger than 5.03

Potential for summer tourism for period 2035-2065
- less than 2.35
- 2.35 to 2.68
- 2.68 to 3.36
- 3.36 to 3.91
- 3.91 to 4.21
- 4.21 to 4.47
- 4.47 to 4.71
- bigger than 5.03
Impacts on touristic stream summer

Changes when season is fixed no adaptation

Changes when season is fixed adaptation

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Change in overnight stays for different areas RCP 4.5
Period 2035-2065 only climate change (above) with seasonal and regional redistribution (below)
Impacts in Winter tourism

Change of climatic potential for region in winter
Changes of touristic overnight stays for period 2035-2065 when tourists stick to alpine skiing (above) or change activity (below)
Impacts on touristic stream winter for RCP4.5 and 2035-2065

Change in overnights stays when tourists stick to skiing in [%]
- less than -23.8
- -23.8 to -10.4
- -10.4 to -4.3
- -4.3 to 0
- 0 to 4
- 4 to 7.5
- 7.5 to 10.8
- bigger than 10.8

Change in overnights stays when tourists change activity in [%]
- less than -33.8
- -33.8 to -24.4
- -24.4 to -15.6
- -15.6 to 0
Impacts on touristic stream

![Map showing changes in overnight stays in summer season in percentage]  
Change in overnight stays summer season in [%]  
- less than -2.7  
-2.7 to -1.9  
-1.9 to -1.2  
-1.2 to 0  
0 to 2.9  
2.9 to 6.3  
6.3 to 9.3  
bigger than 9.3

![Map showing changes in overnight stays winter and summer season in percentage]  
Change in overnight stays winter and summer season in [%]  
- less than -17.4  
-17.4 to -12  
-12 to -7.6  
-7.6 to 0  
0 to 0  
0 to 0.3  
0.3 to 1.1  
bigger than 1.1
Conclusion

Summer beach
- Conditions in Mediterranean best for beach tourism
- Some parts of Mediterranean will get too hot in July-August
- Generally conditions get better in shoulder season, but increased competition prevents from gaining tourists
- If implications of hot climate can be reduced only small changes in overnight stays

Winter alpine Skiing
- Conditions get harder in general
- Important to keep people interested in skiing
- For most regions conditions in summer improve
- Predicted positive change in summer for affected regions is less than in winter