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**BACHELOR THESIS**

„Influence of Global Climate Change on Tourism in the Czech Republic“

„Vliv globální změny klimatu na turistický ruch v České republice“

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Prague, 31.3.2011

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„Influence of Global Climate Change on Tourism in the Czech Republic“

„Vliv globální změny klimatu na turistický ruch v České republice“

## **Summary**

This bachelor thesis examines the impact of global climate change on two touristic destinations in the Czech Republic. Eleven following years (2000 - 2010) have been studied on the basis of data provided by Czech Hydrometeorological Institute, ski center Rokytnice nad Jizerou and Český Krumlov Information office.

First part of this thesis is devoted to theoretical observations. Those refer to basic characteristics of global climate change and its relationship to tourism. Moreover, climatic conditions in the Czech Republic are determined and one part is also dedicated to basic facts about the tourism in the Czech Republic.

Practical part studies the relationship study between climate change and visit rate of two touristic attractive locations. These are Český Krumlov, a town situated in the South Bohemian Region and Rokytnice nad Jizerou, ski center in Krkonoše Mountains. Their visit rate is compared with meteorological data observed during meteorological summer and winter in years 2000-2010.

In the conclusive part all the outcomes are summarized and evaluated. Some ideas for possible future development are mentioned there.

Key words: global climate change, tourism, Rokytnice nad Jizerou, Český Krumlov, regression analysis

## **Souhrn**

Tato bakalářská práce zkoumá dopad globální změny klimatu na dvě turistické destinace v České republice.

První část práce je teoretická a definuje klima, globální změnu klimatu a její vztah k cestovnímu ruchu. Zároveň jsou zde uvedena základní fakta o cestovním ruchu v České republice.

Praktická část se zabývá vztahem mezi změnou klimatu a návštěvností dvou vybraných turistických lokalit: Českého Krumlova, města ležícího v Jihočeském kraji a Rokytnice nad Jizerou, lyžařského střediska v Krkonoších. Jejich návštěvnost je ve srovnání s meteorologickými údaji pozorovanými v průběhu meteorologických let a zim v letech 2000-2010. Analýza byla provedena na základě dat poskytnutými Českým hydrometeorologickým ústavem, Spartakem Rokytnice nad Jizerou a Informační kanceláří v Českém Krumlově.

V závěrečné části jsou všechny výsledky shrnuty a vyhodnoceny a zároveň jsou zmíněna doporučení pro zaměření těchto turistických destinací do budoucnosti.

Klíčová slova: globální změna klimatu, turismus, Rokytnice nad Jizerou, Český Krumlov, regresní analýza



## Contents

1. Introduction.....	10
2. Aim and Methodology .....	11
3. Literature Review.....	13
3.1. Weather, Climate and Climate Change.....	13
3.1.1. Definitions.....	13
3.1.2. Relationship between Climate, Weather and Tourism.....	14
3.1.3. Climate change in numbers.....	16
3.2. Climate in the Czech Republic.....	18
3.2.1. Climate.....	18
3.3. Tourism in the Czech Republic.....	20
3.3.1. 1945 - 1989 .....	20
3.3.2. 1989 - Present.....	20
3.4. Český Krumlov – facts and information .....	21
3.4.1. History.....	21
3.4.2. Culture.....	22
3.4.3. Sightseeing.....	22
3.5. Krkonoše Mountains .....	23
3.5.1. Rokytnice nad Jizerou – facts and information.....	23
4. Analysis.....	24
4.1. Climate Change in the Czech Republic.....	24
4.2. Winter.....	25
4.2.1. Statistical analysis.....	29
4.3. Summer .....	33
4.3.1. Statistical Analysis.....	36
5. Conclusion .....	39
6. Bibliography.....	42
7. Supplements.....	44
7.1. Table of Figures .....	44
7.2. Data.....	44

## **1. Introduction**

I chose the topic "Impact of climate change on tourism in the Czech Republic," because the topic of global climate change is often discussed in the media by journalists and scientists. There are hot discussions at political meetings about the ways of combating global warming, new "climate-friendly" technologies have been developed and politicians publish books about who is causing global warming. There is also the discussion about whether global warming even exists.

Climate directly affects our everyday lives and directly affects the economy. People have to fight more often the effects of floods; farmers are struggling with severe droughts, trying to save the crops.

Also tourism is influenced by weather conditions - when the weather is nasty or extremely drought, people are responding to these changes for example by changing holiday location or by postponing the departure to another season.

The main reason why I chose this topic is the fact that I like traveling, sightseeing as well as skiing is my hobby, so I know what is important for tourists, skiers and what factors are important for me, when I am choosing my holiday location. By choosing this topic, I managed to combine my hobby and current issue.

## 2. Aim and Methodology

The aim of this thesis is to show the influence of global climate change on visit rate of two localities, Rokytnice nad Jizerou and Český Krumlov.

The research is made for winter and summer period. Firstly, there will be analyzed the influence of average temperature change on visit rate and secondly the influence of the snow cover height in the ski center Rokytnice nad Jizerou. The relationship is going to be examined by regression analysis. Moreover, other factors influencing visit rate will be mentioned in this chapter.

The second part of the analytical chapter will be dedicated to the summer period. There will be examined the relationship between average precipitation and visit rate and average temperatures and visit rate of the State Castle Český Krumlov.

At the beginning of every analysis, the  $H_0$  hypothesis (that the climate indicator affects a visit rate) is set. Afterwards, the regression analysis is made.

The main focus of **regression analysis** is the relationship between a dependent variable and one or more independent variables. More specifically, regression analysis helps one to understand how the typical value of the dependent variable changes when any one of the independent variables is varied. Regression models involve the following variables:

- The **unknown parameter** denoted as **b**; measures the impact of X variable on Y variable
- The **independent variable X**
- The **dependent variable Y**

For purposes of this thesis the linear regression analysis will be used. This says, that if one variable changes, the other variable changes in the same sense. A **regression line** is a line drawn through a scatterplot of two variables. The line is chosen so that it comes as close to the points as possible. Its exact location in the array coordinates can be determined by the equation:

$$y=a+bx, \text{ where}$$

- a corresponds to the intercept of the regression line with y axis, when  $x = 0$

- $b$  is a regression coefficient, which shows how much is the dependent variable changed, when the independent variable changes by one unit

The hypothesis  $H_0$  is then either accepted or rejected by the  $p$ - test. This test shows, if the analysis is statistically significant on the 95% confidence level. When the results are statistically significant, the coefficient of correlation is computed in order to prove the strength of the relationship between two variables.

An equally important objective is of this thesis is to give information about the global climate change and define the weather phenomena related to tourism.

The last goal is to compute the average climate change in the chosen destinations and compare it with the results published by the Czech Hydrometeorological Institute.

### 3. Literature Review

#### 3.1. Weather, Climate and Climate Change

##### 3.1.1. Definitions

Weather is a state of atmosphere at the moment of time and is determined by number of meteorological factors including temperature, wind, cloud cover and precipitation at specific geographical location. Weather is an inseparable element of environment and is what tourists actually experience on holidays, affecting their activities and holiday satisfaction. If weather is good or bad is subjective and depends on people's health mood and personal preferences or activities.<sup>1</sup>

Climate is the average pattern of weather for a particular region over a long period of time.<sup>2</sup> It is defined by a number of factors, including: average regional temperature as well as day/night, average humidity, average precipitation, storm events or average amount of sunshine.<sup>3</sup> Averages are calculated over at least three ten-years long periods, known as a Climate Normals. These Normals are used to serve as a „benchmark“, against which recent observations can be compared or as a prediction of conditions most likely to be experienced in a given location. Climate is a key factor considered during a travel planning and is an important attribute taken into account in locational planning, infrastructure development and destination marketing.<sup>4</sup>

Global climate change refers to long-term changes in weather patterns that can be caused naturally or by human activities. Natural causes include volcanic eruptions and natural fluctuation of the climate itself. However, natural causes can explain only a small part of this warming. The majority of scientists agree that it is due to rising concentrations of heat-

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<sup>1,4</sup> World Tourism Organisation and United Nations Environment Programme. *Climate Change and Tourism - Responding to Global Challenges*: World Tourism Organisation, (2008). Spain.

<sup>2</sup> European Commission, What is a climate change? Retrieved from <[http://ec.europa.eu/clima/sites/campaign/what/climatechange\\_en.htm](http://ec.europa.eu/clima/sites/campaign/what/climatechange_en.htm)>, [cit. 23. 1. 2011]

<sup>3</sup> Global warming vs. Climate change, retrieved from <<http://www.grinningplanet.com/2007/01-02/global-warming-vs-climate-change.htm>>, [cit. 23. 1. 2011]

trapping greenhouse gases in the atmosphere caused by human activities.<sup>5</sup> Particularly the burning of fossil fuels like coal and oil, have contributed to increased atmospheric carbon dioxide (CO<sub>2</sub>) and other trace greenhouse gasses that cause so called „greenhouse effect“.<sup>6</sup>

The greenhouse effect is a process, by which the energy from the sun comes down to the Earth, some bounces straight into the space and the rest is absorbed by the oceans, land and atmosphere. This energy warms them and then some of it goes out to space and some is trapped by trace atmosphere gases (carbon dioxide and methane). These greenhouse gasses are here naturally, but human activity is increasing their concentrations. These molecules then reemit the energy in all directions and heat the atmosphere. The atmosphere then works as a real greenhouse and increases the temperatures on the Earth's surface.<sup>7</sup>

### **3.1.2. Relationship between Climate, Weather and Tourism**

The relationship between tourism and climate has been studied since 1970s, when applied climatologists examined the climatic thresholds that defined the season length for a wide range of tourism activities. More recent work has focused on the role of weather and climate in travel motivation, destination choice and holiday satisfaction for tourists.<sup>8</sup>

For many regions of the world, climate is the main motive power for attracting visitors and, in this way, forms an important part of the natural resource base for tourism. Therefore, any change in climate affects this natural resource and will also affect demand for this resource.<sup>9</sup>

