As Many Die At Everest, An Old Problem: Too Many Climbers, Deadly Congestion

This year more than 400 climbers and sherpas decided to try their luck at summiting Mount Everest during the spring climbing season. Tragically, at least four have died so far and more than 30 others are reported to be suffering from severe frostbite and other ailments caused by prolonged exposure to Everest’s brutal conditions. With several days remaining in the climbing season, and many climbers still preparing to make ascents, the potential for further tragedy is high.

Massenandrang am Mount Everest: "Alle standen sich im Weg"

Ein Interview von Matthias Gebauer


Source: www.spiegel.de
Social Carrying Capacity of Protected Areas

Bad Schandau

08.06.2016
1. Social Carrying Capacity and Crowding

2. Visitor Numbers in German national parks

3. Crowding Perception in Saxon Switzerland National Park

4. Demographic Change, Spatial Behavior and Carrying Capacity in Berchtesgaden National Park
Carrying Capacity and outdoor recreation

The concept of Carrying Capacity was introduced to tourism literature by Wagar (1964) and can be defined as "the level of use beyond which impacts exceed acceptable levels specified by evalulative standards" (SHELBY/HEBERLEING 1984, p. 441).

Carrying Capacity is a multidimensional concept including physical, social and ecological aspects.

Focus in Germany and Europe is lying primarily on ecological aspects of carrying capacity.
Social Carrying Capacity

✓ Social Carrying Capacity can be defined as “the level or type of use beyond which impacts to the visitor experience exceed acceptable levels” (VASKE & SHELBY 2008, p.155)

✓ Researches can define and measure indicators for Social Carrying Capacity, however the management of the national park and local stakeholders have to define limits of Social Carrying Capacity

✓ In North America the concept of Social Carrying Capacity is incorporated in visitor management frameworks (LAC, VERP etc.)

✓ Zoning concepts define sub areas with low capacity to provide opportunities for solitude and high capacity to provide opportunities for the general public
Crowding can be defined as "a negative assessment of a certain density level in a given area" (Lee/Graefe 2003)

Recreation use patterns
- Topography
- Geography
- Trip characteristics

Crowding Norms
- Personal characteristics
- Characteristics of others
- Situational variables

Coping behavior
- Displacement
- Cognitive coping

Other Satisfaction Variables
- Weather
- Etc.

Use Levels

Contacts/encounters between Groups

Perceived Crowding

Satisfaction

Source: modified after Manning 2011
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Visitor density (visitor days per hectare and year)
## Most visited areas in German national parks

<table>
<thead>
<tr>
<th>National park</th>
<th>Year of data collection</th>
<th>Interview location</th>
<th>Number of visitors</th>
<th>Share of total visitor number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Saxon Switzerland</td>
<td>2009</td>
<td>Bastei</td>
<td>919,000</td>
<td>53.7%</td>
</tr>
<tr>
<td>Berchtesgaden</td>
<td>2014</td>
<td>Königssee</td>
<td>874,000</td>
<td>55.3%</td>
</tr>
<tr>
<td>Harz</td>
<td>2012/13</td>
<td>Torfhaus</td>
<td>631,000</td>
<td>36.1%</td>
</tr>
<tr>
<td>Harz</td>
<td>2012/13</td>
<td>Brocken</td>
<td>583,000</td>
<td>33.4%</td>
</tr>
<tr>
<td>Jasmund</td>
<td>2013/14</td>
<td>Königsstuhl</td>
<td>515,000</td>
<td>75.8%</td>
</tr>
</tbody>
</table>

- Bastei most visited area in all German national parks
- Concentration of visitors is highest in Jasmund national park
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Two visitor surveys on crowding:

- Schreiner (2009) in the Kirnitzsch Valley in eastern part (n=280)
- Schamel (2011) on four interview locations in the western part (n=312)
- Both studies used 9 point Likert Scale to measure Crowding
Study Area & Methods

