TRANSPORT NETWORKS AND ECOTOURISM DESTINATIONS: THE AIM FOR SUSTAINABILITY

Eden Sorupia

Submitted in total fulfilment of the requirements for the degree of Doctor of Philosophy

September 2007

Faculty of Architecture, Building and Planning
The University of Melbourne

Produced on archival quality paper
ABSTRACT

Ecotourism as sustainable travel to biodiversity-rich areas advocates the utilisation of modes with minimal impacts to the environment. Yet most often the modes available to the public and the transport network that serves the destination undermine its aims of sustainability. The research looks into the relationship between an ecotourism destination and the transport network that serves it. The objective of the study is to identify policies and structures that contribute to improve its sustainability.

Case studies from a developed and developing country are utilised to examine the relationship and to investigate whether strategies differ given the different settings and opportunities open to each. Policies regarding transport, tourism and the environment were evaluated and correlated with current practices, reports, literature as well as interviews of key informants. The study has found that even with good public transport services to the national parks, the mode of choice of visitors remains the private vehicle. Public transport solutions in urban areas remain relevant in the countryside. Policies aimed at reducing car use and promoting public transport have comparable impacts to rural areas. In this setting, non-government organisations and interest groups play a big role in educating the public regarding the sustainability of their mode choices.

The examples from Switzerland and Brazil have shown that their innate differences do not prevent them from employing similar policies and structures, and that improving the sustainability of transport network that serves an ecotourism destination is possible. The study stresses the importance of providing a well-integrated network and good public transport service to ecotourism destinations. Unsustainable travel can be reversed by changing the balance of transport incentives and disincentives and encouraging mode shift to more sustainable modes.
DECLARATION

This is to certify that

(i) the thesis comprises only my original work towards the PhD,

(ii) due acknowledgement has been made in the text to all other material used,

(iii) the thesis is less than 100,000 words in length, exclusive of tables, maps, bibliographies and appendices.

Eden Sorupia
September 2007
ACKNOWLEDGMENTS

My gratitude goes to the University of Melbourne for the opportunity to pursue my PhD under full scholarship and to the Faculty of Architecture Building and Planning for providing a good office base to undertake my research.

Many thanks to my supervisor, Paul Mees, for his untiring support, patience and constructive criticism draft after draft after draft. The extra effort he put into sourcing funding for the Switzerland fieldwork and the WCTR as well as the opportunity to do tutorials to augment my savings when my scholarship ran out.

Special thanks to Nick Low and Catherin Bull for helping shape the thesis in its early stages. Particular mention goes to GAMUT for funding the fieldwork to Switzerland and providing the opportunity to present a paper at the WCTR 2007 in UC Berkeley.

My interviewees both in Brazil and Switzerland for sharing their expertise and time in answering my questions. Special mention to France Chou and Marcos Damas who kept in touch and updated my file regarding the Iguaçu National Park. To PNI Chief Jorge Pegoraro for facilitating data collection as well as giving me free access to select activities of the concessionaires. Felix Laube who secured a contact person for me in the RhB and in the public transport department in Graubünden a few days prior to my flight to Switzerland. Guilherme for translating my questions into Portuguese and giving me pointers about Brazil prior to the fieldwork.

ABP staff: Jane, Lorenne, Jessie, Maricar, Somchit and all the IT staff • UP-NCTS: Karl, Regin, Oyie, Mike, Ed and Ian for the interview, data and program • ANU-Philippine Studies Group for allowing me to share my work and for the feedback •

To the following people who have made the last four years extra fun and meaningful:

Melbourne Tropa: Primo and Vergie for the helpful comments and feedback, Anna, James, Teks, Maan, Maridel, Ed, Shayne, Darwin, Tess, Adrian, Maline • ABP friends: Eka, Imran, Estela, Hao, Phuong, Agus, Paula, Sidh, Tum, Youngmi, Deepika, Yash, Mujeeb, Kate, Morteza, Hui, Gerardo, Andrew, Vrushti, Michelle • M606: Philippa, Simone, Maloti • Cheerleaders: Aimee, Ces, Derlie, 43 Mahusay girls, NCTS, Tita Melinda, Wendell, UP Arki '91, Thelma and Art •

To my parents and siblings, for the support and the love.
## Table of Contents

1. **Introduction**  

2. **Sustainability, Tourism and Transport**  
   - Tourism and the growth of travel  
   - Environmental impacts of tourism-related travel  
     - Global impacts of travel and tourism  
     - Local impacts of travel and tourism  
   - Sustainable development  
     - Weak sustainability  
     - Strong sustainability  
   - Sustainability and tourism  
     - Role of marketing  
     - Particular challenges for developing countries  
     - Weak sustainability applied to tourism  
     - Strong sustainability applied to tourism  
   - Defining ecotourism  
   - Transport and sustainable tourism  
   - Conclusion  

3. **Mapping the Network: The Methodology**  
   - The ecotourism destination and the transport network:  
     a question of sustainability  
   - Approach Adopted  
   - Selection of Case Study Areas  
     - The tourism-transport framework  
     - Eliminating the Philippines as case study  
     - Eliminating Australia as case study  
     - The consideration of Switzerland as case study  
     - The consideration of Paraná, Brazil as case study  
   - Road Map: Data collection methods  
     - Document analysis  
     - Literature review  
     - Interview and site visits  
   - Reading the signs: Methods of analysis  
     - Triangulation  
     - Evidence-based policy  
     - Policy Analysis  

4. **Developing Country Perspective:**  
   - **Parque Nacional do Iguacu, Paraná, Brazil**  
   - Transport and the ecotourism destination  
   - The bigger picture: Paraná State, making a difference?  
   - Foz do Iguacu as a tourism destination within three frontiers  
     - Immigration and the growth of a city  
     - The black market in Ciudad del Este, Paraguay  
     - A history of natural area protection  
   - Iguacu National Park  
     - Internal transport scheme  
     - IBAMA-Concessionaire system  
     - Ecotourism and visitor management
In retrospect: the Iguaçu National Park management
Foz do Iguaçu as a tourist destination and its transport network 76
National and international linkage
FozTrans and transportation management
Transportation in tourism
Conclusions 90

5. **DEVELOPED COUNTRY PERSPECTIVE:**
**SWISS NATIONAL PARK, GRAUBÜNDEN, SWITZERLAND** 92
Switzerland: creating an ideal? 92
Development of the Swiss transport network
Mode of choice: the Swiss Railway
Swiss transport policy
Leisure traffic
The value of Swiss tourism
Graubünden: a tradition of tourism and the development of its transport network
Graubünden as a tourism destination
Transport network in the canton: trains and buses
The Swiss National Park 122
Park access
The OfenPass and the Swiss National Park
In retrospect: the nature tourist, the Swiss National Park and the transport network
The transport network and the private vehicle
Mode split and the mobility in the region
Promoting a more sustainable alternative
Conclusions 138

6. **TRAVEL, THE NATIONAL PARKS AND THE TRANSPORT NETWORK IN PERSPECTIVE** 140
Understanding ecotourism and the role of transport 140
Modes to the ecotourism destination
Managing ecotourism destinations
Encouraging sustainable behaviour
What is driving the car? Of incentives and disincentives, and the aim for sustainability 145
Infrastructure
Public transport services
Slowing down for sustainability
Managing the transportation network for ecotourism destinations 148
Governance structure
Provision of transport services
Towards a sustainable relationship, of carrots and sticks
In retrospect

7. **CONCLUSIONS** 156

**BIBLIOGRAPHY** 160

**APPENDICES** 173
<table>
<thead>
<tr>
<th>Table Number</th>
<th>Title</th>
<th>Page Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>World Arrivals by mode of transport (including estimations for countries with missing data)</td>
<td>6</td>
</tr>
<tr>
<td>2</td>
<td>Emissions of CO₂ from Transport by Country (IEA)</td>
<td>8</td>
</tr>
<tr>
<td>3</td>
<td>Levels of emissions by mode – grams/passenger-km of travel</td>
<td>9</td>
</tr>
<tr>
<td>4</td>
<td>Expected growth in worldwide vehicle ownership and traffic</td>
<td>10</td>
</tr>
<tr>
<td>5</td>
<td>Emissions levels for cars and buses in urban areas</td>
<td>25</td>
</tr>
<tr>
<td>7</td>
<td>Modes used by visitors to the Iguazu National Park</td>
<td>64</td>
</tr>
<tr>
<td>8</td>
<td>Number of Vehicles Entering Iguazu National Park 2002-2003</td>
<td>67</td>
</tr>
<tr>
<td>9</td>
<td>Morning and Evening Timetable, Parque Nacional-TTU route</td>
<td>86</td>
</tr>
<tr>
<td>10</td>
<td>Tourists’ Satisfaction Rating of Specific Services</td>
<td>87</td>
</tr>
<tr>
<td>11</td>
<td>Foz do Iguazu Tourist Population and Travel Organisation</td>
<td>88</td>
</tr>
<tr>
<td>12</td>
<td>Passenger Transport Statistics (in passenger-kilometre)</td>
<td>99</td>
</tr>
<tr>
<td>13</td>
<td>Construction Expenditure in CHF million, at year 2000 prices</td>
<td>102</td>
</tr>
<tr>
<td>14</td>
<td>Modal Split for Year 2000 Micro Census (in %)</td>
<td>106</td>
</tr>
<tr>
<td>15</td>
<td>Lü Village Timetable</td>
<td>115</td>
</tr>
<tr>
<td>16</td>
<td>Transport Infrastructure</td>
<td>132</td>
</tr>
<tr>
<td>17</td>
<td>Travel Times of the various Modes within the Region</td>
<td>134</td>
</tr>
<tr>
<td>18</td>
<td>Mode Split in the Canton Graubünden</td>
<td>135</td>
</tr>
</tbody>
</table>
## List of Figures

<table>
<thead>
<tr>
<th>Figure Number</th>
<th>Title</th>
<th>Page Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>International Tourist Arrivals, 1990-2005</td>
<td>5</td>
</tr>
<tr>
<td>2</td>
<td>International tourist arrivals by means of transport, 2005;</td>
<td>6</td>
</tr>
<tr>
<td></td>
<td>International tourist arrivals by purpose of visit, 2005</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Map of Brazil showing demarcation line by the 1494 Treaty of</td>
<td>46</td>
</tr>
<tr>
<td></td>
<td>Tordesillas</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Early settlements and transport development 1850-1999</td>
<td>47</td>
</tr>
<tr>
<td>5</td>
<td>Paraná Integration Ring</td>
<td>52</td>
</tr>
<tr>
<td>6</td>
<td>Municipality of Foz do Iguaçu showing major access points</td>
<td>53</td>
</tr>
<tr>
<td>7</td>
<td>Local vs Annual Total Tourist Population, 2000-2005</td>
<td>54</td>
</tr>
<tr>
<td>8</td>
<td>Equivalent Tourist Population vs Local Population, 2000-2005</td>
<td>55</td>
</tr>
<tr>
<td>9</td>
<td>BR 469</td>
<td>61</td>
</tr>
<tr>
<td>10</td>
<td>Iguaçu National Park showing its boundaries and the Old Colonial Road</td>
<td>62</td>
</tr>
<tr>
<td>11</td>
<td>Iguaçu National Park Bus</td>
<td>65</td>
</tr>
<tr>
<td>12</td>
<td>Annual Number of Vehicles Entering the Iguaçu National Park</td>
<td>66</td>
</tr>
<tr>
<td>13</td>
<td>Number of visitors to the Iguaçu National Park, 1980-2004</td>
<td>70</td>
</tr>
<tr>
<td>14</td>
<td>Transport Modes: 10-seater cariton, bicycles, Diesel-powered boat</td>
<td>72</td>
</tr>
<tr>
<td>15</td>
<td>Electric vehicle, 24-seater passenger cart, raised trail, Diesel-</td>
<td>73</td>
</tr>
<tr>
<td></td>
<td>powered boat at the floating dock, boat ride to the falls, 12-</td>
<td></td>
</tr>
<tr>
<td></td>
<td>seater alcohol-fuelled jeep</td>
<td></td>
</tr>
<tr>
<td>16</td>
<td>Modes of transport utilised by visitors to Foz do Iguaçu</td>
<td>78</td>
</tr>
<tr>
<td>17</td>
<td>Passenger movement at the Foz do Iguaçu International Bus Station</td>
<td>79</td>
</tr>
<tr>
<td></td>
<td>(Rodoviaria)</td>
<td></td>
</tr>
<tr>
<td>18</td>
<td>Passenger movement at the Foz do Iguaçu International Airport</td>
<td>80</td>
</tr>
<tr>
<td>19</td>
<td>Municipality of Foz do Iguaçu showing the Regions, Population</td>
<td>82</td>
</tr>
<tr>
<td></td>
<td>and Zone Bus Operators</td>
<td></td>
</tr>
<tr>
<td>20</td>
<td>Visitor makeup to Iguaçu National Park, 1981-2005</td>
<td>89</td>
</tr>
<tr>
<td>21</td>
<td>Passenger Road Traffic in year 2000</td>
<td>95</td>
</tr>
<tr>
<td>23</td>
<td>Swiss Rail and Road Infrastructure Investment 1950-2003</td>
<td>103</td>
</tr>
<tr>
<td>24</td>
<td>Transportation revenue and expenditure under FinöV</td>
<td>104</td>
</tr>
<tr>
<td>25</td>
<td>Transportation Modes, Trip Purpose and Mode Share</td>
<td>106</td>
</tr>
<tr>
<td>Figure Number</td>
<td>Title</td>
<td>Page Number</td>
</tr>
<tr>
<td>---------------</td>
<td>----------------------------------------------------------------------</td>
<td>-------------</td>
</tr>
<tr>
<td>26</td>
<td>The Swiss cantons locating canton Graubünden</td>
<td>109</td>
</tr>
<tr>
<td>27</td>
<td>Holiday Regions in Graubünden</td>
<td>110</td>
</tr>
<tr>
<td>28</td>
<td>Map showing Lü with reference to Zernez and Müstair</td>
<td>114</td>
</tr>
<tr>
<td>29</td>
<td>RhB Express Routes</td>
<td>116</td>
</tr>
<tr>
<td>30</td>
<td>Canton Graubünden Transportation Network</td>
<td>118</td>
</tr>
<tr>
<td>31</td>
<td>PostBus Express Routes</td>
<td>121</td>
</tr>
<tr>
<td>32</td>
<td>Mode Share observed over June to October 1993</td>
<td>124</td>
</tr>
<tr>
<td>33</td>
<td>Swiss National Park showing PostBus stops along the OfenPass</td>
<td>125</td>
</tr>
<tr>
<td>34</td>
<td>The Swiss National Park and the RhB and PostBus lines</td>
<td>126</td>
</tr>
<tr>
<td>35</td>
<td>Parking areas P6 in the Hotel Il Fuorn and P5 along the OfenPass</td>
<td>127</td>
</tr>
</tbody>
</table>
1. Introduction