Every day, there are tourists making decisions about where to travel in order to pursue their favorite recreational activity. There are many considerations taken into account, when the travellers are choosing their holiday destination: cost, distance and climate and weather. Wind, humidity, snow conditions or water temperature or number of sunny days play an

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<sup>5</sup> European Commission, What is a climate change? Retrieved from  
<[http://ec.europa.eu/clima/sites/campaign/what/climatechange\\_en.htm](http://ec.europa.eu/clima/sites/campaign/what/climatechange_en.htm)> [cit. 23. 1. 2011]

<sup>6</sup> Karling, H. M, *Global Climate Change Revisited*. Nova Science Publisher, Inc. (2007) , pg. 83

<sup>7</sup> BBC News, Guide to climate change, retrieved from  
<[http://news.bbc.co.uk/2/shared/spl/hi/sci\\_nat/04/climate\\_change/html/greenhouse.stm](http://news.bbc.co.uk/2/shared/spl/hi/sci_nat/04/climate_change/html/greenhouse.stm)> cit. [cit. 27. 1. 2011]

<sup>8</sup> World Tourism Organisation and United Nations Environment Programme. (2008). *Climate Change and Tourism - Responding to Global Challenges*: World Tourism Organisation, Spain, pg.46

<sup>9</sup> C. Michael Hall and James Higham. *Tourism, Recreation and Climate Change* Cromwell Press (2005), pgs. 29, 30

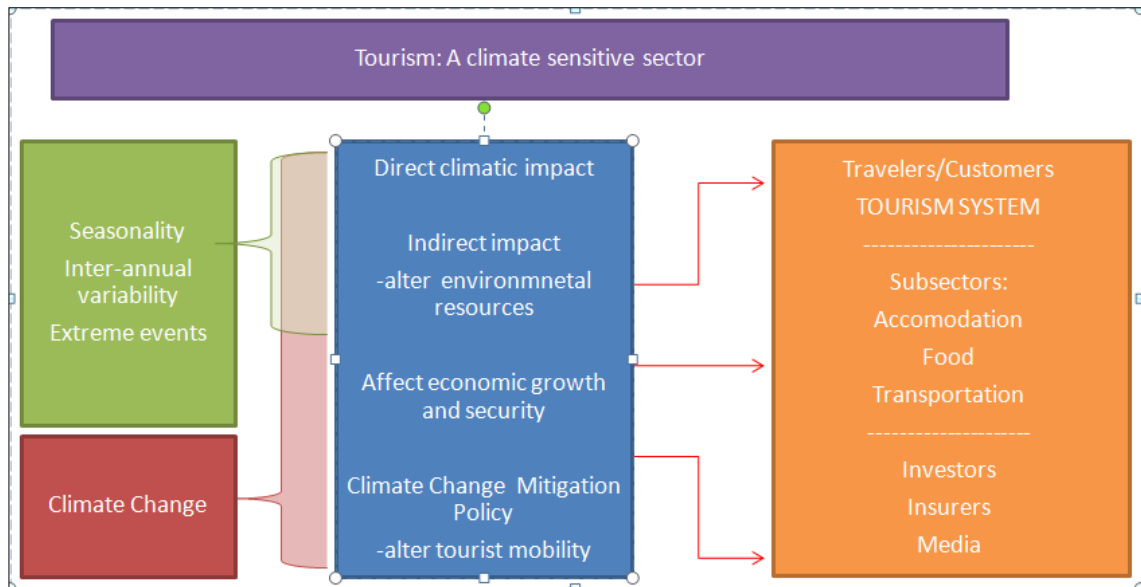


Figure 1: Linkages between climate and tourism

important role in visitor’s satisfaction, decisions or extent of spending – the most important point for tourism businesses.<sup>10</sup> Weather can serve as an opportunity for tourism as well as potential threat. When travelers choose alternative destination, the economic effects can be devastating to local economies and alter the patterns of tourism for long periods of time.

In the Figure 1 we can see, that all tourism sectors are influenced by the climate change, either directly or indirectly. There is a direct impact on economic success of businesses that heavily rely on income from tourism, like skiing, recreational coastal activities or golf. There are also industries and sectors that supply these communities and would be also affected by the change of climate indirectly.<sup>11</sup>

Climate change also brings changes in frequency of extreme events like hurricanes, floods or tsunamis. These extreme events then influence tourism businesses directly. As an example can be taken the region of South - East Asia, where in 2005 more than 200 000 people died in tsunami. This natural disaster lead here to huge losses in revenues from

<sup>10, 11</sup> Climate, Weather and Tourism: Bridging Science and Practice, Division of Research and Graduate Studies East Carolina University, retrieved from

<<http://www.ecu.edu/cs-acad/sustainabletourism/upload/Climate-Weather-and-Tourism-Bridging-Science-and-Practice.pdf>>, [cit. 28. 1. 2011]

tourism and many potential visitors are scared to travel to these places for fear from being also affected due to lack of protection or just does not want to visit beaches and cities, where countless died.<sup>12</sup>

Recently, tourists are also affected by climate change mitigation, as the tourism industry is responsible for large portion of greenhouse emissions from planes and cars. For example, there are about 3% of all greenhouse gasses in the EU produced by air traffic, and this number has an increasing tendency – since 1990 has the percentage risen by 87%. Moreover, planes produce more than 75% percent of CO<sub>2</sub> in the Czech Republic.

Since 1.1.2012 new mitigation emission policy will be introduced in the EU. All planes starting and landing in within the EU countries will be obliged to have emission allowances which should compensate the CO<sub>2</sub> emissions during the flights.<sup>13</sup> This policy could alter tourism mobility in a way of making the flight tickets more expensive and reduces number of passengers using this means of transport. Also many smaller businesses are introducing mitigation policies, like using the efficient light bulbs, waste and water management practices or are installing solar panels. It is also necessary to educate the guests, which these policies are helping to preserve the long-term climate sustainability of their favorite destination.

### **3.1.3. Climate change in numbers**

The Intergovernmental Panel on Climate Change (IPCC) in the Fourth Assessment Report<sup>14</sup> summarized the growing evidence from multiple natural systems that indicate that the global climate is changing. The biological response of ecosystems and individual species has been recorded on every continent. There is a number of indicators of global climate change:

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<sup>12</sup> Tsunami, magnitude of terror, Damage to tourism, retrieved from <[http://library.thinkquest.org/04oct/01724/effects\\_tourism.html](http://library.thinkquest.org/04oct/01724/effects_tourism.html)>, [cit. 29. 1. 2011]

<sup>13</sup> Czech Airlines, Environment, retrieved from <[http://www.csa.cz/cs/portal/company/about\\_us/environment.htm](http://www.csa.cz/cs/portal/company/about_us/environment.htm)>, [cit. 29. 1. 2011]

<sup>14</sup> Intergovernmental Panel on Climate Change , Climate Change 2007: Working Group I: The Physical Science Basis, retrieved from <[http://www.ipcc.ch/publications\\_and\\_data/ar4/wg1/en/faq-3-1.html](http://www.ipcc.ch/publications_and_data/ar4/wg1/en/faq-3-1.html)>, [cit. 30. 1. 2011]



## **Temperatures**

Instrumental observations over the past 157 years showed, that temperatures at the surface have risen globally, with important regional variations. For the global average, warming in the last century has occurred in two phases, from the 1910s to the 1940s (0.35°C), and more strongly from the 1970s to the present (0.55°C). Expressed as a global average, surface temperatures have increased by about 0.74°C over the past hundred years (between 1906 and 2005). An increasing rate of warming has taken place over the last 25 years, and 11 of the 12 warmest years on record have occurred in the past 12 years. <sup>15</sup>

## **Precipitation**

Observations show that changes are occurring in the amount, intensity, frequency and type of precipitation. These aspects of precipitation generally exhibit large natural variability and changes in atmospheric circulation patterns such as the North Atlantic Oscillation have a substantial influence. Pronounced long-term trends from 1900 to 2005 have been observed in precipitation amount in some places: significantly wetter in eastern North and South America, northern Europe and northern and central Asia, but drier in the Sahel, southern Africa, the Mediterranean and southern Asia. More precipitation now falls as rain rather than snow in northern regions. These changes are associated with increased water vapor in the atmosphere arising from the warming of the world's oceans, especially at lower latitudes. <sup>16</sup>

## **Snow and ice**

Observations show a global-scale decline of snow and ice over many years, especially since 1980 and increasing during the past decade, despite growth in some places and little change in others. Most mountain glaciers are getting smaller. Snow cover is retreating earlier in the spring. Sea ice in the Arctic is shrinking in all seasons, most dramatically in summer. Reductions are reported in permafrost, seasonally frozen ground and river and lake ice. Important coastal regions of the ice sheets on Greenland and West Antarctica, and the glaciers of the Antarctic Peninsula, are thinning and contributing to sea level rise. The

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<sup>15</sup> Intergovernmental Panel on Climate Change, How are Temperatures on Earth Changing? Retrieved from <[http://www.ipcc.ch/publications\\_and\\_data/ar4/wg1/en/faq-3-1.html](http://www.ipcc.ch/publications_and_data/ar4/wg1/en/faq-3-1.html)> [cit. 30. 1. 2011]

<sup>16</sup> Intergovernmental Panel on Climate Change How is precipitation changing? Retrieved from <[http://www.ipcc.ch/publications\\_and\\_data/ar4/wg1/en/faq-3-2.html](http://www.ipcc.ch/publications_and_data/ar4/wg1/en/faq-3-2.html)> [cit. 1.2. 2011]

total contribution of glacier, ice cap and ice sheet melt to sea level rise is estimated as  $1.2 \pm 0.4 \text{ mm yr}^{-1}$  for the period 1993 to 2003.

### **Sea level**

Widespread decreases in glaciers and ice caps and warming ocean surface temperature have contributed to sea level rise. Global average sea level rose at an average rate of 1.8 mm per year over 1961 to 2003, and at approximately 3.1 mm per year from 1993 to 2003.