Source: Job et al. (2010), p. 18

Visitors

Study 2011

Study 2009
## Results - Crowding Perception

<table>
<thead>
<tr>
<th>Location</th>
<th>N</th>
<th>Mean</th>
<th>SD</th>
<th>≥5</th>
</tr>
</thead>
<tbody>
<tr>
<td>2011</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bastei</td>
<td>86</td>
<td>5.76</td>
<td>1.68</td>
<td>74.4%</td>
</tr>
<tr>
<td>Brand</td>
<td>76</td>
<td>3.51</td>
<td>1.52</td>
<td>25.3%</td>
</tr>
<tr>
<td>Zescherregrund</td>
<td>75</td>
<td>3.03</td>
<td>1.49</td>
<td>8.0%</td>
</tr>
<tr>
<td>Waltersdorfer Mühle</td>
<td>75</td>
<td>2.73</td>
<td>1.07</td>
<td>12.0%</td>
</tr>
<tr>
<td>2009</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Kuhstall</td>
<td>70</td>
<td>4.43</td>
<td>2.37</td>
<td>44.3%</td>
</tr>
<tr>
<td>Kuhstall-trail</td>
<td>70</td>
<td>3.84</td>
<td>1.97</td>
<td>40.0%</td>
</tr>
<tr>
<td>Großer Zschand</td>
<td>70</td>
<td>2.16</td>
<td>1.60</td>
<td>10.0%</td>
</tr>
<tr>
<td>Bootstation Oberer Schleuße</td>
<td>70</td>
<td>2.37</td>
<td>1.50</td>
<td>11.4%</td>
</tr>
<tr>
<td>Total (2009 + 2011)</td>
<td>592</td>
<td>3.52</td>
<td>2.03</td>
<td>29.0%</td>
</tr>
</tbody>
</table>
Results - Crowding and Expectation

Crowding and expected visitor numbers

- Total (n=297)
- Heavily overestimated (n=6)
- Overestimated (n=84)
- Met (n=157)
- Underestimated (n=37)
- Heavily underestimated (n=13)

Source: Schamel 2011
Results - Reaction to Crowding

All respondents (n=312)

No reaction

51.0%

Spatial Displacement

Visit other areas in national park (61.3%*)

Visit landscape protected area (9.2%*)

Stop visiting national park (0.7%*)

Walk off trail (2.6%*)

Reaction

48.7%

Temporal Displacement

Visit on different weekday (35.5%*)

Visit on different daytime (13.2%*)

Visit on different season (25.5%*)

* Refers to respondents who showed reaction; multiple answers possible

Source: Schamel 2011
More than 80% of visitors are not or only slightly disturbed in their nature experience, however at the Bastei one of three visitors is disturbed.

More than 95% of visitors are satisfied or very satisfied; Significant, but low correlation between crowding perception and satisfaction (r=-0.24).

Low correlation may be rooted back to cognitive coping strategies or displacement of sensitive visitors.
Results - Conflicts besides Crowding

All respondents (n=312)

70.8% No disturbance by behavior of other visitors

29.2% Disturbance by behavior of other visitors

- Dropping waste (53%*)
- To loud (29%*)
- Dog not on leash (22%*)
- Groups too large (17%*)
- Smoking (17%*)
- Walk off trail (17%*)
- Other (10%*)

* Refers to respondents who showed disturbance; multiple answers possible

Source: Schamel 2011
Management Options

✓ No management action needed where crowding perception is low

✓ At the Bastei, Brand and in Lower Kirnitzschvalley providing information about temporal and spatial distribution of visitors numbers is essential

✓ Providing information in situ about possible alternatives to crowded areas and trails

✓ Promotion of off-season use, marketing with low visitor numbers

✓ However, changing temporal and spatial patterns of visitors use could increase crowding perception in other parts of the area
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Research design

- Berchtesgaden NP is the only alpine NP in Germany
- Most visitors concentrate at Lake Königsee, where easy walks can be found, but also demanding mountaineering possible (e.g. Mount Watzmann, 2713m)

- Questionnaire and GPS-Logging in Berchtesgaden National Park (n=481)
- Visitor characteristics
- GPS trajectories of spatio-temporal behavior
- Geodatabase of Berchtesgaden National Park
- Enriched spatio-temporal data
- Visitor counting and short interviews

Berchtesgaden NP is the only alpine NP in Germany
Most visitors concentrate at Lake Königsee, where easy walks can be found, but also demanding mountaineering possible (e.g. Mount Watzmann, 2713m)
✓ **Mountaineer**: 9.4 km distance; 751 m elevation gain; steep trails with danger of falling

✓ **Demanding Hiker**: 14.0 km; 732 m elevation gain; avoid trails with danger of falling; hike in grassland or forest areas

✓ **Convenient Hiker**: 5.7 km; 208 m elevation gain; almost exclusively on trails with even surface

✓ **Walker**: 3.4 km; 64 m elevation gain; highest share of stopping time of total trip time
Activity Types and Age

- Share of Mountaineers drops after the age of 49
- Share of Walkers is strongly increasing after the age of 59
Relative change in trail use assuming scenario 2:

-16% to -10%  
>-10% to -2.5%  
>-2.5% to 2.5%  
>2.5% to 10%  
>10% to 15%  
no data

Zoning:
- Core zone
- Temporary management zone
- Permanent management zone

Source: Geographisches Informationssystem Nationalpark Berchtesgaden 2013; Land Salzburg 2014; own research
Design: J. Schamel; Cartography: W. Weber
Institute of Geography and Geology, JMU Würzburg, 2016
Conclusions

✓ Demographic change is only one factor, besides others like changing preferences for outdoor recreation activities, technological change, etc. that will affect future spatial behavior.