Transport in Ecotourism

Sustainable development and ecotourism were the catchphrases of the 1990s. The former encourages everyone to rethink their utilisation of resources and stresses the importance of taking into consideration the needs of future generations. The latter term involves travel to natural areas rich in biodiversity. Ecotourism became the trend after popular destinations lost their appeal and going off the beaten track to rediscover the wild was all the rage. Since then, conservationists have been lamenting the loss of biodiversity and attributing this to the increasing visitation and subsequent invasion of tourism of wildlife habitat. Furthermore, the impacts on the global environment of the modes available to the public undermine ecotourism’s aim of conservation.

This study seeks to contribute to understanding the role of transport in an ecotourism destination that is defined as sustainable tourism. The accessibility and mobility of the visitors in this setting is significant because the environment that people come to see has to be protected. The study argues that though transport is just a part of the tourism system, if the ecotourism destination is integrated with the transport network, its sustainability may be improved.

It is also significant to look at the mobility of visitors not just at the destinations but also while travelling to and from ecotourism destinations, because these all have impacts. These impacts may have on-site, off-site, local and global consequences, which are dependent on the characteristics of the modes. The type of travel under consideration in this study is limited within the destination country and specific to the destination region. This enables the analysis of the national as well as the local transport network in consonance with tourist use.

Sustainability depends on factors such as a country’s policies, the operator’s attitudes and vision as well as the vigilance of organisations and advocacy groups. Moreover, these policies and regulations mirror how governments value their resources.
This study pursues the developed-developing country dichotomy to see whether despite the economic differences, common strategies in the management of resources can be identified. The protection of the natural environment is the common concern of governments. There is much confidence in a developed country’s management capability where infrastructure and relevant policies are in place, whereas the majority of biodiversity rich areas located in developing countries are perceived to be in danger of consumption. The acknowledged importance of tourism as a source of income makes ecotourism a convenient excuse to achieve both conservation and increase foreign revenue.

Though the role of transport in tourism is vital, it is a component that is seldom considered given the extent of its impact on the environment. Being a relatively new phenomena, there are few studies tackling the sustainability of the relationship between an ecotourism destination and its transport network. Therefore, the aim of this study is to investigate the sustainability of the relationship of a transport network that serves an ecotourism destination. There is a need to re-define the role of transport planning in establishing a more sustainable system for ecotourism destinations. It also seeks to identify the structures and policies that contribute to make the relationship sustainable.

Case studies with commendable practices will be utilised to study the relationship. Although the importance of doing quantification models to measure impacts is acknowledged, this study will only be looking at government policies, agency and organisation reports, prevailing practices to evaluate sustainability as well as utilise interviews of relevant personnel in the fields of transport, tourism and environment.

My interest in investigating the relationship between transport and ecotourism was sparked by my travels within my country, the Philippines. I saw the important role transport and access play in transforming an area from a secret hideaway to a popular destination, oftentimes with disastrous results. A sustainable network seemed imperative for a developing country eager to cash in on its resources. This led to the interest in looking at commendable practices from a developing country, because finding a successful example meant that the implementation of a sustainable network is achievable. The possibility that even developed countries operate within this framework implies that it is replicable and workable.
OVERVIEW OF THE RESEARCH

Working towards understanding the relationship between transport and ecotourism, the flow of this dissertation begins with the discussion of the various transport-tourism issues that set off the study as well as the concepts utilised in the research. This is followed by an outline of the methods that will be used to test the hypotheses, and investigated by looking at case studies. The findings arising from the case studies are thereafter analysed and from which conclusions regarding the relationship are drawn.

Chapter 2 is a literature review of the issues that the research will tackle. Overviews of the different international treaties that have spurred sustainability, transport initiatives towards sustainability, and biodiversity conservation are presented. The debate between strong and weak sustainability is foremost in the discussion due to the varying degrees of implementation by stakeholders, dependent on their definition of the term. Add to this is the manner of how developed and developing countries address issues of sustainability. Debates on ecology and economics, marketing trends and travel motivation are undertaken in relation to how ecotourism is defined by the various players in the industry.

Chapter 3 lays down the methods used for the research. The hypotheses are investigated utilising case studies. The selection of study areas are based on the tourism-transport framework created from the previous chapter. Data gathering entails collecting documents and reports from relevant agencies and offices, interviews with key informants and site visits. In identifying the structures that contribute to the sustainability of the system, data from the case studies are verified through triangulation, evidence-based policy and policy analysis.

The relationship between ecotourism and transport is explored in case studies in Chapter 4 and Chapter 5. An example from a developing country and a developed country are used as case studies to validate the hypotheses regarding the tourism-transport relationship and to see whether there are common structures and policies that define ‘good practice’. The case studies explore the efficiency of the transport services that serve the ecotourism destinations, relate the relevant transport and tourism policies with the practices, and evaluate the management of the destination.

The findings from the case studies are compared and analysed in Chapter 6. The objective is to identify structures and policies that are common to both and which shed
light on the sustainability issue. Areas in the relationship, which both contribute to the success and performance of the network are discussed and related to identify these factors.

The conclusions drawn in Chapter 7 summarises the significant structures and policies which improves the sustainability of the relationship between transport networks and ecotourism destinations.
2. SUSTAINABILITY, ECOTOURISM AND TRANSPORT

This chapter establishes the research questions by examining the interrelationship of transport and tourism. It discusses how the impacts of tourism on travel and of travel to the environment have led to the re-evaluation of the industry’s sustainability. The aim is to understand the role of transport in improving tourism’s sustainability, especially to the biodiversity-rich areas of ecotourism destinations. The examination of these issues is utilised to create the framework for the study.

TOURISM AND THE GROWTH IN TRAVEL

The foundation of the tourism industry is the environment (Mathieson and Wall, 1986). But transport for tourism destinations can undermine the very environment that visitors come to see. Improved transport technology, free time and increases in disposable income have led to an increase in mobility. Banister (2005) points out that the projected 75% increase in World GDP by 2025 means a 57% increase in energy consumption and over 80% growth in vehicle-kilometres. The United Nations World Tourism Organisation (UNWTO) 2006 Tourism Highlights Report shows that there is a continued increase in number of tourist arrivals since 1990 (see Figure 1). The organisation acknowledges that although “terrorism, natural disasters, health scares, oil price rises, exchange rate fluctuations and economic and political uncertainties” beset the industry in 2005, the international arrivals worldwide exceeded 800 million (UNWTO, 2006, p 1). Tourism has opened frontiers while transportation has abetted its growth by providing access and increasing mobility.

![Figure 1 International Tourist Arrivals, 1990-2005](source)

Source: World Tourism Organisation (UNWTO) 2006
Table 1 shows year 2005 UNWTO data regarding mode split of international tourist arrivals and the steady increase of air transport mode share compared to road or rail. In 2005, as shown in Figure 2, air and road transport have almost equal shares. This trend is likely to continue given the projected 73% increase in car ownership and traffic by 2020 (Organisation for Economic Cooperation and Development, 1995: details shown in Table 4) and the UNWTO (2006) attesting to the faster rate of increase in air travel in the last two years compared to land or water transport. This relationship is significant given the 3.7% real growth per annum that the World Travel & Tourism Council (2006) is predicting for 2007-2016. The increase in road and air travel means a corresponding increase in the environmental impacts that each mode produces.

The majority of international trips according to UNWTO (2006) are for leisure purposes (see Figure 2) and given the mode choices, are highly unsustainable. Cheap airfares and the private vehicle increase the convenience of leisure travel. The phenomenon of budget airlines as reported by Underhill (2006) has meant economic gains and a spot on the tourism network for little known cities such as Charleroi in Belgium or Katowice in southern Poland. The “air boom” as he calls it has brought tourism and later, settlers to

\[
\begin{array}{|c|c|c|c|c|c|c|c|c|c|c|c|c|c|c|}
\hline
\text{Year} & \text{International Tourist Arrivals (million)} & \text{Share (\%)} & \text{Change (\%)} & \text{Average Annual Growth \%} \\
\hline
\hline
\text{Total} & 437.8 & 539.6 & 686.7 & 796.4 & 693.2 & 763.9 & 100 & 100 & 100 & -1.9 & 10.2 & 4.6 & 2.7 \\
\text{Air} & 169.4 & 217.7 & 289.8 & 287.5 & 286.2 & 330.0 & 38.7 & 42.2 & 43.2 & -0.5 & 15.3 & 5.5 & 3.3 \\
\text{Land} & 233.2 & 276.6 & 342.3 & 363.1 & 352.2 & 375.1 & 53.3 & 49.8 & 49.1 & -2.7 & 6.2 & 3.9 & 2.3 \\
\text{Road} & 205.9 & 250.9 & 308.2 & 328.3 & 318.6 & 338.5 & 47.0 & 44.9 & 44.3 & -3.0 & 6.3 & 4.1 & 2.4 \\
\text{Rail} & 27.4 & 25.7 & 34.1 & 34.8 & 34.6 & 36.6 & 6.2 & 5.0 & 4.8 & -0.5 & 5.8 & 2.2 & 1.8 \\
\text{Water} & 33.8 & 43.6 & 52.4 & 53.1 & 51.6 & 55.2 & 7.7 & 7.6 & 7.3 & -2.9 & 8.1 & 4.5 & 1.8 \\
\text{Not Specified} & 1.4 & 1.6 & 2.2 & 2.6 & 2.3 & 3.0 & 0.3 & 0.3 & 0.4 & & & & \\
\hline
\end{array}
\]

Notes: Data as collected by UNWTO for TMT 2005 Edition
All 2004 data are provisional numbers.
Source: World Tourism Organisation (UNWTO) 2005

\[
\text{Figure 2} \ (\text{Top}) \ International \ tourist \ arrivals \ by \ means \ of \ transport, \ 2005; \ \\
(\text{Bottom}) \ International \ tourist \ arrivals \ by \ purpose \ of \ visit, \ 2005
\]
Source: World Tourism Organization (UNWTO), 2006
these quaint places, which are sometimes unable to cope with the tourist numbers. It was noted that property prices have gone up and foreign ownership has increased as a result (Underhill, 2006).

The improvement of the economy in these cities has meant that impacts to the environment of such modes are not a priority as gathered from Underhill’s (2006) report. SkyEurope’s CEO was quoted as saying that “Instead of competing with other airlines, we’re competing with other modes of transport” (Underhill, 2006). This competition amongst modes easily marginalises the slower modes. Whitelegg (1997) contends that it has transformed distance into a commodity. This consumption has led to the destruction of natural areas to accommodate infrastructure as well as the reliance on modes that heavily utilise fossil fuels and produce emissions.

ENVIRONMENTAL IMPACTS OF TOURISM-RELATED TRAVEL

Global impacts of travel and tourism
The mode split between air and road (see Figure 2) and the projected increase in tourism travel has led Whitelegg (1997) to question the sustainability of tourism transport patterns, the impacts of aviation, and the continued reliance on the private vehicle. He has also stressed that the long-term impact of the mode choices may be irreversible and it is imperative that governments identify and define priorities for a sustainable transport strategy.

Emissions from road and air transport are the most common sources of greenhouse gases. “The transport sector is responsible for over a quarter of the world’s primary energy use, and for about 54 percent of all world oil consumption” (Peters 2001, p 110). It is also responsible for over 24% of carbon dioxide emissions from 1990-2004 in the European Union - 25 (EU25) countries (European Commission, 2006). Carbon dioxide’s ability to remain in the earth’s atmosphere far longer than the other greenhouse gases makes it a critical contributor to global warming.