## **3.2. Climate in the Czech Republic**

### **3.2.1. Climate**

The Czech Republic has a temperate continental climate, with relatively hot summers and cold, cloudy and snowy winters. It is influenced by the interaction of continental and oceanic effects. The climate is characterized by prevailing western winds, intensive cyclonal activities causing frequent interchange of air masses and comparatively adequate precipitation.<sup>17</sup>

To a larger extent, climate is heavily influenced by altitude, geographical coordinates and local geomorphology. Due to the complex topography consisting in a number of areas of hilly ranges and valleys and diverse expositions, the country experiences number of microclimates, which can be advantageously utilized for otherwise atypical production: e.g. growing grapes or other thermophile crops even in some parts of central Bohemia. The mean average humidity is usually between 65 – 70%.<sup>18</sup>

### **Precipitation**

In general, at higher altitudes, the temperatures decreases and precipitation increases. The most deficient regions in precipitation are the leese of Krušné hory Mountains (the northwest of Bohemia) bounded approximately by the towns of Most, Chomutov and Žatec, extending northeastwards along the Ohře river, and narrow belt along the Dyje River (the southern part of Moravia). In these regions, the mean annual precipitation did not reach 450 mm in 1961 – 1990.

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<sup>17</sup> Český statistický úřad, Statistická ročenka České republiky. Praha (2000): Scientia., pg. 48

<sup>18</sup> Csaba Csaki, M. D., Food and Agriculture in the Czech Republic. Washington, D.C:(1999) The World Bank, pg.47

The highest annual mean precipitation amounts, exceeding 1300 mm, are recorded on the windward slopes of Jizerské hory and Krkonoše Mountains. The highest mean precipitation amount was recorded at Lysá hora Mt. (1390 mm).<sup>19</sup>

## Temperatures

The mean seasonal temperature in the Czech Republic for the baseline period (1961-1990) varies from -0,1 to 9,6 °C for spring, from 8,8 to 18,5 °C for summer, from 2,9 to 9,6 °C for fall and -6,8 to 0,2 for winter. The lowest temperature means are observed in the mountains regions at the north, east and southwest borders of the territory. The warmest regions are the lowlands, about 200 meters above the sea level in the southeast of the Czech Republic and in the central Bohemia. Prague forms a specific region, where the heat island increases the annual mean by about 1 °C over the value corresponding to its geographical location.

The temperature decreases with the altitude and latitude in all seasons: least in winter and most in spring.<sup>20</sup>

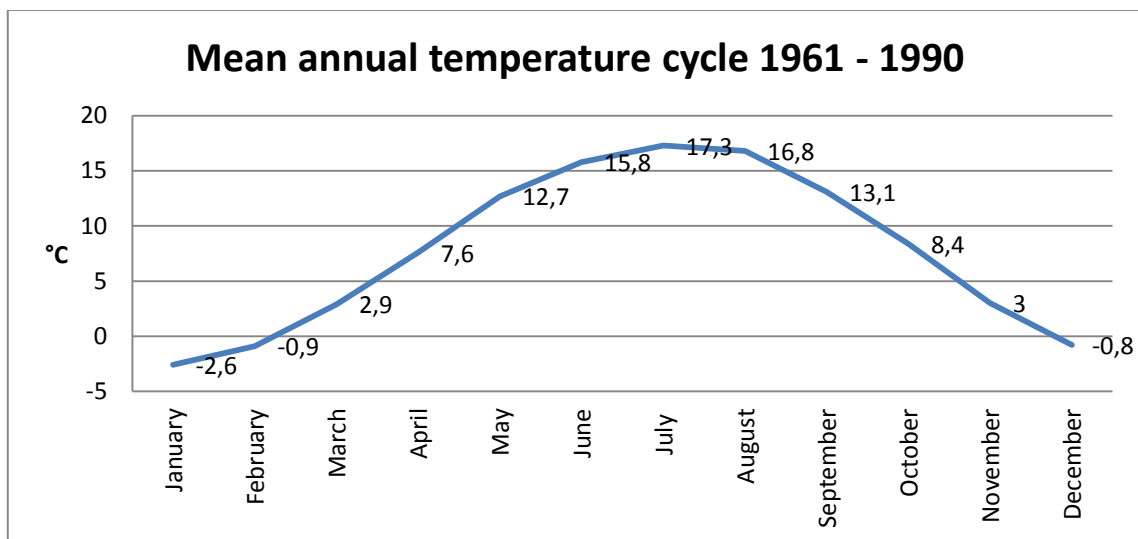


Figure 2: Mean annual temperatures (1961-1990), Source: Kalvová, Jaroslava et. al. (1996)

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<sup>19,20</sup> Kalvová, Jaroslava et. al. Climate Change Scenarios for the Czech Republic. Nakladatelství Český hydrometeorologický ústav, Praha (1996), pgs 16-29

### **3.3. Tourism in the Czech Republic**

#### **3.3.1. 1945 - 1989**

There was an domestic tourism prevailing in the post-war period until the Velvet revolution in 1989. It was caused mainly by the political conditions and administrative measures (visa requirements, exit permits). Domestic tourism could be characterized as short term, unorganized and concentrated in the summer season. 90% of travellers spent their summer holidays in their weekend house or in a camp (in the tent or caravan).

Incoming tourism was created mainly by the citizens of former socialistic countries (93%), the main motives of outgoing tourism were business trips (50%) mainly to the former socialistic countries.<sup>21</sup>

#### **3.3.2. 1989 - Present**

Rapid development of tourism in the Czech Republic started after the fall of communist regime in 1989 and this sector became an important sector of the Czech economy. People were allowed to travel without restrictions, borders were opened. According to the Czech Statistical Office (CZSO), the number of journeys abroad have risen by 442, 2% between 1988 and 1991.<sup>22</sup>

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<sup>21</sup> Czechtourism, Historie cestovního ruchu v ČR do roku 1989, retrieved from <<http://www.czechtourism.cz/pro-studenty/faq-casto-kladene-otazky/cestovni-ruch-v-cr>>, [cit. 8.3. 2011]

<sup>22</sup> Časopis COT Business, Rozvoj cestovního ruchu v ČR po roce 1989, retrieved from <[http://www.cot.cz/data/cesky/99\\_03/3\\_statistika2.htm](http://www.cot.cz/data/cesky/99_03/3_statistika2.htm)>, [cit. 9.3. 2011]

Also the incoming tourism expanded rapidly by 475% between 1988 and 1996 (see the graph below).

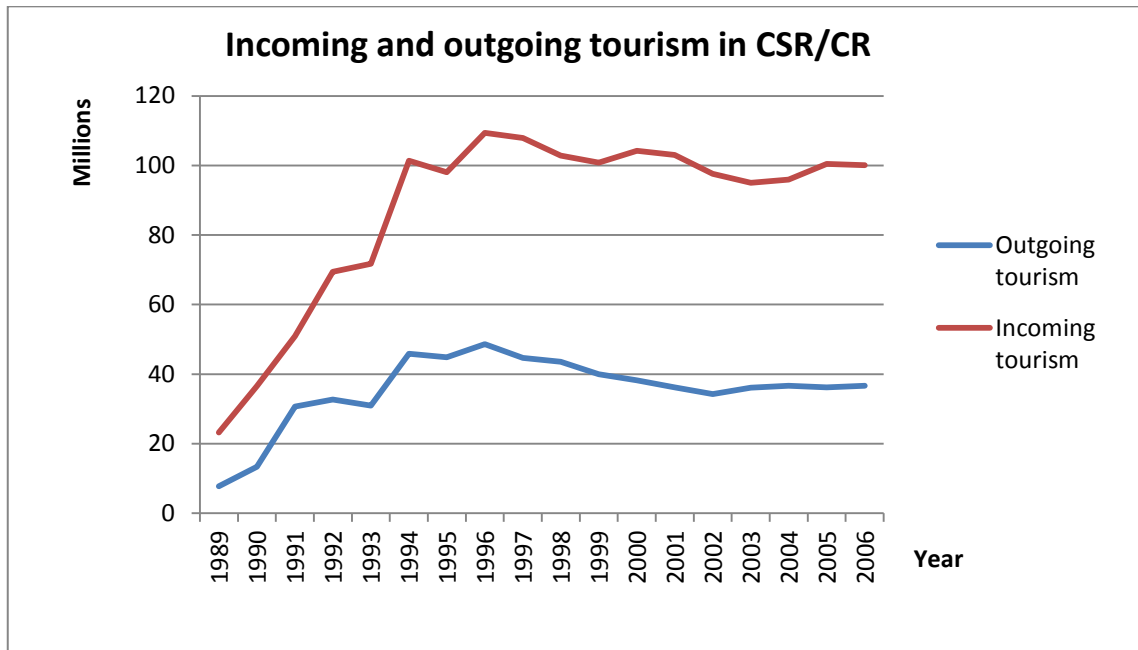


Figure 3: Incoming and outgoing tourism in CSR/CR, Source: Ministry for Regional Development<sup>23</sup>

### 3.4. Český Krumlov – facts and information

#### 3.4.1. History

Český Krumlov is a small city situated in the South Bohemian region, with about 13,9 thousand inhabitants<sup>24</sup>, well known for fine architecture and a castle.

The prosperity began since the Vitkovec family inherited Krumlov in 1302. Over the next decades they built a town, the St. Wenceslas was constructed above the square and the first houses were built and castle was expanded from the small fortress to the large palatial residence. The city has signs of Late-Gothic reconstruction from 15 th century and was later on significantly influenced by Classicism.

After 1945, respect for medieval forms was lost and during this era and they were often simply destroyed. After the turn of the century, emphasis on preservation, together with

<sup>23</sup> Ministry for regional development, Statistics and Analysis, retrieved from <<http://www.mmr.cz/Cestovni-ruch/Statistiky-Analyzy>>, [cit. 9.3. 2011]

<sup>24</sup> Český Krumlov, Basic information about the town, retrieved from <[http://www.ckrumlov.info/docs/cz/zakinf\\_1.xml](http://www.ckrumlov.info/docs/cz/zakinf_1.xml)>, [cit. 7.3. 2011]

growing tourism, contributed to the greater public awareness of the historic and artistic significance of the town. Český Krumlov today retains its rare medieval urbanistic composition, with extensive reserve of Gothic and Renaissance buildings, hardly touched by the disruptions of modern civilization.