✓ Results suggest that, demographic change may lead to a concentration of visitors of easy trails, due to increase of Walkers.

✓ Frequentation of trails in remote areas is likely to decline with demographic change.

✓ The demographic change may lead to a concentration of visitors in easily accessible areas, which may increase social conflicts, especially as older visitors were found to be more sensitive to these conflicts (ARNBERGER & EDER 2011, TRACHSEL & BACKHAUS 2011).
Thank you for your attention
Enriching GPS-trajectories

- 2 Persons
- 55 years male and 56 female
- Member of Alpine hiking club

- Medium self-rated endurance
- No health restrictions
- Etc.

Land cover along trail
Enriching GPS-trajectories

- 2 Persons
- 55 years male and 56 female
- Member of Alpine hiking club

- Medium self-rated endurance
- No health restrictions
- Etc.

Trail difficulty
Land cover along trail
Enriching GPS-trajectories

- 2 Persons
- 55 years male and 56 female
- Member of Alpine hiking club

- Medium self-rated endurance
- No health restrictions
- Etc.

Slope of trail in movement of direction
Trail difficulty
Land cover along trail
Enriching GPS-trajectories

- 2 Persons
- 55 years male and 56 female
- Member of Alpine hiking club
- Medium self-rated endurance
- No health restrictions
- Etc.
Social Norm Curve

Source: Manning et al. 1999, p. 99
Crowding Norms

- **Gesamt**
  - Bewertung der Akzeptanz vs. Anzahl der Personen auf dem Foto

- **Basel**
  - Bewertung der Akzeptanz vs. Anzahl der Personen auf dem Foto

- **Waltersdorfer Mühle**
  - Bewertung der Akzeptanz vs. Anzahl der Personen auf dem Foto
Crowding perception in other German National Parks

- **Kalisch (2012):** only slight forms of crowding on Hamburger Hallig in Schleswig-Holstein Wadden Sea National Park

- **Ahrend (2013):** about one fourth of the visitor perceives moderate to heavy forms of crowding on trails to Brocken in Harz National Park, however high satisfaction levels

- **Wölffle et al. (2016):** no forms of crowding on weekdays, but about one fourth of visitors perceives some form of crowding on sundays in Eifel National Park
## Demographic Scenarios

<table>
<thead>
<tr>
<th>Activity Types</th>
<th>Share of groups with a member over 60 years</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>32% (Today)</td>
</tr>
<tr>
<td></td>
<td>40% (Scenario 1)</td>
</tr>
<tr>
<td></td>
<td>48% (Scenario 2)</td>
</tr>
<tr>
<td></td>
<td>56% (Scenario 3)</td>
</tr>
<tr>
<td>Mountaineer</td>
<td>11.2%</td>
</tr>
<tr>
<td></td>
<td>10.7%</td>
</tr>
<tr>
<td></td>
<td>10.1%</td>
</tr>
<tr>
<td></td>
<td>9.5%</td>
</tr>
<tr>
<td>Demanding Hiker</td>
<td>21.5%</td>
</tr>
<tr>
<td></td>
<td>19.7%</td>
</tr>
<tr>
<td></td>
<td>18.0%</td>
</tr>
<tr>
<td></td>
<td>16.3%</td>
</tr>
<tr>
<td>Convenient Hiker</td>
<td>30.5%</td>
</tr>
<tr>
<td></td>
<td>30.5%</td>
</tr>
<tr>
<td></td>
<td>30.5%</td>
</tr>
<tr>
<td></td>
<td>30.6%</td>
</tr>
<tr>
<td>Walker</td>
<td>36.8%</td>
</tr>
<tr>
<td></td>
<td>39.1%</td>
</tr>
<tr>
<td></td>
<td>41.3%</td>
</tr>
<tr>
<td></td>
<td>43.5%</td>
</tr>
</tbody>
</table>

✓ Assuming an age effect, the share of Walkers will incline at the expense of Moutaineers and Demanding Hikers
Demographic Change and Spatio-Temporal Behavior
Conclusions

- Demographic change likely leads to a concentration of visitors and may thus lead to a exceeding of Social Carrying Capacity
- Crowding is primarily occurring at gathering points
- At the Bastei, the most visited spot in all German national parks, Crowding is a widespread phenomenon and it must be discussed if social carrying capacity is exceeded
- Displacement in reaction to crowding is observable, however the relationship between crowding perception and satisfaction is weak