The World Travel & Tourism Council (2006) reports that tourism has become the world’s largest industry, providing 8.7% of the world’s employment and contributing 3.6% of the world GDP. With tourism receipts totalling over US$883 billion in 2006, as an export category, it “ranks fourth after fuels, chemical and automotive products” (UNWTO, 2007). Translated to the amount of travelling done plus the projected
increase for the next ten years, tourism-related travel is undeniably a very significant source of greenhouse gas emissions.

Although this is a simplistic correlation between CO\textsubscript{2} and world tourism, the impact of increased travel and the high levels of emissions of the modes utilised has to be stressed. According to the UNWTO World Tourism Barometer (2007), France followed by Spain, the USA, China and Italy are the top five tourism destinations in 2006. These countries’ CO\textsubscript{2} emissions from transport from 1972-2004 are shown in Table 2. In Banister’s (2005, p 23) list of ‘good guys’ and ‘bad guys’ according to CO\textsubscript{2} emissions, with the exception of China\textsuperscript{1}, the other four are under his ‘bad guys’ category.\textsuperscript{2} The fact that the top five destinations are major sources of CO\textsubscript{2} presents a strong correlation between emissions and tourism travel and further justifies Whitelegg’s call for a sustainable transport strategy for tourism.

\textbf{Table 2 Emissions of CO\textsubscript{2} from Transport by Country (IEA)}

<table>
<thead>
<tr>
<th>Year</th>
<th>World</th>
<th>China</th>
<th>France</th>
<th>Italy</th>
<th>Spain</th>
<th>USA</th>
</tr>
</thead>
<tbody>
<tr>
<td>1972</td>
<td>2497</td>
<td>51.80</td>
<td>66.40</td>
<td>51.80</td>
<td>27.40</td>
<td>1150.70</td>
</tr>
<tr>
<td>1974</td>
<td>2647</td>
<td>61.00</td>
<td>72.30</td>
<td>52.20</td>
<td>35.40</td>
<td>1174.50</td>
</tr>
<tr>
<td>1976</td>
<td>2881</td>
<td>69.40</td>
<td>81.40</td>
<td>57.90</td>
<td>40.20</td>
<td>1242.80</td>
</tr>
<tr>
<td>1978</td>
<td>3127</td>
<td>83.40</td>
<td>87.70</td>
<td>64.70</td>
<td>41.90</td>
<td>1327.10</td>
</tr>
<tr>
<td>1980</td>
<td>3137</td>
<td>83.00</td>
<td>89.70</td>
<td>71.80</td>
<td>45.50</td>
<td>1237.60</td>
</tr>
<tr>
<td>1982</td>
<td>3152</td>
<td>88.80</td>
<td>91.80</td>
<td>74.50</td>
<td>43.20</td>
<td>1223.20</td>
</tr>
<tr>
<td>1984</td>
<td>3297</td>
<td>100.00</td>
<td>94.30</td>
<td>77.80</td>
<td>45.20</td>
<td>1277.50</td>
</tr>
<tr>
<td>1986</td>
<td>3448</td>
<td>111.40</td>
<td>98.50</td>
<td>83.70</td>
<td>46.00</td>
<td>1311.60</td>
</tr>
<tr>
<td>1988</td>
<td>3740</td>
<td>124.00</td>
<td>108.00</td>
<td>91.90</td>
<td>57.80</td>
<td>1418.50</td>
</tr>
<tr>
<td>1990</td>
<td>3894</td>
<td>122.40</td>
<td>114.50</td>
<td>96.60</td>
<td>64.10</td>
<td>1424.00</td>
</tr>
<tr>
<td>1992</td>
<td>4082</td>
<td>141.30</td>
<td>120.40</td>
<td>103.70</td>
<td>70.20</td>
<td>1427.30</td>
</tr>
<tr>
<td>1994</td>
<td>4216</td>
<td>149.00</td>
<td>122.60</td>
<td>105.60</td>
<td>71.50</td>
<td>1503.70</td>
</tr>
<tr>
<td>1996</td>
<td>4434</td>
<td>164.10</td>
<td>123.20</td>
<td>108.10</td>
<td>77.80</td>
<td>1573.20</td>
</tr>
<tr>
<td>1998</td>
<td>4658</td>
<td>206.30</td>
<td>132.10</td>
<td>112.80</td>
<td>85.30</td>
<td>1636.60</td>
</tr>
<tr>
<td>2000</td>
<td>4841</td>
<td>230.70</td>
<td>135.70</td>
<td>113.00</td>
<td>91.60</td>
<td>1714.00</td>
</tr>
<tr>
<td>2002</td>
<td>4990</td>
<td>243.80</td>
<td>138.10</td>
<td>117.00</td>
<td>97.40</td>
<td>1745.00</td>
</tr>
<tr>
<td>2004</td>
<td>5292</td>
<td>307.30</td>
<td>135.80</td>
<td>120.10</td>
<td>106.90</td>
<td>1791.40</td>
</tr>
</tbody>
</table>


\textsuperscript{1} China is not part of the Annex I countries agreeing to specific targets of the Kyoto Protocol in 1997. On the other hand, China’s rapid growth and industrial/manufacturing practices have fuelled the controversy surrounding the role developing countries play in the climate change debate.

\textsuperscript{2} Banister classified the bad guys into five categories: those emitting >3 tonnes/person/year, 2-3 tonnes/person/year, OECD average=2.555 tonnes, EU15 average=2.183 tonnes and 1-2 tonnes/person/year/. The USA falls under the first category, France under the EU15 average, while Spain and Italy are under the last category. Countries with emissions <1 tonne/person/year are the good guys. Banister, D. 2005, \textit{Unsustainable Transport: City Transport in the new Century}, Routledge, Oxfordshire.
The issue of global warming and its repercussions has levelled the field for all nations. “[E]verybody is a stakeholder” when it comes to the environment (Macdonald, 2000, p 142). The Committee on Science, Engineering, and Public Policy (1991) acknowledges that climate change is the result of global processes with emissions from the various parts of the world contributing to greenhouse warming. This has led Macdonald (2000) to point out the importance of preventing further deterioration and repairing the damage. This call to safeguard and improve the quality of the atmosphere is reminiscent of what the ecologist Garrett Hardin (1968) called the “the tragedy of the commons,” where he tackled the relationship between population and the earth’s finite resources. His discussion of pollution and the impossibility to fence in the atmosphere and waterways led to his proposal of imposing taxes and coercive laws that require the polluter to treat his pollutants before these are discharged.

Given the amount of greenhouse gas emissions, Macdonald (2000) stresses the importance of reducing emissions, mainly because it would take more energy to clean it up. In transport, this means looking at modes or systems that use the least energy and produce the least emissions. Table 3 presents the projected vehicle emissions based on the OECD Working Group on Transport as cited in Banister (2005). In the light of leisure travel, rail and coach/bus as modes produce the least CO2. The increase in air and road travel (it is easy to assume that majority of trips would be by car given the increase in vehicle ownership as projected by the OECD to 2020, see Table 4), has led Whitelegg (1993) to suggest that the movement of goods and people should utilise lower energy and produce fewer emissions by increasing the use of public transport along with walking and cycling.

<table>
<thead>
<tr>
<th>Mode</th>
<th>CO2</th>
<th>C</th>
<th>NOx</th>
<th>PM10</th>
<th>Fuel</th>
</tr>
</thead>
<tbody>
<tr>
<td>Car</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Petrol</td>
<td>186</td>
<td>51</td>
<td>0.59</td>
<td>0.063</td>
<td>10 km/litre</td>
</tr>
<tr>
<td>Diesel</td>
<td>141</td>
<td>38</td>
<td>1.39</td>
<td>0.188</td>
<td>13.5 km/litre</td>
</tr>
<tr>
<td>Hybrid</td>
<td>125</td>
<td>34</td>
<td>0.19</td>
<td>---</td>
<td></td>
</tr>
<tr>
<td>Rail</td>
<td>73</td>
<td>20</td>
<td>---</td>
<td>---</td>
<td></td>
</tr>
<tr>
<td>Air</td>
<td>213</td>
<td>58</td>
<td>0.54</td>
<td>---</td>
<td></td>
</tr>
<tr>
<td>Taxi</td>
<td>223</td>
<td>61</td>
<td>1.52</td>
<td>0.413</td>
<td></td>
</tr>
<tr>
<td>Coach/Bus</td>
<td>56</td>
<td>16</td>
<td>0.19</td>
<td>0.019</td>
<td></td>
</tr>
<tr>
<td>Metro/Tube</td>
<td>107</td>
<td>29</td>
<td>0.075</td>
<td>---</td>
<td></td>
</tr>
</tbody>
</table>

Table 3 Levels of emissions by mode – grams/passenger-km of travel

Notes: 1 gram of carbon emitted is equivalent to 0.2727 gram of CO2.
The warming potential of all aircraft emissions (CO2, NOx and water vapour is about three times the CO2 emissions alone – www.chooseclimate.org/flying.
Source: Banister, 2005, p 35.
### Table 4: Expected growth in worldwide vehicle ownership and traffic (in thousands)

<table>
<thead>
<tr>
<th></th>
<th>1995</th>
<th>2020</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Cars</td>
<td>Vehicles</td>
</tr>
<tr>
<td>OECD North America</td>
<td>170,460</td>
<td>231,557</td>
</tr>
<tr>
<td>OECD Europe</td>
<td>160,215</td>
<td>203,429</td>
</tr>
<tr>
<td>Pacific</td>
<td>52,654</td>
<td>101,188</td>
</tr>
<tr>
<td>TOTAL OECD</td>
<td>383,329</td>
<td>536,174</td>
</tr>
<tr>
<td>Rest of the World</td>
<td>111,255</td>
<td>240,357</td>
</tr>
<tr>
<td>Globe Totals</td>
<td>494,584</td>
<td>776,531</td>
</tr>
<tr>
<td>Vehicle-kilometres – (billions)</td>
<td>7,792</td>
<td>12,341</td>
</tr>
</tbody>
</table>

**Notes:**
- All vehicles include cars, light trucks, motorcycles and heavy trucks.
- OECD North America – US and Canada
- OECD Europe – Austria, Belgium, Denmark, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, The Netherlands, Norway, Portugal, Spain, Sweden, Switzerland, Turkey, UK, Finland
- OECD Pacific – Japan, Australia, New Zealand
- Mexico is a member of the OECD (since 1994) but is excluded from these OECD figures.

**Source:** OECD, 1995 based on Table 2.2 of Banister, 2005.

### Local impacts of travel and tourism

The United Nations Environment Programme (UNEP) in its 2002 Annual Report (p 23) acknowledges that “badly managed tourism can destroy biodiversity, trample indigenous people’s rights and overload local infrastructure.”

With improved mobility, tourism and travel touches all aspects of local life. Orbasli and Shaw (2004) acknowledge that the traffic tourism generates is ‘problematic’. Croall (1995) expresses the same sentiment in his description of day-trippers that plague the British countryside. He describes the phenomenon as the “spectre of tourism” which is slowly ruining erstwhile pristine landscapes, quaint communities, as well as polluting the air and water, trivializing cultures, and degrading life on this planet (Croall, 1995, p 1).

Land transport, particularly rail and road, impacts wildlife and habitat when these pass through natural areas, creating divisions in an otherwise contiguous plain. The example in Mowforth and Munt (1998, p 118) of the construction of a highway through the Metropolitan National Park in Panama City, which has “the largest area of tropical rainforest within the boundaries of a city,” has an impact not just with the division of the park area but on the way people will travel. It has been argued in various transport research that the construction of highways induce travel demand. As with changes in infrastructure, improvement in a destination’s transport system influences tourism development as evidenced by the growth along popular corridors (Prideaux, 2004).

There is also the reality that present transport networks are products of transport policies formulated by government organisations more concerned with economic and social
factors rather than an “explicit concern for tourism” (Page, 1994, p 49). This is exemplified in the Northeastern Brazil Integration Development Program (Polonoroeste program) in the 1980s where the federal government of Brazil with the aid of the World Bank constructed federal highway BR 364 through the Amazon (World Bank, 2007). The aim was to integrate the inland cities of Cuiaba, Mato Grosso and Porto Velho, Rondônia in the west with the rest of the country. However, the consequences of the road building brought to light various environmental issues ranging from deforestation, spread of diseases to the indigenous population, conversion of land uses due to economic speculation, etc. (World Bank, 2007, Greenbaum, 1984, Skillings, 1984). Although some of the issues may not be critical to conservation sites developed after the construction of access roads, impacts of the existing road on the protected environment remain significant.

With the popularity of natural areas for tourism and the location of these destinations in areas far from city centres, transport impacts are indeed significant. Increase in traffic means a higher incidence of road accidents, noise and air pollution. Indirect impacts of transport, on the other hand, involve changes in the quality of life of the locals who have to put up with the increased visitation in the area and the subsequent increase in pressure on their resources. The implications of the current travel behaviour to these natural areas emphasise the need for a more sustainable relationship to be in place.