In recognition of this, in 1992 was added to the UNESCO list of world cultural and natural monuments.<sup>25</sup>

### **3.4.2. Culture**

The city is well known for many cultural events that attract the tourists from the whole world. One of the most important highlights is Five-Petaled Rose Celebrations which take place in June. The spirit of the Renaissance age is brought back to life for three days with the hubbub of jousts, craft fairs, medieval music, street plays, and fencing duels to culminate with the highlight of the festival – a spectacular procession in historical costumes featuring knights on horseback and many notables linked with the history of the town.

Probably the longest-running musical event of this size on the Czech cultural scene, the International Music Festival, has gained immense repute due to the liaison of the attractive ambience of the historical town with music concerts of different genres from the 15th century up to the present. The festival is not only the highlight of the Krumlov cultural summer but clearly a leading cultural event in the Czech Republic.

### **3.4.3. Sightseeing**

There are many things to do in addition to the visit of the castle. Český Krumlov offers plenty of museums (e.g. Marionette Museum, Museum of torture instruments or Wax museum), Galleries (Czech Ceramic Design Agency) or Theatres (the most famous is Revolving Auditorium situated in the Castle gardens). Visitors can enjoy performances such as Carmina Burana or Three Musketeers on the open-air scene from June to September.<sup>26</sup>

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<sup>26</sup> Český Krumlov, Highlights in 2011/12 in Český Krumlov, retrieved from <<http://www.ckrumlov.info/docs/en/atr176.xml>> [cit. 7.3. 2011]

### **3.5. Krkonoše Mountains**

The Krkonoše Mts. are situated in a mild climatic zone and are affected mainly by the predominating western winds which cause the erratic character of the weather. In comparison with the Slovak mountains, the Krkonoše Mts. have an oceanic character of weather and are the mountains with the roughest climatic conditions in all the Czech mountain ranges. This is an influence of the elevation of its ridges being permanently exposed to the wet oceanic air. Weather was and has been reflected in the entire natural process, in the vegetation composition, in altitudinal zonation and finally with a principal impact on every tourist coming to the Krkonoše Mts.<sup>27</sup>

#### **3.5.1. Rokytnice nad Jizerou – facts and information**

Rokytnice nad Jizerou is a town situated in the Giant Mountains, on the north of the Czech Republic. It was found in the 16th century and the first inhabitants were mining copper and iron ore. Rokytnice was also popular for a glass industry.

Later on, in the 18th century, textile industry became important. After the war, the town was more and more popular as a sport and recreational center.

Nowadays, Rokytnice has one of the largest skiing areas in the Czech Republic. Ski center spreads out over the southern slopes of Lysá hora [Lysá Mountain] at an elevation of 630 to 1,315 above the sea level. By way of comparison with others, it is one of the best ski locations in the Czech Republic. There are 26 lifts and 18 kilometers of ski slopes. There is also second longest chair lift here, which is 2198 meters long.<sup>28</sup>

Very popular sport in Giant Mountains is also cross country. There are many trip destinations near Rokytnice, for example Zlaté návrší, Labská bouda or Černá hora. Rokytnice is takes part in a project „ Giant Mountains – cross country paradise“, which connects all ski areas here and provides more than 500 kilometers of treated routes.

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<sup>27</sup>, Správa Krkonošského národního parku, Climate, retrieved from < <http://www.knap.cz/en/climate/>> [cit. 7.3. 2011]

<sup>28</sup>Rokytnice nad Jizerou, Lyžování v Rokytnici nad Jizerou, retrieved from <<http://www.rokytnice.com/cs/lyzovani-rokytnice-nad-jizerou>>, [cit. 7.3. 2011]

## 4. Analysis

### 4.1. Climate Change in the Czech Republic

There are many scientific opinions about a climate change and its impacts. For purposes of this thesis is supposed, that climate change exists and influences the number of visitors coming to touristic localities in the Czech Republic. As the main cause of this dependence is considered global warming.

According to the Czech Hydrometeorological Office, the average temperature in the Czech Republic have risen by 0,82°C in the last 10 years – by 1,38°C in winter and by 1,19°C in summer.

Trend for the last	Linear change trend (°C/ 10 years)		
	year	winter	summer
34 years	0,29	0,07	0,63
25 years	0,34	0,51	0,59
<b>10 years</b>	<b>0,82</b>	<b>1,38</b>	<b>1,19</b>

Source: Czech Hydrometeorological Institute

There is an increasing trend in winter and summer temperatures in the Czech Republic. The average annual value over the past decade is rising, with summer temperatures growing faster than the winter ones.

A similar trend is observed in the precipitation regime. Annual precipitation in the Czech Republic shows a slight increase, which is most notable in winter, while in summer is the annual precipitation trend slightly downward.



## **4.2. Winter**

There will be analyzed two meteorological factors in this chapter that can influence the visit rate of skicenter Rokytnice nad Jizerou. Data were observed in the meteorological station in Harrachov, which is located approximately 6 km from Rokytnice nad Jizerou. There is also ski center located in Harrachov, but unfortunately no data about the visit rate were provided by this resort.

In recent years, we can observe a shortening of the winter ski season, which will undoubtedly continue in future years. Skiing is one of the sport activities directly dependent on the height of snow cover. If there is not enough snow in the ski resort, visitors naturally seek other ski centers with a good snow conditions. This is the reason why the snow height influences the customers' decision about the locality, where to spend a winter holidays. Another factor directly influencing the decision about the ski resort is air temperature. The average temperatures are directly influencing the quality and quantity of snow cover. Moreover, temperatures directly affect personal feelings. When the visitors feel too cold, they don't enjoy their holidays and this negative experience affects then their future locality choice.

As mentioned before, this resort is situated in the Krkonoše Mt. in the northern part of the Czech Republic. Even if this ski center offers to its visitors quite wide range of winter activities, only skiers visiting the Skiareál Horní Domky will be considered in this research. Data for this research were provided by Czech Hydrometeorological Office for the period 1996 to 2010 for meteorological winter (December-March).

### **Snow cover**

Based on data provided by the Czech Hydrometeorological Institute, we can see how many days on average was the snow cover higher than 20 centimeters. These data were measured from December to March in the years 1996 and 2010.

As we can see in the Figure 4, there is a fluctuating, slightly increasing tendency of the line. The curve reached a bottom in in the winter season 1997/1998, when there were only eleven days on average, when the snow cover was higher than 20 cm. The curve then reached the peak in the season 2005/2006 with 30, 25 days on average.

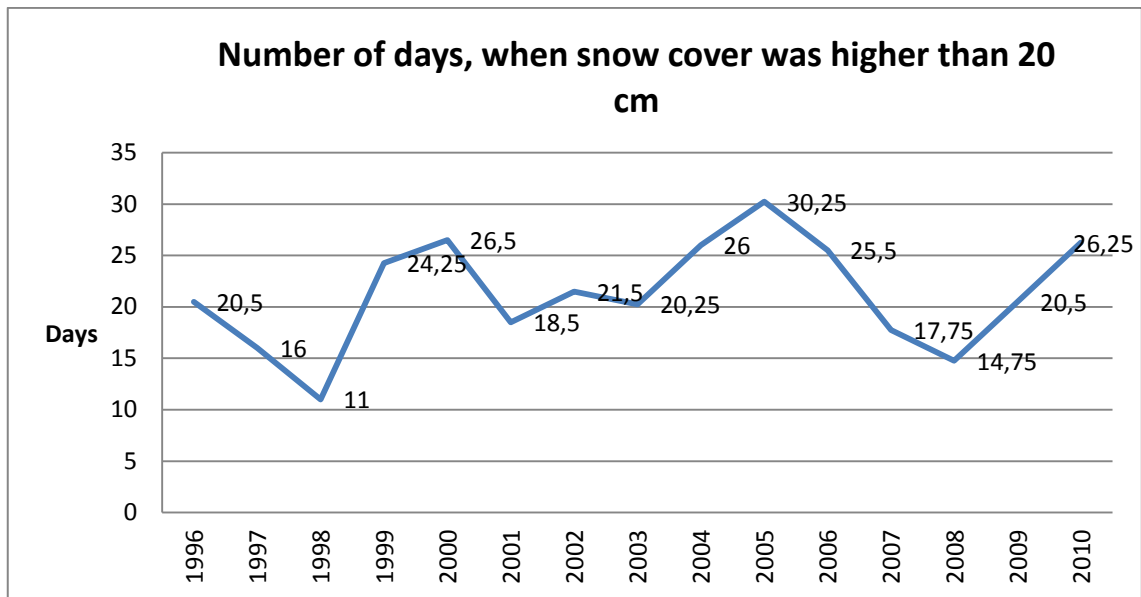


Figure 4: Number of days with snow cover higher than 20 cm, Source: Czech Hydrometeorological Institute

There is not a significant change of the number of the days with a snow cover higher than 20 cm. I think, that the main reason for this development is the fact, that there is a possibility to produce artificial snow with a snow cannons nowadays, which could prolong the duration of the season on ski slopes and improve the quality of cross-country tracks for many weeks. Unfortunately, there are some barriers we have to face when using this snowmaking equipment. Firstly, there is a price barrier. The price of one snow cannon goes from 200 000 to 1 000 000 CZK. Also production of the snow itself is quite expensive. The most powerful guns can produce more than 80 cubic meters of snow per hour in ideal conditions, but this is the hourly consumption of 36,000 liters of water. Other costs are for electricity, whose prices are still rising. Moreover, these devices can work only, when the temperatures are lower than  $-2^{\circ}\text{C}$ . When we consider, that the temperatures are rising, these machines could be useless in few years.

According to expert estimates, there were used about 1200-1500 snow cannons producing the technical snow in the last season in all ski centers in the Czech Republic, which produced about 97% of artificial snow lying on the slopes. The success of the season is strongly dependent on the snowmaking equipment nowadays.