**SUSTAINABLE DEVELOPMENT**

The 1987 ‘Brundtland Report’ defined sustainable development as “development that meets the needs of the present without compromising the ability of future generations to meet their own needs” (World Commission on Environment and Development, 1987, p 87). The 1992 Rio Earth Summit produced the Agenda 21 document, which laid the groundwork for sustainable development and was adopted by 178 governments, as well as the United Nations Framework Convention on Climate Change (UNFCCC) and the Convention on Biological Diversity (CBD). In the 1997 Conference of the Parties (COP) to the UNFCCC in Japan, 166 countries signified their commitment to the Kyoto Protocol which required parties included in Annex I (highly industrialized countries) to limit their greenhouse gas emissions by an average of at least five percent below 1990 levels within the period 2008-2012 (UNFCCC, 1997).
The UNFCCC and the CBD provide complementary frameworks that countries can work with in searching for answers on issues regarding sustainability, reduction of emissions and the protection of biodiversity. In combating deforestation, ecotourism is cited as one of the activities that governments can tap with the help of the private sector and funding institutions (WTTC, 1996). Ecotourism is seen to increase the value of the forests and ensures the supply of genetic material. The significance and identification of sinkholes to offset carbon emissions encourage the retention of forests and afforestation projects. The majority of these projects are located in developing countries and/or tropical areas that have retained large areas of rainforests. International organisations such as the World Wildlife Fund (WWF), Nature Conservancy, World Bank and International Monetary Fund (IMF) have offered to pay part of the debts of developing countries rich in biodiversity to safeguard these from further destruction. This debt-for-nature scheme has been enforced in Poland, the Philippines, Bolivia and Costa Rica (Macdonald, 2000). In most areas, a lot (to almost 80%) have been lost to logging and harvesting-for-profit over the years leading to depletion of resources and sometimes extinction of species. Overall conservation of the natural resources has been encouraged which allowed the countries to review their consumption.

The World Trade & Tourism Council together with the United Nations World Tourism Organisation and the Earth Council formulated the Agenda 21 sectoral programme for the travel and tourism industry in 1995. The document looks into the relationship of the different governments, industries, and non-government organisations (NGOs). The WTTC (1996) guidelines not only advocate sustainability in practices, management, and operations; but also rely on the changed behaviour of tourists to achieve sustainability.

Sustainable development remains a challenge even twenty years after the WCED report defined it. Within the concept of sustainable development, two key concepts are contained: the first emphasises alleviating global poverty; and the second concept tackles the “idea of the limitations imposed by the state of technology and social organization on the environment’s ability to meet present and future needs” (WCED, 1987, p 87).

Working with the premise that the Earth’s resources are finite, it is therefore critical to make rational choices regarding their utility. Two forms of the scarcity theory are postulated by economics: ‘Malthusian’ scarcity operates on the principle that limits may be exceeded but at a certain cost; while for ‘Ricardian’ scarcity “absolute limits are not breached but the cost of harvesting, extracting and using a resource rises” (Pearce 1993,
The debate regarding the valuing of finite natural assets has spurred questions regarding the appropriate level of sustainability.

Two levels of sustainable development have emerged based on the perception of finite resources which Neumayer (1999) calls weak sustainability and strong sustainability.

**Weak Sustainability**

Sustainability which allows for the substitution of natural resources with manufactured products is considered weak. This perspective does not put a great deal of value on the resources and treats each component as disposable and replaceable.

John Hartwick and Robert Solow are two neo-classical economists whose works are acknowledged as the bases for the weak sustainability argument (Neumayer, 1999). Both allow market forces to determine the value of the limited resources and regard the production of substitutes as important in the process. For Hartwick (1989), either the limited quantities encourage conservation due to its high prices or the production of the substitute increases the price of the resource. The logic of the law on supply and demand illustrates the point; this ensures minimum utilization of the scarce resource, encourages substitution, and creates a market for the substitute product. Solow (1974) allows competition to set the value of the resource whereby when demand equals supply, two things can happen: the price can be so high that demand is suspended or so low that it would not be worth holding onto. Similar to Hartwick, Solow (1974) acknowledges that technological progress allows for the replacement of finite resources in production with manufactured ones.

**Strong Sustainability**

Where weak sustainability sees the depletion of natural resources as a process that can be controlled naturally by the increase in prices and the role of technology to produce substitutes, strong sustainability supporters, on the other hand, argue that resources should not be depleted. Substitution of resources is not the answer. An extinct species remains extinct and its utility may forever be unrealised.

Most ecologists and ecological economists advocate the strong sustainability framework. The manner of preserving the stock is more important than just balancing the costs of the loss. Ruckleshaus (1990, p 128) points out the fact that humanity’s existence is dependent on our ability to “abstain from destroying the natural systems that regenerate
this world.” Pearce et al (1990) present three realities as potential arguments for the strong sustainability paradigm: the first one involves the reality that once natural assets are used up; these cannot be created, destroyed and created again unlike manufactured capital. Second, the reality that ecological systems are complex and unknowingly destroying some function in the system is dangerous. The third reality involves scale where thresholds and discontinuities are results of damage due to exceeded thresholds.

The debate between weak and strong sustainability revolves on the proper utilisation of resources. The weak sustainability argument appears to be a justification for the sustainable exploitation of resources. Weak sustainability considers control pricing and the encouragement of substitutes as natural controls for the depletion of natural resources. The strong sustainability argument, on the other hand, searches for alternatives and strategies to prevent further damage. The non-substitutability of resources is the core concept of the argument. It acknowledges the importance of each component in the system and stresses the conservation of resources.

SUSTAINABILITY AND TOURISM

The Agenda 21 sectoral programme for the travel and tourism industry highlighted the relationship between its operations and the management of the environment. Strategies for making tourism sustainable were first identified in the Globe ’90 conference in British Columbia, Canada. The creation of the “Principles for Sustainable Tourism” acknowledges the fact that previous practices, particularly those involving large numbers of people, have destroyed destinations with their lack of consideration of the environment. Archer et al (2005, p 79) point out that because tourism receipts rely on the attraction of “unique and fragile environments and societies,” making tourism operations sustainable would benefit the environment too.

The UNWTO (2006) acknowledges tourism as a strong economic sector and an industry reliant on the state of a destination’s environment. Improving the sustainability of tourism would entail economic and ecological trade-offs. For example, the increase in visitor numbers to the Monteverde Cloud Rainforest Reserve in Costa Rica is blamed for the disappearance of the golden toad, where numbers fell from 1,500 in 1987 to virtually zero within two years (Honey, 1999). Economics also led the Kenya Wildlife Reserve to re-evaluate their practices after their tourist projections showed a two percent drop in tourist days between 1990 and 1995 (Cater and Lowman, 1994). The institution of
reforms for the protection of the environment in the reserve is now estimated to bring in an eight percent increase in wildlife tourist days per annum and US$306 million over the five year period (Cater and Lowman, 1994).

The World Travel & Tourism Council (1996) identified three types of environmental policies which include (1) those that result in cost savings, (2) those that appeal to the consumer and make products more attractive, and (3) those that promote sustainability but have no commercial advantage. Governments and tourism operators are encouraged to focus their efforts on the latter types as these take time to implement. In addition, it follows that trade-offs between economics and ecology are being swayed in favour of ecology. The last two provisions indicate how the mindsets of consumers and destinations have changed through the years. The “driving forces of social change” are due to the tourists’ dissatisfaction with existing products, increased environmental awareness and cultural sensitivity, the realisation of the importance of the resources in destinations, and the changing attitudes of developers and tour operators (Prosser, 1994, p 31).

The fragmentation of enterprises within the tourism industry has led the United Nations Environmental Programme (2002) to encourage governments to take an active role in mitigating environmental, social, and economic problems associated with it. The World Travel & Tourism Council (1996) relies on governments, national tourism administrations and trade organisations to incorporate the necessary changes to make the system sustainable. It encourages the assessment of the capacity of existing regulatory, economic and voluntary framework as well as the implications of the organisation’s operations. It further recognises the importance of the role and participation of the local community, and the need for coordination between the different sectors. The planning for sustainable tourism developments, perceived as an integral part of the tourism development process, promotes the exchange of information, skills and technology between developed and developing countries (WTTC, 1996).

The continued growth of travel and tourism despite the setbacks it has faced in the last few years has delighted those in the industry, yet it has worried academics and environmental organisations due to the industry’s varying levels of sustainability. Given the various forms of tourism and their claims to sustainability, the challenge lies in correctly identifying those whose practices are truly sustainable.
Mowforth and Munt (1998) present sustainable tourism as an alternative to mass tourism, which involves the participation of large numbers of tourists usually in package tours (Vanhove, 1997). They acknowledge that tourists define the degree of ‘greenness’ of their vacation and the role that advertising and marketing play can be crucial to the integrity of the level of sustainability. Pigram and Wahab (1997) affirm the influence that marketing firms have on the promotion of these destinations. Sustainable tourism should not be seen as a result of marketing or a created term to ‘green-wash’ a destination. Sustainable tourism is the application of the strong sustainability concept in tourism, highlighting the importance of protecting the environment.

Role of Marketing

Given the international significance of tourism, the influence of the media in promoting ‘sustainable tourism’ can distort the perception of the public regarding tourism’s sustainability. Tourism operators work with different objectives from park rangers, environmental organisations, or even tourists, and which are reflected in their treatment of the tourist destination.

Travis (1985, p 98) acknowledges the fact that “[t]ourism is an internationally ‘traded’ commodity” and the various government tourism agencies create their own marketing mechanisms to promote the attractions in their area. Prosser (1992, p 40) identifies “[t]wo dimensions to the ethical debate about the tourism industry: first, the methods it uses to manipulate and stimulate demand; second, the strategies used to organize and make available the supply of holiday opportunities at the destination end.” The travel industry thinks and plans in terms of market segments using variables such as numbers, price, activity/experience, destination, age, socio-economic status, accommodation type, timing and length of stay (Prosser, 1992). All these variables equate to economic gain such that more visitors, higher rates, longer stays, and more development mean bigger profits.

The first dimension is reflective of Krippendorf’s (1987, p 20 as cited in Prosser 1992) sentiments that “‘Tourism is business, not charity’ ‘To hell with paradise!’ is how promoters of tourism talk….why a journey is undertaken is of no consequence to them – what matters is that it is undertaken.” These sentiments provide proof that promoters of tourism work with a weak level of sustainability. For them, the environment is just the setting, what counts in the end is the total number of tourists. The main objective of the
exercise is to sell holidays and images which may be misrepresentations of what is really there (Prosser, 1992). Even destinations that may have strict conservation regulations are not spared from these promotions and are fair game. The sentiment that one has to take that trip is what drives the tourism industry.

The process of making the trip starts with booking the accommodation and purchasing the necessary tickets to the destination, and ends when the actual trip has been made. There is not enough attention given to how the trip is undertaken; only that one reaches the destination. Sometimes the ‘getting there’ part of the travel involving mode choice can make a difference to the whole experience. Høyer (2000, p 147) points out that from empirical studies, 40-60% of what he calls “environmental loads” are from transport used by tourists from their homes to the destinations. This is one gap in tourism and transport research that has been acknowledged by Page (1994, p 8), stating further that the modes of transport chosen by tourists “form an integral part of their journeys and experience.” The modes provided and are available to tourists impact the travel’s level of sustainability. Black (2004, p 62) acknowledges that most of the transport modes available are unsustainable due to utilisation of petroleum, and “pollute local and global environments and result in fatalities and injuries…[furthermore] none of the transport modes recover fees for the externalities they generate.”

The second dimension identified by Prosser (1992) in the ethical debate involves the supply side of the tourism industry. Too much exposure and good marketing can take its toll on a destination. The pressure to accommodate the influx of tourists can lead to environmental sacrifices in exchange for profit. A case in point is the construction of hotels along the beachfront in Tortuguero, Costa Rica has led to the destruction of turtle nesting areas (Honey, 1999). It has been argued by Barbier et al (1994) that habitat loss can have a huge impact on biodiversity and the interdependence of the species to keep an ecosystem functioning and resilient. The moderate stand that the government took where the environment is concerned in the above example shows that it operates with a weak level of sustainability.

The avoidable loss in the above example led Ceballos-Lascurain (2001) to promote a code of ethics based on ‘profit with principles’ in his report to UNEP. His concept advocates the analysis of profits on a long term basis rather than short, quick cash back type of investment which can lead to the exploitation of the resource and culture. It also encourages the government to support investments of the local community especially in
tourism ventures to natural areas. It is acknowledged that the creation of a long term plan does not necessarily guarantee the protection of the resources nor does it mean that strategies cannot be created separate from these plans. The reality remains that tourism depends on tourist receipts and the marketing of natural areas is still an issue for conservationists and protected area managers (Ceballos-Lascurain, 2001).

Because economic issues dog resource management styles, it is all the more important for the strong sustainability concept to be considered in the process of any tourism development. Inskeep (1987) echoes this sentiment and advocates that an evaluation of alternative levels and types of growth, which are economically viable yet avoids environmental degradation, be done for tourism developments.

**Particular challenges for developing countries**

The increased demand in natural areas with a high level of environmental quality has redirected the attention of tourism to the developing countries. With most of the biodiversity hot spots\(^3\) defined by Conservation International located in developing countries, the planning and development strategies as well as the implementation of environmental plans is critical. Developing countries are the areas where issues regarding environmental management, global economic politics as well as the impacts of human activities on the environment are significant (Miller, 1995).

With the travel and tourism industry expected to contribute 3.6% to the world’s GDP in 2006 and provide employment for 1 in every 11.5 jobs or 8.7% of total employment (WTTC, 2006), the bankability of tourism and the potential of its natural environment are not lost on developing countries (Mowforth and Munt, 1998).

Travis (1985) divides developing countries into those that see tourism as an economic solution and those that are at what he calls an ‘intermediate stage’ where an evaluation of the previous system has been done to improve and protect widely visited areas. Developed countries, on the other hand, are focused more on domestic tourism and resident recreation (Travis, 1985). The events of September 11 led to an increase in domestic tourism and its impacts on the existing attractions meant either allowing for more development or opening new tourism destinations (Griffin, 2002). The former

\(^3\) Earth’s biologically rich areas with high numbers of species found nowhere else that face extreme threats and have lost at least 70% of their original vegetation. Conservation International 2005. http://www.conservation.org accessed 23 July 2005.
may be a popular destination where almost everyone has been to and therefore needs a revamp to be able to compete. The other option means extending the area covered and the “intensification in low-key destinations” which is controversial in itself due to the expected increase in visitation in this type of destination (Griffin, 2002, p 27).

As in any setting, tourism challenges the values set regarding biodiversity and habitat protection. In this light, developed countries have an advantage over developing ones because they can afford to be pro-active given their database and the use of the latest technology in forecasting the impacts at various levels of development (Griffin, 2002). Another advantage for developed countries that Griffin (2002) identified is that the legislative framework for control such as environmental planning and effective enforcement systems are in place with only politics making a difference.

Developing countries on the other hand, operate on a reactive rather than the proactive system that developed countries have. Griffin (2002) acknowledges that less developed countries are more vulnerable to increased visitation due to the popularity of environmental and cultural features that those from developed countries come to see. Based on the lack of systems in place and the economic returns that tourism promises, Griffin (2002) believes developing a sustainable system is a challenge for developing countries.

**Weak Sustainability applied to Tourism**

Weak sustainability in tourism reflects a system of management that revolves more on the comfort of the tourist than the environment. This is manifested in the management of resources, visitors, and travel patterns whose impacts on the environment are taken lightly. Operators offering this level of sustainability are those whose businesses are based on the natural environment and it is convenient for them to cash in on the popularity of travel to natural areas.

The attitude towards limited resources under the weak sustainability argument allows for substitution of the resources. Because these are not valued highly, the construction of tourist infrastructure is accommodated within the destination. Protected areas are also opened up to accommodate and encourage increased visitation.

The degradation and damage to the natural setting of remote areas has most often been attributed to the number of visitors and the activities they engage in. Although increased
visitation can take its toll on the resources, the modes utilised to get to the destination can have even greater impacts. Ayala (1996) contends that sometimes volume and scale do not necessarily determine environmental and socio-cultural impact because visitor volume is not the same as visitor impact. An extreme example would be a group of five chartering a flight to an island jungle to engage in hunting, and whose greenhouse gas emissions may be higher than a busload of tourists going to a national park. Rosenthal (2007) points out that at least bus tours stay on the paved road whereas those who drive their jeeps venture into untamed areas and destroy flora and fauna.

It can be concluded that the manner of travel, how tourists travel to, within, and from destinations; and the modes utilised have an impact on the level of sustainability. It follows that utilising modes which produce lesser emissions increases the sustainability index of a destination.

**Strong Sustainability applied to Tourism**

Weakly sustainable tourism deals more with setting the experience of the tourist, sometimes even compromising the environment in the process. Strongly sustainable tourism upholds that the conservation of the environment is non-negotiable and the management of the resource is a priority.

Hunter (1997, p 864) sees sustainable development as an “adaptive paradigm, capable of addressing widely different situations, and articulating different goals in terms of the utilization of natural resources.” He advocates the strong sustainability argument wherein a substitute for a more productive and environmentally friendly option is favoured over one that would further exploit the resource. Among the approaches that Hunter (1997) presents regarding sustainable tourism, ‘environment-led tourism’ and ‘neotenous tourism’ support strong sustainability. In both cases, the concern for the quality of the environment is foremost rather than development and/or tourism receipts. The second approach recognises the need to close some areas to tourism for ecological reasons.

Holden (2000) asserts that tourism environments should be seen to possess social, cultural, economic and political dimensions, aside from the physical one. The attractiveness of a particular type of environment to tourism is a “function of value judgments and fashions that exist in society” just as the Romantic Movement stresses the emotions of “joy, freedom, and beauty gained by visiting ‘untamed’ landscapes” (Holden,
2000, p 26). Given Holden’s (2000) perspective on the transience of a destination’s popularity and Butler’s (1980 cited in Hvenegaard 1994, Prosser 1994) model of the tourism cycle which sees the decline or a rejuvenation of a destination as the last stage of a visitation cycle, these further point out the importance of advocating strong sustainability concepts in tourism destination management. Choosing to safeguard the environment on which tourism is based is not a losing investment as it guarantees tourists a good experience and may improve visitation.

Burns (1989) echoes this point by saying that the management of resources on which tourist activities and attraction are based is important. Inskeep (1987, p 132) agrees that it is the responsibility of the government and in the interest of developers to make sure that “environmentally appropriate tourism planning and development are accomplished.” He adds that environmentally oriented policies should include (a) using tourism as a means to conserve areas which have good environmental quality, (b) employing marketing techniques aimed at attracting environmentally conscious tourists, and (c) to control growth and phase the development so that monitoring may be done as well as prepare the local community for the impending changes.

The majority of researchers advocate the strong sustainability argument. Urging governments to have strong conservation objectives, Cater and Lowman (1994) encourage that strong environmentally sound practices should be employed to avoid losses and degradation of the resource base. Farrell and Runyan (1991) agree that the state of natural resources, the ecosystem, and regional ecology that provide the ‘backdrop’ to destinations have an impact on the success of the site. They encourage a planning and management approach that enhances and maintains the resource quality since demand and use will take its toll on the resource base.

Wilson (1990) presents a bleak picture whereby, as evidenced through time, it has been due to increased human activity that the rate of extinction has increased. Though he supports that species have been known to recover, in areas such as “islands, lakes and other isolated and strongly circumscribed environments” the destruction of a habitat can prove fatal to entire species (Wilson, 1990, p 53). Going back to the strong sustainability argument on the preservation of biodiversity, the loss of species means undiscovered potential for humanity. Wilson (1990, p 57) argues that extinction “diminishes humanity” and speaking as an ecologist, the loss of species not fully accounted for puts a void in the world of living things. He doubts if nature can replace the loss of the specie
given the complexity of genetics and evolution. Taking the cue from strong sustainability, where biodiversity is rich, minimal human activity should be allowed.

The need to always take into consideration the impact on the environment of any tourist destination will ensure that the resource remains intact. This study advocates strong sustainability in tourism and recognise the role that governments and organisations play in acknowledging the value of resources through the policies and regulations that these promote.

DEFINING ECOTOURISM

Ecotourism is more than just travel to natural areas. It involves the consideration of transport modes and their impacts on the global environment and the biodiversity of the destination. However, ecotourism researchers have not only neglected to consider the manner travel is undertaken, they do not even agree on aspects that need to be considered in defining the term. Their concerns cluster around the activities offered, the management style (Hunter, 2002), tourist types (Weaver and Lawton, 2002), or even the value given to the resource (Cater and Lowman, 1994). The different takes on ecotourism may be due to the fact that these are tourism-based research and are only concerned with on-site impacts. Because of the preoccupation with a destination’s environmental integrity, these fail to take into consideration that travel impacts to and from the destination may be more substantial than those within.

The tabulation by Fennell (2003) of the various definitions of ecotourism since the introduction of the term highlights the contradictions that occur regarding issues of conservation, sustainability, and it being nature-based. The majority, who thought little of the sustainability aspect of ecotourism, apparently do not consider the importance of sensitive and fragile areas falling under this category. This shows that majority of ecotourism research advocates the weak sustainability concept, which does not bode well for the conservation of biodiversity-rich areas. Given the environmental significance of ecotourism areas, the management system has to be based on strong sustainability tenets to ensure the protection of resources.

While Mowforth and Munt (1998) point out that sustainability is not the exclusive characteristic of the new forms of tourism which have recently been introduced, the bottom line for all these variations is their awareness of the industry’s impact on the
environment. The World Tourism Organisation Congress on Tourism and the Environment in 1992 defined ecotourism as travel that promotes conservation (Hvenegaard, 1994). This study argues that given that the environment is the common denominator, it is imperative that a strong sustainability approach is taken in defining ecotourism. It would be impossible for conservation to occur if the practices were unsustainable from the outset.

The potential of ecotourism as the vehicle for the conservation of biodiversity and the protection of sensitive and fragile areas has remained the rallying call of governments needing to cash in on resources they could not exploit. However, even this seemingly win-win situation is vulnerable to the provision and state of transport services. Mellgren (2007) covered the recent Global Ecotourism Conference in Oslo, Norway and reports that “ecotourism may damage [the] environment.” This is attributed by the experts to the amount of greenhouse gas emissions the modes of travel utilised to get to these remote and pristine areas (Mellgren, 2007). In the case of forest reserves, the increased greenhouse gas emissions have already led to palpable changes in climate, which in turn threaten the ecological balance of these areas.

Sustainability in tourism has established the importance of conserving the environment of destination areas. Strong sustainability does not allow for the degradation of the resource base. With the high level of biodiversity found in ecotourism destinations, this study advocates that ecotourism is strong sustainability applied in tourism. Ecotourism is, therefore, sustainable travel to areas rich in biodiversity which utilises modes with minimal impacts to the environment.

**TRANSPORT AND SUSTAINABLE TOURISM**

Tourism’s sustainability is dependent on the tourists’ mobility. How tourists travel to, within, and from tourist destinations are most often undertaken using modes that rely too much on fossil fuels and whose greenhouse gas emissions are significant. Road and air transport modes are responsible for almost 90% of international tourist arrivals (see Figure 2), modes whose impacts to tourism’s sustainability are major concerns.

Although international air travel is acknowledged as one of the most unsustainable modes due to the amount of greenhouse gas emissions it produces (see Table 3), it is outside the scope of this study. The main reason is that international air travel becomes a
proxy for the distance between the countries of origin and destination of tourists. The 
bulk of international tourists come from North America, Europe and Japan. In Cairns, 
Australia, for example, 66% of international tourists arriving in 2006 come from Japan, 
followed by 6% from the United Kingdom (Tourism Queensland, 2007). Furthermore, 
the impact of air travel is a global problem which requires global solutions.

The modes utilised by tourists to get to their final destinations within the country of 
arrival are more relevant to this study, as these choices are more susceptible to the 
influence of national and local policy-makers. This study maintains that if the mode split 
favours air travel, then the tourism operation is not sustainable. Short-haul flights expend 
more energy for the plane to reach the right altitude compared to the length of the flight.

The levels of emissions of the various modes (see Table 3) already provide a preliminary 
picture of the impacts to sustainability of road-based transport such as the car, bus and 
rail. These are discussed in turn along with the non-motorised forms of transport such 
as cycling and walking.

The convenience of the car remains a challenge to mobility’s sustainability not just where 
tourism is concerned but even everyday travel. The main reason why the car is the mode 
of choice is because public transport services, most often than not, cannot compete with 
its level of service. Numerous researchers (see Whitelegg, 1997, Vuchic, 1999, Newman 
and Kenworthy, 1999, Mees, 2000, Banister, 2005) tackle the various issues that affect the 
level of service of public transport. These issues include frequency of services, 
punctuality, safety, cost, inter-modal integration, density, number of transfers etc. The 
extpected growth in car ownership (see Table 4) means an increase in traffic and 
emissions; hence, the censure of destinations dependent on personal mobility. Tourism 
researchers tackling visitor management issues (e.g. Nelson and Wall, 1986, Eaton and 
avocate strengthening public transport services to discourage car use.

Bus and rail are popular public transport alternatives which are seen to improve a 
network’s sustainability based on the number of passengers these can carry. Although 
these modes also rely on petroleum-based products and give off emissions, the amount 
of emissions when distributed amongst the number of passengers is considerably less 
compared to that of the car. But this assumption only holds true when these modes 
operate at full occupancy. It follows that low patronage of these modes increases their
unsustainability due to the increase in emissions per passenger-km (see Table 5 which compares the levels of occupancy and emissions between cars and buses in urban areas).

Table 5  Emissions levels for cars and buses in urban areas

<table>
<thead>
<tr>
<th>Vehicle Type (Occupancy)</th>
<th>NOx</th>
<th>PM10</th>
<th>CO</th>
<th>VOC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Car (1 person)</td>
<td>0.31</td>
<td>---</td>
<td>3.37</td>
<td>0.23</td>
</tr>
<tr>
<td>Bus (empty)</td>
<td>14.46</td>
<td>0.74</td>
<td>18.90</td>
<td>0.57</td>
</tr>
<tr>
<td>Exhaust emissions (g/km)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Car (4 persons)</td>
<td>0.08</td>
<td>---</td>
<td>0.84</td>
<td>0.06</td>
</tr>
<tr>
<td>Bus (40 passengers)</td>
<td>0.36</td>
<td>0.02</td>
<td>0.47</td>
<td>0.01</td>
</tr>
<tr>
<td>Exhaust emissions (g/passenger-km)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Car (1.67 persons)</td>
<td>0.19</td>
<td>---</td>
<td>2.02</td>
<td>0.14</td>
</tr>
<tr>
<td>Bus (12 passengers)</td>
<td>1.21</td>
<td>0.06</td>
<td>1.58</td>
<td>0.05</td>
</tr>
</tbody>
</table>

Notes: Car is a post 1/1/93 petrol vehicle with a catalytic converter. Bus is a post 1/10/94 diesel vehicle. The occupancy levels are typical of the current levels of use. Sources: Banister, 1997 and DOE/DOT, 1996 as cited in Banister, 2002.