Both ski resorts (Rokytnice and Harrachov) are fully equipped with snowmaking equipment, which allows visitors to enjoy the snow up to five months in a year. It is also

necessary to mention, that artificial snowing is vital for Rokytnice, because most of the slopes are situated to the south and the snow melts faster here. According to the [lyzovani.cz](http://lyzovani.cz)<sup>29</sup>, there is 93% of the ski resorts equipped with the snowmaking cannons and it is being invested into the new, modern equipment every season.

### **Average temperatures**

As mentioned before, another factor directly influencing the decision about the ski resort are air temperatures. The average temperatures are directly influencing the quality and quantity of snow cover and the visitors' personal feelings.

In the Figure 5, based on the data from the Czech Hydrometeorological Institute, we can observe the average temperature development from 1996-2010 for the period of meteorological winter.

There is a slightly decreasing trend of the curve. The warmest winter was in 2000 and 2002 with average temperature -1, 1°C. The coldest winter was in 2010 and, when the average temperature was -4, 0°C.

This slightly downward trend is also discussed in the Czech media. There is a theory, that extremely cold weather is a consequence of global warming.<sup>30</sup> This year's unusual frosts and snow avalanches - which in earlier years affected many places in the northern hemisphere - are the result of rising temperatures of the water surface layers in the oceans.

Ice cover reflects less sunlight and warmer oceans intensify vertical ascent of warm air and its accumulation and then push cooler moist air to the poles. Moisture accumulates in the polar latitudes in the form of icy air and snow and falls abundantly on the mainland.

When we compare our results with the hypothesis of the Czech Hydrometeorological Office on the page 26, our average temperature increase is only 0,2°C. The reason might be that our research is made only for one small region compared to the complex research of Czech Hydrometeorological Institute that made it for the whole republic.

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<sup>29</sup> Lyžování, Rokytnice nad Jizerou, retrieved from <<http://www.lyzovani.cz/vleky-sjezdovky-informace/ceska-republika/rokytnice-nad-jizerou-18.html>> [cit. 12.3. 2011]

<sup>30</sup> Novinky.cz, Extrémní mrazy jsou důsledkem oteplování, retrieved from <<http://www.novinky.cz/zahranicni/evropa/220973-extremni-mrazy-jsou-dusledkem-oteplovani.html>>, [cit. 12.3. 2011]

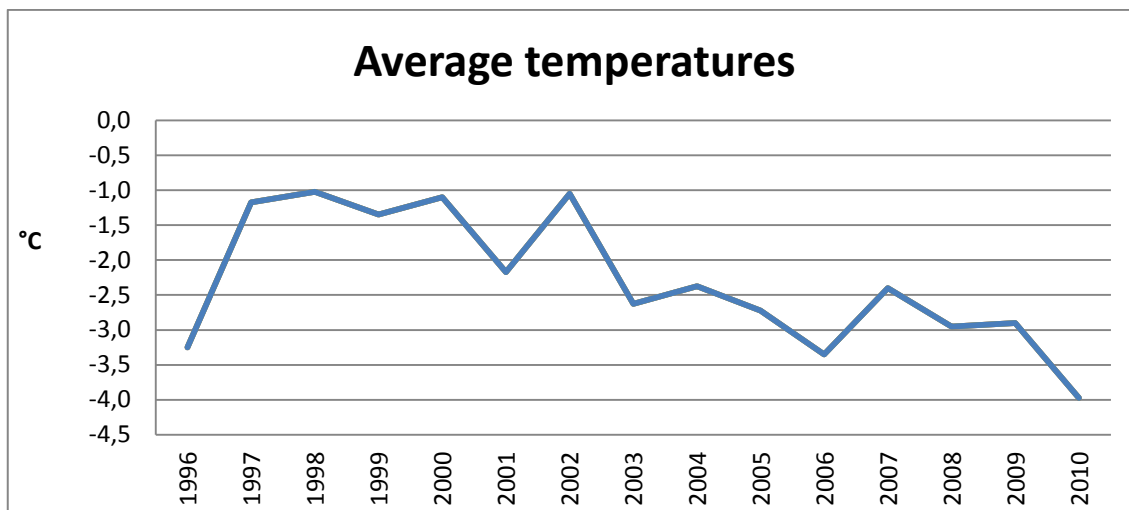


Figure 5: Average temperatures in Rokytnice nad Jizerou, Source: Czech Hydrometeorological Institute

### Visit rate

Based on data provided by the ski resort Rokytnice, Figure 6 was created describing the number of visitors in this center from 1996 to 2010. As we can see in the graph, the number of visitors is fluctuating. From 1998 to 2003 there was an increasing tendency with a peak in 2004, when 310 250 skiers visited the resort.

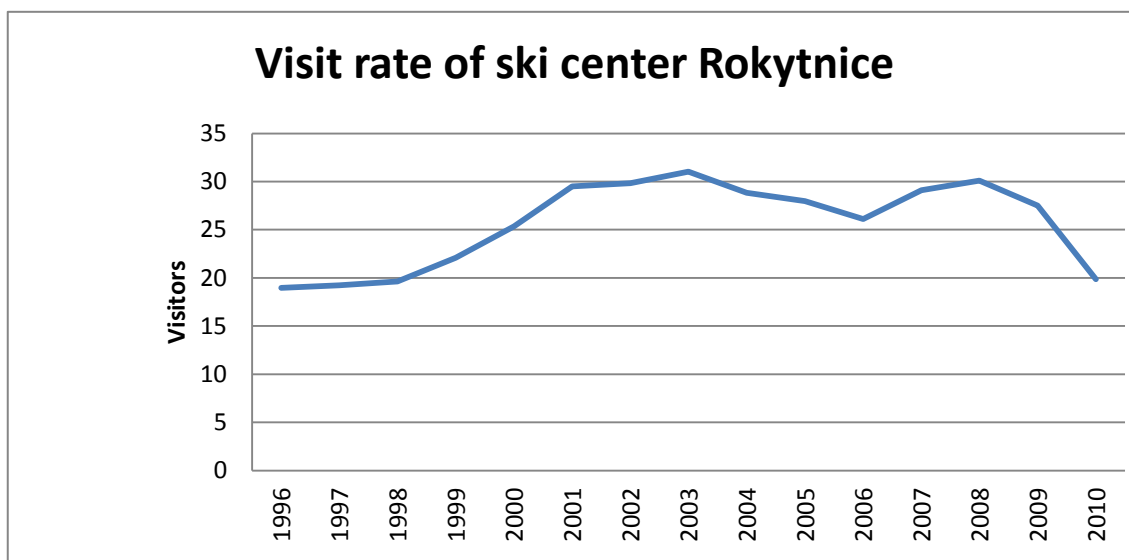


Figure 6: Visit rate of ski center Rokytnice, Source: TJ Spartak Rokytnice

From 2003 to 2006 there was a decline with the lowest point in 2006. The situation started to improve from 2006 to 2008, but then it fell suddenly by 76 398 visitors from 2008 to 2010. This development can be easily explained by the fact, that two new chairlifts were

opened during our research period. The first one was opened in 1996 and leads to the top of the Lysá Hora Mountain. This chairlift is rare, because it was built in the first zone of Krkonoše Natural Park. The second chairlift was opened in 2006 as well as the new parking and technical facilities were built next to the lower station. There were also built new apartments and shops in the center of Rokytnice, offering wide range of services.

#### 4.2.1. Statistical analysis

##### Correlation and linear regression

In statistics, **correlation analysis** aims to quantify the relationship between two variables and prove the degree of dependence. If the two processes show a correlation, it is likely to depend on each other.

The degree of correlation expresses the correlation coefficient ( $r$ ), which can take values from -1 to +1, in an absolute value. The smaller is degree of dependence; the closer goes the coefficient of correlation to zero.

The main focus of **regression analysis** is the relationship between a dependent variable and one or more independent variables. More specifically, regression analysis helps one to understand how the typical value of the dependent variable changes when any one of the independent variables is varied. Regression models involve the following variables:

- The **unknown parameter** denoted as **b**; measures the impact of X variable on Y variable
- The **independent variables X**.
- The **dependent variable, Y**

For purposes of this thesis the linear regression analysis will be used. This says, that if one variable changes, the other variable changes in the same sense. A **regression line** is a line drawn through a scatterplot of two variables. The line is chosen so that it comes as close to the points as possible. Its exact location in the array coordinates can be determined by the equation:

$$y=a+bx, \text{ where}$$

- a corresponds to the intercept of the regression line with y axis, when  $x = 0$

- $b$  is a regression coefficient, which shows how much is the dependent variable changed, when the independent variable changes by one unit

When testing hypotheses, we always compare these two hypotheses:

- Zero is the hypothesis you are testing, usually denoted by  $H_0$
- Alternative hypothesis, usually denoted by  $H_1$ .