The projected increase in motorisation and its consequences to sustainability has led to the renewed promotion of non-motorised forms of transport such as cycling and walking. These non-polluting forms are encouraged inside protected areas but require the construction of bikeways and trails to contain traffic and to keep the rest of the area intact.

Ecotourism needs more environmentally friendly modes made available to the public. The few studies (e.g. Nelson and Wall, 1986, Croall, 1995, Coleman, 1997, Mowforth and Munt, 1998, Hoyer, 2000, Capineri and Spinelli, 2002, Black, 2004, Orbasli and Shaw, 2004) that tackle the relationship between transport and tourism also point out the gaps in policies and encourage the participation of governments. Page (1994) recommends the integration of tourist transport policies into the transport policy of the region itself. This enables the local government to take into consideration tourism’s impact in the region. The possibility of creating long-term plans safeguards the resources from opportunists aspiring for a quick cash back (Ceballos-Lascurain, 2001) and gives the industry time to come up with strategies to realise their objectives (Page, 1994).

The lack of research in the area of tourism transport makes it difficult to find a method that would help identify the optimum relationship between transport and tourism. Although Vuchic (1999) discusses the importance of providing a good transport system in cities, the concepts he puts forward which contribute to a liveable city are relevant in assessing the efficiency of any transport network. Vuchic (1999) points out the importance of providing services and achieving a balance between transit incentives and
auto disincentives. Transit incentives are measures that improve the performance of public transport against the car. This may entail increase in the frequency of services, reliability, comfort, lower fares and the construction of a higher quality transit mode (Vuchic, 1999). Auto disincentives may be an increase in monetary costs or decrease in the convenience of cars by increasing gasoline taxes, parking charges and limiting on street and parking (Vuchic, 1999). This strategy encourages mode shift from car to public transport, hence taken into the context of the study, an ecotourism destination with a balanced and integrated transport system increases its sustainability.

Given the importance of transport in tourism and the very few studies which tackle the subject matter has led to the question of identifying what entails ‘best practice’. How should the transport network be interrelated with an ecotourism destination to promote sustainability? How does the definition of ecotourism by governments translate into specific policies and reflect in their practices? And given the importance of mobility and accessibility, how important is a destination’s public transport network in the process?

With the aim of the study to investigate the sustainability of the relationship of an ecotourism destination and its transport network, it is important to identify the structures that contribute to its sustainability. Are there ecotourism destinations that exhibit commendable practices? Given the challenges facing developing countries, would they employ different strategies than developed countries? And who are involved in the planning process, would non-government organisations and academics be involved along with the government agencies?

The challenge of sustainability in an industry that relies much on transport is significant considering the various environmental issues that it has to contend with. Transport is indeed the ‘Catch-22’ of ecotourism (Huntley as quoted in Mellgren, 2007).

**CONCLUSION**

Tourism’s growth is mainly due to transport. The increased travel has led to environmental impacts which threaten the very attractions that tourism promotes. Yet given the impact of transport in tourism, there are few studies tackling its sustainability. Moreover, these studies fail to consider the entire travel process of going to, travelling within and departing from destinations. The impacts of transport are particularly significant in ecotourism destinations which are biodiversity-rich areas and are extremely
vulnerable to visitation. This conservation aspect of ecotourism is evocative of the strong sustainability concept where degradation of the resource base is not allowed. Studies acknowledge the importance of integrating tourism with transport policies so that travel to tourist destinations do not utilise unsustainable modes which further contribute to greenhouse gas emissions. Although, evidence shows that popular heritage sites, national parks and even the countryside have fallen into disrepair due to the onslaught of tourists and vehicles, there are destinations where commendable practices are in place. These particular destinations are important in identifying the structures that improve the sustainability of a transport network that serves an ecotourism destination.
3. **Mapping the Network: The Methodology**

The previous chapter established that transport is a component of ecotourism whose impact to its sustainability has not been explored at length. This study seeks to contribute to the literature by utilising the methods discussed in this chapter to answer the research questions.

**The Ecotourism Destination and the Transport Network: A Question of Sustainability**

The popularity of ecotourism has led to questions of its sustainability and the protection of the environment that it promotes. The entire travel process of visitors to ecotourism destinations has to be considered, an area with limited research and which this study seeks to augment. On this premise, the principal research objective is to identify policies and structures which contribute to improve the sustainability of a transport network that serves an ecotourism destination. The focus is on the sustainability of the modes available to the public and the level of public transport services, which are deemed important indicators. Due to the limited literature tackling sustainability of transport services in the rural areas, this study applies the urban concept of transit incentives and automobile disincentives of Vuchic (1999) to explain tourist travel behaviour.

Although it is a challenge for developing countries to develop a sustainable system, both developing and developed countries need to provide sustainable transport options. This study is open to the probability that these strategies may even be similar. Differences in management are suggested to stem from the way governments define ecotourism, which are reflected in their policies. The integration of tourism in transport policies is perceived to be beneficial to both the destination and the public. Moreover, the participation of non-government groups in decision making is believed to make a difference in the quality of policies regarding sustainability. These correlations will be investigated through analysis of case studies of destinations with ‘best practice’. Finding examples which demonstrate the characteristics of an optimum relationship will help in identifying the policies and structures which influence sustainability.
The following hypotheses arising from the literature reviewed in the previous chapter will be pursued in this study:

- The travel behaviour of tourists to and from ecotourism destinations is at least as important as the impacts of on-site travel, but is generally not taken into account in planning.

- How governments define and understand ecotourism determine how resources are valued: for example, governments with a ‘weak’ understanding of sustainability will tend to ignore the environmental consequences of tourism-related transport, or only consider the impacts of transport within the ecotourism destination; governments with ‘strong’ understanding of sustainability will also address the environmental consequences of travel to and from the destination.

- If tourism is integrated with transport policies, then the ecotourism destinations within a region will be well-served by transport services. Destinations with good public transport services are easier to reach and promote more sustainable transport alternatives to the car.

- Both developed and developing countries are capable of providing sustainable transport options.

- The involvement of groups such as non-government organisations and people’s initiatives in policy-making brings attention to and insists changes to unsustainable practices involving transport in/and tourism.

- The sustainability of a network can be determined from the balance between transport incentives and disincentives. Because the public favours the mode that provides a higher level of service, this strategy enables shifts to more sustainable modes.

**APPROACH ADOPTED**

The case study method facilitates the investigation of the sustainability of the relationship of a transport network and the ecotourism destination it serves. A case study allows for a phenomenon to be examined (Yin, 2003). The aim of knowing how sustainability can be improved is best explored by looking at commendable examples which possess the characteristics deduced from the literature. Examples which display the optimum tourism-transport relationship allow for the validation of theories with practice. The
structures that are important are those that work both in theory and practice. This is also the reason why one of the analytical approaches is evidence-based policy.

Because of the limited research specific to the topic, the case studies tackled in tourism-transport research do not exhibit structures which consider the whole network. The majority of researchers have focused on the destination area and do not account for the sustainability of the entire travel. The few studies (e.g. Eaton and Holding, 1996; Coleman, 1997; Høyer, 2000) which looked into the whole travel process are mainly critical of the prevailing practices. Their evaluation of how public transport failed to encourage mode shift (Eaton and Holding, 1996; Coleman, 1997) and how mobility should be reduced in the richer nations (Høyer, 2000) have helped in shaping the criteria for case study areas. I acknowledge that looking at examples where problems abound is easier than identifying cases which exhibit commendable practices.

Investigating examples from a developed and developing country allow for the comparison of effective strategies employed by each. It is important to know the background for the policies which wrought the changes and improved travel behaviour. Finding similar structures in both cases validate that particular structure statistically as essential to the sustainability of the relationship. Because the case studies show evidence of best practice, it is suggestive that the policies that govern its practices influence its level of sustainability. The acknowledgement of the various stakeholders of the efficiency of the network and the provision of services further validates the importance of these policies and structures in improving sustainability.

The exploratory nature of this study allows for the generalisations of workable strategies and policies from the case studies. Aside from the intention of contributing to the literature, the lessons learned from these examples can aid local governments of popular tourist destinations in improving the sustainability of their network. This emphasises the importance of selecting commendable examples rather than analysing destinations that are geographically convenient.

**SELECTION OF CASE STUDY AREAS**

Ecotourism destinations can be either terrestrial or aquatic. It is important to identify the type of ecotourism destination considered in the study because travel behaviour differs in each setting. This study acknowledges that both types are important and both suffer
from unsustainable visitation practices. But due to the fact that the majority of protected areas are terrestrial in nature and where the impacts of tourist travel behaviour are observable, this type is easier to study. Opting for national parks stems from the literature where researchers (Wilson, 1990, Mowforth and Munt, 1998, Macdonald, 2000) have placed a great deal of importance on the protection of forests. The issue of climate change has led to the exploration of carbon sequestration and storage management through the expansion of carbon sinks by afforestation, reforestation and agro-forestry (Macdonald, 2000). Forests absorb CO\textsubscript{2} yet are vulnerable to global warming. Moreover, the unsustainability of transport modes to these areas undermines their protection.

The following tourism-transport framework is utilised in choosing case study areas. It is important that these areas possess the characteristics and qualities identified in the following sub-section.

**The Tourism-Transport Framework**

The popularity of ecotourism which involves travel to biodiversity-rich areas, means that the characteristics of the transport network that serves it is crucial to its sustainability. The study argues that it is important for ecotourism destinations to be well-linked to the rest of the region. A transport network with the following characteristics is considered to have good linkage as gathered from the discussions in Chapter 2:

1. There is good public transport service to the ecotourism destination. Given the peripheral location of these destinations and the issues involved in travel, it is important that public transport services the destination. A network with a strong public transport patronage is seen to operate at a high sustainability level.

2. The configuration and infrastructure of the transport network should have very little impact on the integrity of the ecotourism destination. The level of development within a biodiversity-rich area is critical to the management of the resources. The accommodation of infrastructure lessens the amount of natural areas which increases impacts to the resource base and compromises the strong sustainability concept with which ecotourism operates.

3. Destinations where tourism has been integrated into the transport policies of the region would make good examples. The inclusion of tourism in transport
policies ensures that the management and growth of the tourism sector can be handled by the transport network.

The study has argued that the sustainability of ecotourism is dependent on its transport network and the modes available to the public. In response, the management of an ecotourism destination must be as proactive where transport is concerned:

1. The ecotourism destination employs a visitor management scheme that is favourable to the ecology rather than economic gain. This remains a challenge to developing countries where ecotourism is seen as both an economic and conservation strategy. With majority of biodiversity-rich areas still intact in developing countries, destinations where the management has ensured the protection of resources are commendable examples.

2. There are car disincentives in place to discourage the use of private vehicles to the ecotourism destination. These disincentives may be in the form of limited parking areas or the collection of parking fees. Different rates may be imposed dependent on the number of passengers of vehicles. The aim is two-fold: one, to discourage car-driving visitors to ecotourism destinations which are serviced by public transport; and second, to increase public transport patronage so that the collective impact (in the form of greenhouse gas emissions) to the environment is lower.

3. Education of the public is important. Visitors are made aware of options and mode choices open to them. The advocacy of promoting environmentally friendly modes and public transport encourages sustainable travel behaviour. The role of organisations (non-government organisations, people’s initiatives, community groups, etc.) cannot be downplayed in this setting. Their active support and promotion are instrumental to the success of changing the travel behaviour patterns of the public.

Destinations which exhibit commendable practices are critical in analysing the strategies that helped improve the level of sustainability. The limited number of case studies from tourism research which actually fall under the ecotourism definition of this study is a challenge. It means that this study has to generate examples of destinations where commendable practices are in force.
In the selection of case studies, several areas were considered based on the literature on ecotourism. These areas varied from mountain resorts, island communities, nature reserves, national parks, wildlife sanctuaries, biosphere reserves, etc. (see Appendix A Destination Areas by Type for the full list). Moreover, because these were collated from tourism sources, their criteria for good practices were destination-based – meaning, the research only considered the transport system at the destination, utilising environmentally friendly modes such as hiking, canoeing, and horseback riding. These destination-oriented studies make it difficult to consider other types of destinations due to the fact that information regarding how tourists get to and leave these places is seldom provided. In this manner, it is easy to assume that rental cars were utilised for inland destinations; while for island communities, chartered flights or ferryboats may have been the modes. This logically eliminates island communities from the list due to the sustainability of the mode choices available (see Appendix B Ecotourism Destinations Shortlist).