Firstly, we assume that the hypothesis  $H_0$  is true. By the random experiment, we verify or reject the  $H_0$  hypothesis. The first step is the determination of the confidence level or probability  $\alpha$  (a measure of risk, when the hypothesis  $H_0$  improperly denied, although valid).  $\alpha$  is determined as yet small, usually 0,05. One often "rejects the null hypothesis" when the  $p$ -value is less than 0,05. Rejection of the hypothesis  $H_0$  is equivalent to acceptance of hypothesis  $H_1$ .<sup>3132</sup>

### Average temperatures, visit rate

The null hypothesis test of regression coefficient significance shows the relationship between  $y$  and  $x$ . Zero hypothesis is  $H_0: b \neq 0$  ( $x$  affects  $y$ ). Alternative hypothesis  $H_1: b = 0$  indicates that  $x$  does not affect  $y$ .  $\alpha = 0, 05$

From the data provided by CHMI and TJ Spartak Rokytnice nad Jizerou, using Excel spreadsheets the following results were obtained:

#### SUMMARY OUTPUT

<i>Regression Statistics</i>					
Multiple R		<b>0,222360887</b>			
R Square		0,049444364			
Adjusted R Square		-0,029768606			
Standard Error		42841,28255			
Observations		14			
<i>ANOVA</i>					
	<i>df</i>	<i>SS</i>	<i>MS</i>	<i>F</i>	<i>Significance F</i>
Regression	1	1145632767	1145632767	0,624195306	0,444824983
Residual	12	22024505889	1835375491		
Total	13	23170138656			

<sup>31</sup> Dittrich Vladimír, Zdeněk Burda, Statistika pro IV. ročníky SEŠ, SPN (1973), pgs. 10-16

<sup>32</sup> Regresní analýza, Adam Koppel, retrieved from <<http://www.koppel.cz/VSE/files/STP202.htm>>

	<i>Coefficients</i>	<i>Standard Error</i>	<i>t Stat</i>	<i>P-value</i>
Intercept	<b>239551,6703</b>	30116,49499	7,954168317	<b>0,00000399</b>
-3,25	<b>-9882,938756</b>	12509,09396	-0,790060318	0,444824983

On the first sight we can see, that the p-value is very low, 0, 00000399. Because  $p < \alpha$ , the null hypothesis is rejected and the alternative (x does not affect y) is accepted. **This means that there is not a statistically significant dependence of Y on X.**

**Coefficient of correlation (multiple R) =0,222** corresponds to a very weak relationship between average temperature and visit rate

### **Snow cover, visit rate**

Secondly, relationship between snow cover and visit rate will be stated. The same sample of data was used as in the first regression analysis.

The null hypothesis test of regression coefficient significance shows the relationship between y and x. The zero hypotheses is  $H_0: b \neq 0$  (x affects y). Alternative hypothesis  $H_1: b = 0$  indicates that x does not affect y.  $\alpha=0, 05$

From the data provided by CHMI and TJ Spartak Rokytnice nad Jizerou, using Excel spreadsheets the following results were obtained:

### SUMMARY OUTPUT

<i>Regression Statistics</i>					
Multiple R			0,121768244		
R Square			0,014827505		
Adjusted R Square			-0,060954994		
Standard Error			46061,70009		
Observations			15		
<i>ANOVA</i>					
	<i>df</i>	<i>SS</i>	<i>MS</i>	<i>F</i>	<i>Significance F</i>
Regression	1	415125188,8	415125188,8	0,1956587	0,66551794
Residual	13	27581842793	2121680215		
Total	14	27996967982			
	<i>Coefficients</i>	<i>Standard Error</i>	<i>t Stat</i>	<i>P-value</i>	
Intercept	234502,6572	51714,5761	4,534556306	0,00056073	
X Variable 1	1045,161634	2362,837634	0,442333243	0,66551794	

On the first sight we can see, that the p-value is very low, 0, 00056. Because  $p < \alpha$ , the null hypothesis is rejected and the alternative (x does not affect y) is accepted. **This means that there is not a statistically significant dependence of Y on X.**

**Coefficient of correlation (multiple R) =0,121** corresponds to a very weak relationship between average number of days, when the snow cover is higher than 20cm and visit rate.

### **Causes**

There are many reasons, why there is not significant statistical dependence between chosen variables. Firstly, our model is simplified; there were some important variables, which were omitted. For example, the wage rate of population, price or promotion expenses of the ski center.

Moreover, the important factor is the size of a ski resort and a length of slopes. Rokytnice is a part of the project called SKIREGION.CZ. This project brings together ski resorts Rokytnice nad Jizerou, Harrachov, Paseky nad Jizerou, Rejdice and Příchovice. The idea of this project is, that one ski pass is valid in all the five ski resorts.

The next point is technical equipment – number of ski lifts, chairlifts, their capacity and comfort ability. People do not want to spend too much time waiting in the queue or on the slow lift going up the hill. SKIREGION.CZ offers the most chairlifts and ski lifts in total in the Czech Republic (6 chairlifts and 36 ski lifts). Total length of slopes across SKIREGION is 40.5 km and a transmission capacity of cable cars and ski lifts is 30,000 persons / h.

Naturally, very important factor is a price of the ski pass. The prices are quite high compared to the big resorts in the Alps. One day ski pass valid in four areas of SKIREGION.CZ costs 23 Euro, skiers in Italy can enjoy for 46 Euro more than 1,200 kilometers of ski trails and excellent technical background in the form of 450 ski lifts. There are many travel agencies offering last minute holidays for convenient prices and more and more skiers are using their service.

Furthermore is important, that every visitor of the resort finds something for him. A family with children appreciates slight downhill compared to a very good skier looking for steep and long slopes; snowboarders have fun in a snow park.



Naturally, a presence of services, such as ski school, ski service, ski shops, ski rentals or supermarket is vital nowadays. A new trend, so called Après Ski – activities that can visitors do after skiing - are more and more popular. People want to go to out, enjoy the evening with their friends in the pub, go dancing – generally socializing after skiing.

### **4.3. Summer**

An unstable climate (increased precipitation, atmospheric moisture, temperature extremes, strong wind, air pollution, etc.) affects the state of historic monuments and buildings, and their visit rate. The aim of this chapter is to find out, how average precipitation and average temperatures influence the visit rate of State Castle Český Krumlov in summer season. The State Castle Český Krumlov was chosen because it placed the first rank of popularity among the Czech castles in 2010.<sup>33</sup>

There are more scenarios, how do the visitors behave. First scenario is that when there is a bad weather, people go to the castle to keep themselves out of the rain. This holds mainly for watermen, which are coming to Český Krumlov during their trip on the Vltava River.

Second case is, when there is a bad weather, people stay at home. Visitors want to enjoy the sightseeing in the city and this is not pleasant during the rain in the cold weather.

Third scenario is that when there is a good weather, people go to visit the sights. But when the temperatures are extremely hot, people spent their holidays at the water, swimming and sunbathing.

#### **Average precipitation**

On the Figure 7 we can see the average precipitation observed in Hydrometeorological station in Český Krumlov between the years 1996 and 2010 from June to August. On the first sight we can see, that the chart is fluctuating. The peak was reached in 2002, when the average reached 179, 3 mm/month. There were huge floods in the entire area of the Czech Republic which extensive big damages to the estates and infrastructure. The overall damages cost cca 79,9 billion Czech crowns.

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<sup>33</sup> Český Krumlov, Basic information about the town, retrieved from <[http://www.ckrumlov.info/docs/cz/zakinf\\_1.xml](http://www.ckrumlov.info/docs/cz/zakinf_1.xml)>, [cit. 7.3. 2011]

Thanks to the fact, that the water flow can be reduced by the Lipno dam, the damages on the historic sites in Český Krumlov were not devastating.

As we can see in the graph, another flood was in 2009, when only the first level of flood activity declared.

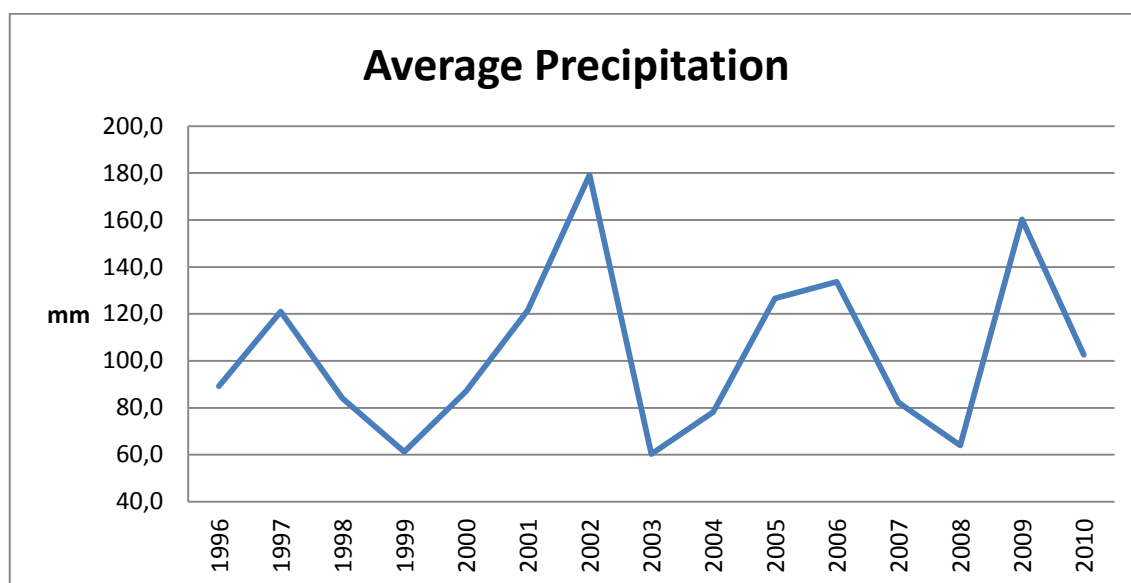


Figure 7: Average precipitation in Český Krumlov, Source: Czech Hydrometeorological Office

This time series is too short to prove, that the number of extreme events has been increasing recently, but we can say, that the frequency of floods is high, almost every 3-4 years.

### **Average temperatures**

As we can see in the Figure 8, the temperatures have an increasing trend in the last 14 years. We calculated that the average temperatures have risen by 0, 2°C on average – this result is lower than the result of the Czech Hydrometeorological Institute on the page 29. The highest average temperatures were in 2003 (19, 8°C from June to August).