The non-consideration of convenient destinations such the Philippines as my home country, or Australia as my country of residence is mainly due to the fact that both do not have commendable practices which could enrich the tourist-transport sustainability debate. These are discussed in turn.

Eliminating the Philippines as case study

Studying ecotourism destinations in the Philippines would be very similar to looking at Costa Rica (touted as the poster country for ecotourism) – the importance of biodiversity conservation is acknowledged and tourism is strong; yet, the transport aspect is dropped from the sustainability equation.

The archipelagic make-up of the Philippines of more than 7,000 islands has produced a highly diverse flora and fauna that it is considered as “one of the world’s most important biodiversity hotspots” (Hicks, 2002, p 12). Several programs were launched to save the resources from further damage and degradation. A debt-for-nature swap was done by placing several important protected areas in the care of World Wide Fund for Nature (WWF) in exchange for the cancellation of some of the country’s debts (Hicks 2002). The World Bank is funding for the protection of ten sites, while the European Union (EU) has eight sites under its National Integrated Protected Areas Program (NIPAP).

The Tourism Master Plan of the Republic of the Philippines was prepared in 1991 with
the help of the World Tourism Organization (WTO) and United Nations Development Program (UNDP). Memorandum Circular No. 98-02 (MO 98-02) issued by the Department of Tourism and the Department of Environment and Natural Resources in June 1998 created the “Guidelines for Ecotourism in the Philippines.” Although these documents highlight planning for environmentally critical areas, transport is never given the attention it deserves. Even the presentation of operators with good practices in the 4th Ecotourism Congress which I was fortunate to attend in November 2005, transport was never mentioned. As with the majority of ecotourism research, discussions are limited to the management of the destination. This oversight may be due to the strong central government (even with the decentralisation in 1991) and its very bureaucratic top-down approach in planning. With various agencies handling transport issues, not much has been done. The weak inter-agency and inter-government links further compound the issue. I personally believe that the transport network needs an overhaul to be sustainable. Not only are the modes unsustainable, the transport networks serving tourist destinations far from prominent city centres are illegible.

Eliminating Australia as case study
The main problem with Australian sites under consideration (see Appendix A) are the modes going to and back from these destinations. There are no strategies or policies in place that take into consideration the environmental consequences of the modes utilised. Statistics and reports from Tourism Research Australia suggest that these modes can either be by air (cheap domestic airfares) or by private vehicle. Hence, the objective of learning from an example where the relationship between a destination and transport network is sustainable is not possible with an Australian example.

Australia, as a nation-continent with significant number of flora and fauna not found anywhere else in the world, is special. The eradication of indigenous species due to the introduction of foreign species has led to the vigilance of various organisations securing the country’s biodiversity. Ecotourism Australia’s notable Eco Certification Program ensures that practices safeguard the environment and keep the destinations intact. Yet even with the strong advocacy on biodiversity conservation, the role of transport is superficial (just a means to get around, with no consideration for its impacts) and destination-based.

Although Australia has many important national parks, its public transport network does
not fully support these destinations. Prideaux (2004, p 88) attributed the development of tourism in the North Queensland region and the emergence of “intrastate drive tourism” to the construction of the all-weather road between Cairns and Brisbane after the Second World War.

Taking the example of the Daintree National Park in Port Douglas and the Kuranda Rainforest in North Queensland, these are distinct attractions with commendable ecological management systems. The main problem with these destinations is that, due to their locations and the lack of integration to the municipalities, the main mode of access would be the private vehicle. Statistics show that by the end of March 2007, 96% of domestic day tourists (1.56 million) and 60% of domestic overnight tourists (899,400) in Tropical North Queensland are intrastate (Tourism Queensland, 2007). With Queensland taking 24% of domestic visitors, receiving 17.2 million domestic overnight visitors and 29.6 million domestic day visitors by the end of March 2007 (Tourism Queensland, 2007), one could easily (and rightfully) assume that majority of these domestic tourists took a flight from the major cities and/or utilised private vehicles to finally reach their destination. This can be deduced from statistics which show that 34.3% of domestic visitors are interstate while 65.7% are intrastate, and that 48% of trips were booked by directly booking accommodation, followed by booking through the airline (29%), travel agent (19%) and car hire (12%) (Tourism Queensland, 2007). Tourism transport is still basically run by the private sector that provides the linkage to tourism areas.

The consideration of Switzerland as case study

The identification of the Swiss National Park in Graubünden, Switzerland as the case study from a developed country stems from the almost-perfect example that Switzerland sets. The country’s integrated transport network is impressive, with services even to the small villages on top of the mountains. There are commendable tourism initiatives such as the GAST- Gemeinschaft Autofreier Schweizer Tourismusorte, an association of several resort towns in Central Switzerland and the canton Valais which has strung together nine car-free destinations. The strict regulations and practices that these resorts have put in place, car-free and only accessible by public transport, to have better air quality are laudable. The non-dependence on private vehicle to get to the destination is very rare in tourism transport research.
The initial background study done on the Swiss National Park, as detailed in its website, discouraged visitors to bring their cars due to the limited parking in the area and encouraged the use of the PostBus. The park has strict management rules prohibiting visitors to leave the marked trails. The strict nature reserve was created by organisations which continue to manage the park with the federal government.

The sincerity of Switzerland in achieving its emissions quota as set under Kyoto Protocol meant it has placed great importance on the efficiency of its public transport services.

**The consideration of Paraná, Brazil as case study**

Because good public transport service is a prerequisite for a sustainable network, the case study from a developing country took quite some time to be established. The majority of developing countries do not have good infrastructure and formal transport services. Curitiba in Paraná, Brazil has been making waves as the poster city for the successful implementation of a bus rapid transit, and which has been extended to serve tourist destinations. The awareness of the local and state governments of the importance of public transport has seen the deliberate improvement of services.

Paraná State is also promoted as the Ecological Capital of Brazil and home to the Iguaçu National Park. The national park, served by a bus route, is quite famous for its waterfalls and receives over 2,000 visitors daily. However, the landmark decision in the year 2000 to ban private vehicles from entering the park and the subsequent provision of an internal public transport mode ensured the reduction of visitor impacts.

The initial backgrounds utilised in the identification of the two case study areas are summarised in Appendix C Early comparisons of the Swiss and Brazil case study areas.

**ROAD MAP: DATA COLLECTION METHODS**

Several data gathering techniques are employed in this research which involves document analysis, literature reviews, field survey, and interviews with key informants regarding the issues and practices. Details of each are discussed in turn.

**Document Analysis**

The reports, documents, and policies establish the administrative and legislative evidence in the consideration of transport in making ecotourism destinations sustainable. These
also identify the other factors that influence the current practices. These documents also present the existing structures in the types of governments and how the various agencies and organisations work to achieve the goals of sustainability. Copies of policies and other relevant documents on transport, environment and tourism were either downloaded when these were sourced online or provided as hard copies by some of the interviewees. Quantitative reports especially from the statistics office are easily available online and are utilised to validate the reports.

For Switzerland, federal and cantonal laws, policies and regulations are available online in their respective departments. Although most of these are available in German, two online translation engines were utilised to get the gist of the provisions. The texts to be translated are run through both search engines to verify the different uses of a word. These are then verified and correlated with facts gathered from interviews, with some of the English texts and documents provided by the agencies, as well as from the current practices. However, other government agency documents and reports (non-statutory) have English translations.

The various offices that are relevant to the study are the following: the Federal Department of Environment, Transport, Energy and Communications (DETEC) under which the Federal Office of Transport (FOT), Swiss Federal Roads Authority (FEDRO), Federal Office for Spatial Development (ARE), Swiss Federal Railways (SBB), and the Swiss Agency for the Environment, Forests and Landscape (SAEFL) are connected. The website of the Swiss Federal Statistics Office (SFSO) is a mine of information and very well updated. It should be noted that the Federal Office for Spatial Development (ARE) came up with a document on “Sustainability Assessment: Conceptual Framework and Methodology” in April 2004; while the Swiss Federal Council (SFC) has the “Sustainable Development Strategy 2002.” ProNatura is one of the oldest environmental organisations and is well represented in the National Park Federal Commission (NPFC) which manages the Swiss National Park.

In the canton of Graubünden, transport policies and regulations are available online (non-English) from the website of the Building, Traffic and Forest Department (BVFD). Maps and Human Powered Mobility (HPM) guidelines were supplied by the Tiefbauamt.

---

4 The translation engines utilised for the entire study are Alta Vista – Babel Fish Translation with URL http://babelfish.altavista.com and the Free Translation and Professional Translation Services from SDL International with URL http://www.freetranslation.com.
Office which is under the BVFD. Documents (non-English) from the Regional Policy Office were handed out, while statistics (non-English) from the Amt für Wirtschaft und Tourismus Graubünden (Economic Development and Tourism Office) were emailed on 26 July 2006. The major transport providers in the canton are the Rhaetian Railways (Rhätische Bahn - RhB) and PostBus. Although the websites of both offices are up to date, promotional materials, timetables, and other info on the organisations (some non-English) were provided.

Specific to the Swiss National Park are two German publications, one by Lozza (1996) on the first and last tourist survey that was done in the SNP, and the other by Küpfer (2000) who did an economic impact study of the SNP on the communities in the region. Both studies were done in conjunction with the University of Zurich. Maps and promotional materials of the national park were either purchased or provided.

For Brazil, as with Switzerland, national policies are available online and usually in Portuguese. Relevant offices include the Ministerio do Turismo, Ministerio dos Transportes, and Ministerio do Meio Ambiente for data regarding policies on transport, tourism, and the environment, respectively. Notable institutions operating at the national level are the Brazilian Institute of Tourism (EMBRATUR) and the Brazilian Institute for the Environment and Renewable Natural Resources (IBAMA).

Statistical documents were had from the State of Parana Tourism Office (SETU) as well as from the Municipal Tourism Office of Foz do Iguaçu (Prefeitura de Foz do Iguaçu-Turismo – SMTU). The Environmental Institute of Paraná (Instituto Ambiental do Paraná – IAP) provided brochures of the various biodiversity conservation projects in the state. Portuguese/English journals were given by the Fundação o Boticário de Proteção à Natureza, an environmental organization based in Curitiba. EcoParaná shared the development plans for the Iguaçu National Park and provided maps and other materials. FozTrans provided a soft copy of the map of the city, transport policies and mode statistics.

Specific to the Iguaçu National Park, the park administration, IBAMA, provided copies of the 1981 Public Use Plan and the 1999 Management Plan as well as maps and park statistics.

---

5 Where my comprehension of the Portuguese language fell short, the online translation engines were utilised.
Literature Review
A review of the literature on the relationship between tourism and transport specific to the case study areas contextualises the treatment of each component. These have been sourced from the libraries on campus, online from university or organisation websites, and from journals, books and reports purchased from/given out by some interviewees.

These documents and research done by universities, institutions, NGOs, international NGOs and by experts in the field supplement and countercheck data and practices of the government agencies. These publications present the views of these groups regarding the issues on transport and/or tourism. These research and reports help measure the effectiveness of the policies e.g. improvement in air quality would show lower greenhouse gas levels if the policies on emissions are well implemented.

Related literature on policy making and analysis facilitate the understanding of the organisation of structures, the process of policy creation, and the measurement of policy performance. This enables the assessment of current practices and the recommendation of a more workable system where some aspects are found lacking.

Interviews and Site Visits
Interviews with key informants from relevant government agencies, sectoral and people’s organisations and park administrations provide different perspectives regarding the management and provision of services. Interviews were conducted from 26 May to 24 June 2005 in Brazil and from 1 to 11 September 2006 in Switzerland. Please refer to Appendix D List of Interviewees for the full listing and contact details.

The aim was to have, as much as possible, a representation of the various stakeholders: the government sector and the private sector as well as non-government organisations who work within the area. This enabled me to cover the various concerns of each sector and to have their views on the issue of sustainability in transport in/and tourism. The agencies that manage transport, tourism and the environment work towards different goals yet the common aim is to achieve/improve sustainability. The role of non-government organisations, experts and academics lie in their vigilance regarding the operations within the system. These groups foster research and strengthen the role of the community in decision-making. As much as possible, organisations that deal directly
or have done studies concerning the national parks were chosen. Tourism agencies and tourism groups within the area gave details on the impacts of national park visitation regulations on their operations and practices. Random interviews of tourists (both international and local) have affirmed how the majority travel when on vacation or when travelling to the national park.

Questions asked covered subjects such as the planning process, service provision, park management, visitor management, feedback on the transport network and accessibility of the park amongst others. Answers to these questions explain the current practice as it reflects the values of those involved in the planning process. The investigation of the relationship amongst stakeholders establish the importance of the role each play in the planning process as well as determine the type of structure which best facilitates the implementation of policies. The conduct of informal interviews with locals and tourists was also done mainly to get their feedback regarding the workability of the transport system and their choice of modes.

The need for visual inspection is important to avoid falling into the propaganda trap of government agencies and promotional materials. Some regulations look good on paper but do not work as well in reality, or there are components which advertisements and public reports do not share. These discrepancies point out breaches in implementation and aides in the identification of areas in the planning process that needs improvement. On the same note, an ocular survey of the networks provides insights to the reliability and workability of the public transport system. It also enabled me to personally check out the most common modes of transport utilised by visitors to the national parks as well as gauge the efficiency of the system for the duration of my 2-week stay.