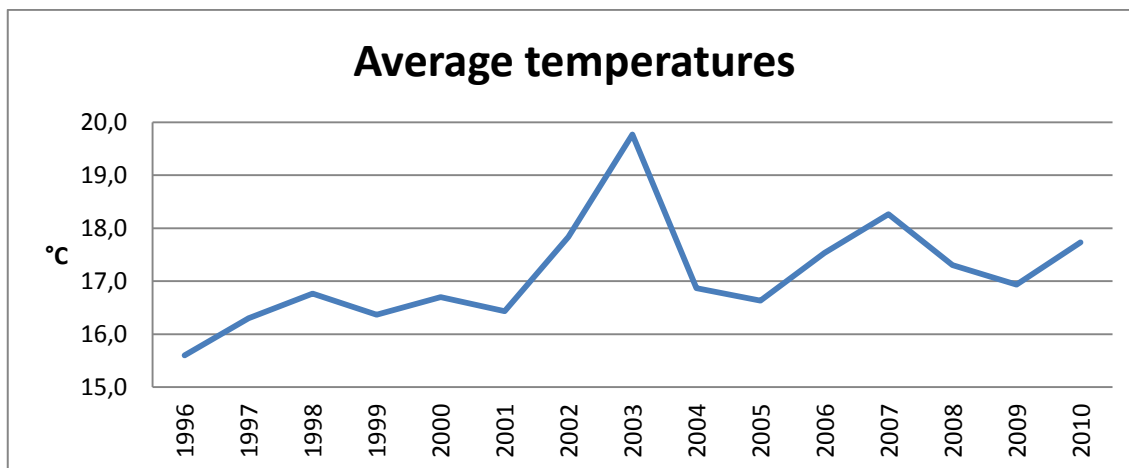


Figure 8: Average temperatures in Český Krumlov, Source: Czech Hydrometeorological Office

Compared to the data given in the hypothesis (+ 1,19° C) is our average change much lower, but this is caused by the fact, that our research is done in the locality, where the temperatures are not as high as for example in Moravian region or in Žatec. The reason in the location of this place, the elevation is 492 meters above the sea level. The climate is also influenced by the fact, that the city is situated near the Šumava Mountains.

### Visit rate

On the basis of data given by the Information Centre in Český Krumlov, the visit rate has an increasing tendency. There were two exceptions the years 2002 and 2009. These years were floods in the city. We can observe a decrease by more than 21% compared to the year 2001. There is a strong relationship between these two events.

Moreover, in 2000 the castle opened the castle tower to the public, which increased the visit rate of the castle by 125 311 visitors between the years 1999 and 2000.

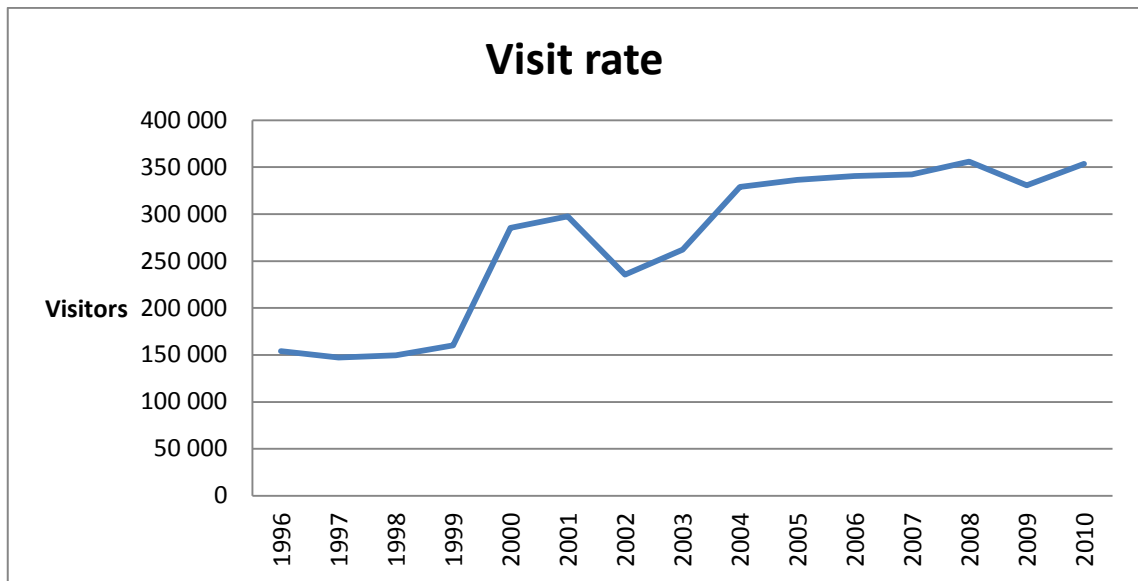


Figure 9: Visit rate of the State Castle Český Krumlov, Source: Information Center Český Krumlov

### 4.3.1. Statistical Analysis

#### Visit rate, precipitation

The null hypothesis test of regression coefficient significance shows the relationship between y and x. The zero hypotheses is  $H_0: b \neq 0$  (x affects y). Alternative hypothesis  $H_1: b = 0$  indicates that x does not affect y.  $\alpha=0,05$

From the data provided by CHMI and Information Centre Český Krumlov, using Excel spreadsheets the following results were obtained:

#### SUMMARY OUTPUT

<i>Regression Statistics</i>	
Multiple R	0,108163642
R Square	0,011699374
Adjusted R Square	-0,064323752
Standard Error	84246,96791
Observations	15

#### ANOVA

	<i>df</i>	<i>SS</i>	<i>MS</i>	<i>F</i>	<i>Significance F</i>
Regression	1	1092258535	1092258535	0,153892299	0,70119917
Residual	13	92268170834	7097551603		
Total	14	93360429369			

	<i>Coefficients</i>	<i>Standard Error</i>	<i>t Stat</i>	<i>P-value</i>
Intercept	246461,2004	68649,43965	3,590141474	0,003293383
X Variable 1	248,5198114	633,5086823	0,39229109	0,70119917

On the first sight we can see, that the p-value is very low, 0, 00329. Because  $p < \alpha$ , the null hypothesis is rejected and the alternative (x does not affect y) is accepted. **This means that there is not a statistically significant dependence of Y on X.**

**Coefficient of correlation (multiple R) =0,108** corresponds to a very weak relationship between average precipitation and visit rate.

### Visit rate, average temperatures

#### SUMMARY OUTPUT

<i>Regression Statistics</i>	
Multiple R	0,393461346
R Square	0,154811831
Adjusted R Square	0,089797356
Standard Error	77908,78809
Observations	15

ANOVA					
	<i>df</i>	<i>SS</i>	<i>MS</i>	<i>F</i>	<i>Significance F</i>
Regression	1	14453298977	14453298977	2,381190214	0,146789534
Residual	13	78907130392	6069779261		
Total	14	93360429369			

	<i>Coefficients</i>	<i>Standard Error</i>	<i>t Stat</i>	<i>P-value</i>
Intercept	-277332,7304	356561,0435	-0,77779874	0,450611752
X Variable 1	32058,30096	20775,11599	1,543110564	0,146789534

Because  $p > \alpha$ , the null hypothesis is confirmed and the alternative (x does not affect y) is rejected. **This means that there is a statistically significant dependence of Y on X.**

$$y = 32059,3 - 2777332,73x$$

**Regression coefficient a= 32059,3** corresponds to the intercept of the regression line with y axis, when  $x = 0$ .

**Regression coefficient b= -277332,73** corresponds to the average change of visit rate, when the temperatures change by 1°C. Our result can be interpreted as follows: when the temperature rises by 1°C, the visit rate decreases by 277332, 73 visitors.

**Coefficient of correlation (multiple R) =0,393** corresponds to a moderate strong relationship between average temperatures and visit rate.

**R square= 0,154,** which means, that this model shows only 15, 4% of variability of the dependent variable. There is probably another model (exponential) better fitting for this case.

### **Causes**

In my opinion, there many other factors influencing the visit rate of the castle in Český Krumlov. The most important factor is promotion. If the castle is presented in the tourist guides, international touristic portals or if there are travel agencies, that offer guided tours and make trips to the castle.

Český Krumlov as well as for example Karlštejn are favorite destinations for one day trips from Prague and many travel agencies do offer it a part of the scheduled sightseeing program.

More and more tourist also travel on their own and for them is important, that these destinations are stated in the tourist guides, with the information about prices, transport or accommodation possibilities. Český Krumlov is also on the list of UNESCO heritage, which

Next important factor is transport accessibility – if there is a good connection by public transportation and if the journey does not take too long. There are going Student Agency busses directly from Prague to Český Krumlov every two hours. Especially for tourists is important, that the connection is very easy, without changing the bus. The journey takes three hours and many Japanese and Spanish tourists go to Český Krumlov for one day – by the first bus there and by the last bus back.

Naturally an important factor influencing visit rate is a price of the ticket. There are many tourists that only visit the castle's area, but do not pay an entrance fee to the castle or do not visit a guided tour. There should be price discounts for children, students, pensioner or

disabled visitors as well as favorable prices for families or big groups. The lower price, the more visitors buy a ticket for guided tour.

It is advantageous, when the castle offers more tours during the castle, because then is a bigger chance that everybody finds something interesting for him. There should be a short track for families with small children as well as long track for history lovers. The castle with a foreign clientele should offer a guided tour at least in English.

There are many cultural events like Five-Petaled Rose Celebrations or International Music Festival. Visitors of these festivals often visit the castle during their stay.

In conclusion, the wage rate and purchasing power influences the ability of people to travel and do sightseeing.

## **5. Conclusion**

This thesis had as its aim to describe and explain the influence of global climate change on tourism in the Czech Republic. There were two touristic localities chosen for this research: Ski center Rokytnice nad Jizerou for the winter period and the State Castle Český Krumlov for summer period.

On the basis of data from the Czech Hydrometeorological Office, TJ Spartak Rokytnice nad Jizerou and Information Office in Český Krumlov, regression analysis was made in order to explain the relationship between average visit rate, average precipitation, average precipitation and the length of snow cover higher than 20 cm.

In winter period in Rokytnice nad Jizerou, both results of regression analysis were analyzed as statistically insignificant and the alternative hypotheses  $H_1$  (that visit rate is not affected by the average temperatures and the snow cover). The reason is, that our research was very simplified and only two meteorological factors were included. Moreover, there are many factors as the quality of service offered, wage rate or competition influencing the visit rate. There is technical equipment such as snow cannons that helps to improve snow conditions and prolongs the ski season despite of the climate warming.

In summer period in Český Krumlov, the regression analysis concerning visit rate and average precipitation was analyzed as statistically insignificant. The second analysis concerning average temperatures and visit rate was analyzed as statistically significant and

the dependence between these two parameters was evaluated as middle strong and diverse: when the temperatures are increasing, the number of visitors is increasing. This result confirms the theory, that when there is a nice weather, people want to spent this time swimming or sunbathing.

As in the first case, there are other factors influencing the visit rate as the traffic accessibility, cultural events, wage rate or the price of the ticket.

In my opinion, the State Castle Český Krumlov should invest more money in reconstruction of the castle and historic buildings. As the part of UNESCO heritage has a good promotion, but for example the webpage of the castle could be translated into more foreign languages.

The restaurants and hotels should try to keep the prices friendly if they do not want to lose the Czech clientele. There are many watermen coming to the city and they want to spend some time in the city, visit the castle and do not want to pay excessive prices for food and entrance.

In my opinion, Czech ski areas cannot compete with foreign ski areas, but they should try to keep the prices as low as possible and try to orientate on the customers with small children that are not able to travel for a long distances to the Alps. Small children also learn how to ski and they do not need many slopes that are kilometers long.

Ski areas should offer many Après ski activities for children – they often do not ski a whole day and need another activities such as sledging or swimming in order to have fun. Parents can spend a nice evening in a good restaurants or bowling bar or in sauna.

Domestic ski resorts should also invest into technical equipment, for example to the snow cannons in order to prolong the ski season and improve the ski conditions during the winter. An emphasis should be put on the preparation of ski slopes as well as the investments into the lifts should be made every year.

One of the most important issues is in the advertisement and promotion on the Internet. Visitors look for the information online and ski center should have a good web page including actualities about the snow cover, prices or cultural events.

To sum it up, this research was very simplified on the bachelor thesis level, but as I find this topic as very interesting, I would like to take an opportunity to study these „other”



effects influencing visit rate of chosen touristic localities in more detail in my diploma thesis.

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## **7. Supplements**

### **7.1. Table of Figures**

Figure 1: Linkages between climate and tourism .....	15
Figure 2: Mean annual temperatures (1961-1990) .....	19
Figure 3: Incoming and outgoing tourism in CSR/CR .....	21
Figure 4: Number of days with snow cover higher than 20 cm.....	26
Figure 5: Average temperatures in Rokytnice nad Jizerou.....	28
Figure 6: Visit rate of ski center Rokytnice .....	28
Figure 7: Average precipitation in Český Krumlov.....	34
Figure 8: Average temperatures in Český Krumlov .....	35
Figure 9: Visit rate of the State Castle Český Krumlov .....	36

### **7.2. Data**

**Number of days, when the snow cover was higher than**

<b>rok</b>	<b>výška v cm</b>	<b>January</b>	<b>February</b>	<b>March</b>	<b>December</b>	<b>Average</b>
1996	1	31	29	10	31	25,25
1996	5	31	29	31	31	30,5
1996	10	31	29	31	31	30,5
1996	20	21	19	11	31	20,5
1996	50	0	12	31	0	10,75
1997	1	31	28	16	18	23,25
1997	5	31	28	15	13	21,75
1997	10	31	28	10	9	19,5
1997	20	31	28	3	2	16
1997	50	0	5	0	0	1,25
1998	1	17	14	21	31	20,75
1998	5	15	14	16	31	19
1998	10	14	14	11	31	17,5
1998	20	5	13	0	26	11
1998	50	0	0	0	8	2
1999	1	31	28	31	27	29,25
1999	5	31	28	31	26	29
1999	10	31	28	31	23	28,25
1999	20	31	18	31	17	24,25
1999	50	14	27	28	3	18
2000	1	31	29	31	16	26,75
2000	5	31	29	31	16	26,75
2000	10	31	29	31	16	26,75
2000	20	31	29	31	15	26,5
2000	50	19	29	30	0	19,5
2001	1	31	28	26	31	29
2001	5	31	28	23	31	28,25
2001	10	31	24	18	31	26
2001	20	15	16	12	31	18,5
2001	50	0	4	0	16	5
2002	1	31	28	26	16	25,25
2002	5	31	28	26	15	25
2002	10	31	28	25	9	23,25
2002	20	31	25	19	11	21,5
2002	50	31	8	0	0	9,75
2003	1	31	28	31	25	28,75
2003	5	31	28	31	25	28,75
2003	10	31	28	31	23	28,25
2003	20	14	28	23	16	20,25
2003	50	0	21	0	0	5,25
2004	1	31	29	29	31	30
2004	5	31	29	29	31	30
2004	10	31	29	29	31	30
2004	20	31	29	29	15	26
2004	50	21	28	20	0	17,25

2005	1	31	28	31	31	30,25
2005	5	31	28	31	31	30,25
2005	10	31	28	31	31	30,25
2005	20	31	28	31	31	30,25
2005	50	11	28	31	15	21,25
2006	1	31	28	31	10	25
2006	5	31	28	31	3	23,25
2006	10	31	28	31	0	22,5
2006	20	31	28	31	12	25,5
2006	50	31	28	31	0	22,5
2007	1	13	28	18	31	22,5
2007	5	12	28	16	31	21,75
2007	10	10	28	14	13	16,25
2007	20	17	28	10	16	17,75
2007	50	6	2	0	0	2
2008	1	23	6	21	31	20,25
2008	5	21	2	14	28	16,25
2008	10	20	0	12	27	14,75
2008	20	12	20	15	12	14,75
2008	50	0	0	0	0	0
2009	1	31	28	31	23	28,25
2009	5	31	28	31	20	27,5
2009	10	31	28	31	3	23,25
2009	20	23	28	31	0	20,5
2009	50	0	14	24	0	9,5
2010	1	31	28	28	31	29,5
2010	5	31	28	28	31	29,5
2010	10	29	28	27	31	28,75
2010	20	21	28	25	31	26,25
2010	50	3	23	5	19	12,5

Source: Czech Hydrometeorological Institute

Average air temperature and visit rate  
Rokytnice nad Jizerou

**Average air temperature**

year	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
January	-3,6	-4,3	-1,7	-2,2	-3,7	-2,4	-3,1	-4,0	-5,2	-2,1	-6,3	-1,2	-4,4	-4,7	-6,4
February	-3,1	-0,6	1,0	-3,3	-0,2	-1,7	1,3	-5,5	-2,0	-4,7	-4,1	-2,8	-2,8	-2,1	-2,9
March	-2,6	1,1	-0,2	2,1	0,8	0,4	1,8	0,8	0,4	-1,5	-1,7	-3,1	-1,7	-2,2	0,2
December	-3,7	-0,9	-3,2	-2,0	-1,3	-5,0	-4,2	-1,8	-2,7	-2,6	-1,3	-2,5	-2,9	-2,6	-6,8
Average	-3,3	-1,2	-1,0	-1,4	-1,1	-2,2	-1,1	-2,6	-2,4	-2,7	-3,4	-2,4	-3,0	-2,9	-4,0
Change	2,1	0,2	-0,3	0,3	-1,1	1,1	-1,6	0,3	-0,4	-0,6	1,0	-0,6	0,1	-1,1	4,0

Source: Czech Hydrometeorological Office

**Visit rate**

Average change: 0,2

season	visitors
1996/1997	189645
1997/1998	192456
1998/1999	196283
1999/2000	221072
2000/2001	253373
2001/2002	295138
2002/2003	298251
2003/2004	310250
2004/2005	288265
2005/2006	279573
2006/2007	261185
2007/2008	290988
2008/2009	300988
2009/2010	275200
2010/2011	198802

Source: TJ Spartak Rokytnice

Klimatological data from the meteorological station Český Krumlov

**Average monthly air temperature (°C)**

	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	
<b>june</b>	15,9	15,8	16,6	14,7	17,3	13,8	17,8	19,9	15,2	16,6	16,8	18,5	16,9	14,9	16,4	
<b>july</b>	15,4	15,8	16,9	18,0	15,1	17,7	18,2	18,6	17,3	17,7	20,7	18,8	17,5	18,0	19,7	
<b>august</b>	15,5	17,3	16,8	16,4	17,7	17,8	17,5	20,8	18,1	15,6	15,1	17,5	17,5	17,9	17,1	
<b>average</b>	15,6	16,3	16,8	16,4	16,7	16,4	17,8	19,8	16,9	16,6	17,5	18,3	17,3	16,9	17,7	
<b>average change</b>	0,7	0,5	-0,4	0,3	-0,3	1,4	1,9	-2,9	-0,2	0,9	0,7	-1,0	-0,4	0,8		0,2

**Average monthly precipitation (mm)**

	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	
<b>june</b>	107,5	92,2	109,4	43,3	72,7	104,7	107,5	70,2	134,8	88,1	170,0	34,0	52,5	231,9	84,7	
<b>july</b>	68,4	214,0	99,2	81,5	139,0	73,8	73,7	63,8	63,8	171,6	120,6	92,8	81,9	97,8	133,8	
<b>august</b>	91,9	56,6	43,7	59,0	49,6	186,2	356,6	47,1	35,9	120,0	110,4	120,1	57,5	151,1	89,2	
<b>average</b>	89,3	120,9	84,1	61,3	87,1	121,6	179,3	60,4	78,2	126,6	133,7	82,3	64,0	160,3	102,6	
<b>average chage</b>	31,7	-36,8	-22,8	25,8	34,5	57,7	-118,9	17,8	48,4	7,1	-51,4	-18,3	96,3	-57,7		1

Source: Czech Hydrometeorological Office



Data Český Krumlov

year	visit rate	average precipitation (mm)	average temperatures (°C)
1996	154 075	89,3	15,6
1997	147 322	120,9	16,3
1998	149 686	84,1	16,8
1999	160 119	61,3	16,4
2000	285 430	87,1	16,7
2001	297 534	121,6	16,4
2002	235 427	179,3	17,8
2003	262 103	60,4	19,8
2004	329 133	78,2	16,9
2005	336 316	126,6	16,6
2006	340 475	124,0	17,5
2007	342 297	82,3	18,3
2008	355 785	64,0	17,3
2009	330 732	160,3	16,9
2010	353 627	102,6	17,7

Source: Czech Hydrometeorological Office, Information Office Český Krumlov