**READING THE SIGNS: METHODS OF ANALYSIS**

The aim of this research is to identify the structures that establish a more sustainable system for ecotourism destinations through the assessment of prevailing practices, government policies, reports of various agencies and organisations. Although there are various ways to measure impacts and sustainability of a system e.g. ecological footprint or ecological valuation, which explores several econometric methods, it is not the primary objective of this study to apply such measures. Calculating values of impacts provide the empirical bases for policies and regulations. These values are useful when looking at trends and scenarios to correlate with practice. These can also be utilised to support or
verify an observation empirically.

Triangulation, evidence-based policy and policy analysis are utilised in validating the data in order to identify which structures contribute to improving sustainability.

**Triangulation**
The triangulation method across multiple sources checks the validity of the results. Following the logic of triangulation as Stake (1995) articulated and applying it to the aim of the study, it follows that when a phenomenon is checked in various settings and yields similar results, then it is sufficient to say that the strategy contributes to the sustainability of the system. Likewise, results were checked for both internal and external validity. To check for internal validity, the results of the analysis should show that the stakeholders agree that the system is sustainable and efficient for each case study. It is externally valid once the comparisons of the results of each case study show that stakeholders for both case studies have similar perspectives of what is effective. It can be deduced that these are the important structures that have to be in place for sustainability to be attained.

**Evidence-Based Policy (EBP)**
Evidence-based policy builds a systematic evidence base in understanding certain phenomena and enables in providing answers to the questions “what works?” and “why does it work?” (Pawson, 2005). Utilising Yin’s (2003) pattern-matching logic to analyse the case studies, the relation of the hypotheses with the findings yield the common structures. The matrix of findings categorise the results into distinct issues that are critical to the sustainability of tourism transport.

**Policy Analysis**
The analysis of policies can assess the sustainability of the transport-tourism relationship as well as identify the factors that affect these. In evaluating the effectiveness of policies, the governing body has a clear set of goals regarding environmental management and the significance of controlling transport impacts. A legislative and administrative base oversees its implementation and a system of monitoring that provides feedback. Indicators provide information regarding the current conditions, impacts, and environmental quality.

In analysing policies, the level of commitment of the government in addressing the issues of transport’s impact in ecotourism destinations, the quality of its policy initiatives and
the degree of implementation are established. The criteria for policy analysis utilise three systems to check whether the policies affecting transport in tourism are sustainable: the first one looks into the policy considerations to check the government’s commitment; second, the approach and strategies to planning; and lastly, policy feedback and monitoring.

A. Policy considerations

1. There is a clear stand regarding ecotourism and the management of ecotourism destinations.

2. The role of other agencies in the formulation of policies is taken into consideration in the management of impacts to ensure a balanced approach.
   a. Tourism guidelines take into consideration the role of transport in the management of destination areas.
   b. Transport planning is one of the controls used in the management of visitation impacts which are not confined on-site.
   c. A resource management plan is created after undergoing a resource valuation process to regulate impacts to critical resources.

3. Takes into consideration the issue on climate change and there are programs initiated to address it.

4. The public transport component is emphasized and there are existing programs that encourage its usage.

B. Planning approach and strategies

1. A multidisciplinary approach is taken in answer to the various issues on sustainability

2. There is a clear linkage among the various levels of policy making bodies which accounts for the consistency of policies

C. Feedback and Monitoring

1. There is a system of accountability within each sector which monitors the implementation of policies

2. There are corresponding penalties such as environment-related fines for violations
The aim of looking at the various perspectives is to be able to identify and define what good practice is and the components that make it so. An affirmation of the hypothesis occurs when different sectors agree on common structures that should be in place to make the relationship between ecotourism destinations and transport sustainable.

Chapters 4 and 5 present the two case studies and set out to determine these structures from a developing and developed country’s perspective.
The previous chapters point out that the challenge for developing countries is in their capability of developing a sustainable system. Developing countries in general struggle to provide good transport services. Areas for ecotourism deal with the dilemma of biodiversity protection or revenue increase.

This chapter presents the experience and current practices in Iguaçu National Park in Paraná, Brazil. The objective is to identify strategies that work, find out why these work, and to look at aspects that still need improvement.

TRANSPORT AND THE ECOTOURISM DESTINATION

Travel and tourism was not a priority of Brazil’s leaders and was seen as an unnecessary luxury until the late 1980s and early 1990s when revenue from the industry contributed an estimated eight percent to the country’s GDP and employed one in every eleven of those in the workforce (US Library of Congress, undated). The focus is more on domestic tourism whose spending power is twenty times of international tourists, and those of neighbouring countries such as Argentina, Paraguay, and Uruguay which entails short distance journeys to the beaches and shopping areas (Healy, 1996). A significant change in focus occurred after the country hosted the Rio Earth Summit in 1992 leading to the prioritization of ecotourism (Mourão, undated).

Brazil with its area of more than 8,500,000 km² is blessed with a variety of natural attractions. Its ecotourism corridor covers ten states. The Amazon in the north covers seven states or 40% of the country and contains the largest biodiversity in the world. The Pantanal wetlands in Mato Grosso and Mato Grosso do Sul are rich in wildlife, caves, waterfalls and mountain forests. Finally, there are the waterfalls at Foz do Iguaçu in Paraná. Ecotourism seems to be a natural option for a country as rich in biodiversity as Brazil. Healy (1996) believes the promotion and development of ecotourism are difficult tasks. He identifies the need to re-educate the locals regarding ecotourism in
order to increase their interest in the richness of the biodiversity and the importance of conservation. The provision of appropriate support infrastructure is also an issue. Amongst the protected areas identified for ecotourism, it is only the Iguazu Falls which has good lodging, dining, and tourist facilities (Healy, 1996). In 1994, a paper entitled “Ecotourism: Parameters for a National Policy” was published by the working group composed of representatives of the Ministry of Industry, Commerce and Tourism and the Ministry of the Environment to strengthen the ecotourism thrust of the government and promote proper development (Healy, 1996).

**THE BIGGER PICTURE: PARANÁ STATE, MAKING A DIFFERENCE?**

The State of Paraná is located in the southern region of Brazil and has an area of 199,880 km² with a population of more than ten million in 2004 (IPARDES, 2005). As an agro-industrial centre with the capitals of Argentina, Uruguay, and Paraguay within 1,300 km, having a well-developed road network propelled the socio-economic status of the state. Infrastructure includes 15,300 km of roads and 3,370 km of track which has aided in the conveyance of produce and goods, it also links the various regions and promotes ecological tourism. The seaport in Paranaguá is an important port as it also serves Paraguay by special arrangement and has been linked with Curitiba by the Imperial Railway since 1880 (Mello, undated).

Paraná was not even part of the Brazilian territory when the Portuguese landed on its shores in 1500. The 1494 Treaty of Tordesillas (see Figure 3) cut through the right of Belém in the north, and straight down to the left of São Paulo in the south. It was only due to the search for indians to enslave to work on the vast sugarcane plantations that expeditions by the Bandeirantes of São Paulo were undertaken inland, during the period when King Philip II of Spain inherited the Portuguese crown in 1580, creating a contiguous Hispanic America. After Portugal won its independence from Spain in 1640, it refused to give up the new territories under the principle of “uti possidetis” which recognized physically settled areas by the Portuguese as now part of the territory (Smith and Vinhosa, 2002).

---

6 Conflict between Portugal and Spain over territories of the New World led to Pope Alexander VI demarcating lands to the west of the imaginary line running north-south 2,735.81 km (100 leagues) west of the Cape Verde Islands as belonging to Spain; while to the east as Portugal’s. This line was further moved west when Portugal accused the Pope of favouring Spain, thus giving Portugal a small portion of South America in the process. Smith, J. and Vinhosa, F. 2002, *History of Brazil, 1500-2000: Politics, economy, society, diplomacy*, Pearson Education Limited, London.
Figure 3  Map of Brazil showing demarcation line by the 1494 Treaty of Tordesillas
Note: Demarcation line added by the author.
Figure 4  Early settlements and transport development, 1850-1999
Source: Lowry, 2002
Paraná was part of the captaincy of São Paulo until 1853 when it became an independent province. The topography of the province is composed of three plateaus namely Curitiba Plateau, Ponta Grossa Plateau and Guarapauva Plateau created by the mountain ranges of Serra do Mar, Serra do Purunã, and Serra da Boa Esperança, respectively; radiating inland from the Bay of Paranaguá (details in Figure 4).

Paraná’s plateaus made expeditions inland very difficult, allowing early settlements in the coast of Paranaguá and Curitiba. The completion of the Graciosa Road (see Figure 4) which crosses Serra do Mar linked Curitiba and the Port of Paranaguá in 1872 followed by the railway in 1875. This connection facilitated the transport of produce from the farms to the port. Another railway was opened in the 1900s linking Santa Catarina province in the south with São Paulo, enabling the supply of meat products to reach the northern states.

The third plateau of Paraná took some time to be settled due to its accessibility. To hasten population growth, the state government encouraged migration from Europe even coming up with a favourable land repayment scheme (Diacon, 1991). Poles and Ukrainians settled in the south central in 1870s; to the east were Poles, Germans and Italians; Curitiba had a wide range of immigrants from Italy, Germany, Poland, France, Switzerland and England; and the Japanese settled in the north, just south of São Paulo, to help in coffee production (Lowry, 2002).

The cultivation of coffee preoccupied settlers of northern Paraná from the 1900s. Coffee production was substantial and important to the economy until the mid-70s that São Paulo financed the extension of its railway from Santos through Sorocaba to Ourinhos near the Paraná border. Smith and Vinhosa (2002) recounted how railroad building was perceived to provide greater economic benefits by opening previously uninhabited areas to settlement and facilitating the conveyance of produce to the ports.

7 The division of the territory stipulated in the 1494 Treaty of Tordesillas into hereditary fiefs or captaincies managed and protected by donatários who were members of the Portuguese elite laid the framework for land ownership, which has remained an issue to the present times. King John III later revoked this land arrangement due to the threat by the French in the south, and installed a Governor-General to manage the entire territory in 1548. Meade, T. A. 2003, A Brief History of Brazil, Facts on File, Inc, New York.

8 These provinces later became the states when the monarchy was overthrown in 1889 and a federal republic was created.


10 Immigrants from Europe were favoured to “whiten” the population as well as aid in the economic development. Ibid.
This was further demonstrated in 1928 when the English-owned Paraná Plantations Ltd bought control of the São Paulo-Paraná Railway and continued the line westward into Londrina by 1935, and Apucarna by 1937. The federal government later extended this line to reach Maringa and Cianorte when it regained control in 1944 under the nationalisation program. (Details in Figure 4)

The industrialization of Paraná began in 1958 initially with agro-industries processing coffee and forest products (Lowry, 2002). When Petrobrás (Petróleos Brasileiros), the country’s oil company established in 1953 to stop Brazil’s dependence on imported oil, opened a refinery in Curitiba in 1977 it became one of the state’s major industries.

The collapse of the coffee industry in the 70s and the continued industrialisation increased the migration of displaced rural workers into the urban areas in search of jobs. The increased population in the urban centres and the inability of the municipal governments to accommodate and provide the basic services became a growing problem. From 1981 to 2001, the state government launched what it called the municipalisation process. This was a series of programs aimed at strengthening the municipalities through the provision of funds and guidance for the improvement of urban infrastructure and social service facilities as well as appropriate investments to promote growth (Lowry, 2002). The inequality between cities and population distribution often stem from these aspects.

The importance of the role the state government plays to control urban migration is reminiscent of the level of influence exerted by the central government during the first republic. When the monarchy abolished slavery in 1888, it signalled the end of a good relationship with the landed gentry who had extensive political and economic influence. A military movement in 1889 overthrew the monarchy and declared a federal republic. A central government headed by a president was retained, maintaining Brazil’s political and territorial unity (Smith and Vinhosa, 2002). Power decentralised to the various states gave them financial autonomy. This awarded states with strong export economy and the most number of eligible voters such as São Paulo and Minas Gerais electoral strength and widespread influence.

Lowry (2002) discussed at length the history of the process in Municipal Development in Paraná: Policies and Programs, 1981-2001. Unlike the decentralisation that created the first republic and the emergence of powerful states, the municipalisation process aimed to
discourage the creation of a ‘primate city’. The state government worked with a version of the theory of economic location\textsuperscript{11} developed by German scholars in the early 20\textsuperscript{th} century, a process which entailed understanding the role of cities and its functions as part of a system. Policies, which control land use and regulate investment to promote growth, aimed to distribute population evenly throughout the system and discourage the emergence of a ‘primate city’ (Lowry, 2002).

A military takeover in April 1964 led to an authoritarian military rule which lasted until 1985. Through these years, the Federal government appointed the state governors and major city mayors. It was 1971 when Jaime Lerner, an architect-planner, was appointed mayor of Curitiba, the capital of Paraná, and ordered to promote development but to control the population (Irazabál, 2005). Working with the Curitiba Research and Urban Planning Institute (IPPUC), an agency he previously presided over, Lerner’s implementation of the 1965 Master Plan (Plano Diretor) was swift and done at minimum cost. He has always been credited for the success of urban planning in Curitiba whose growth as a linear city is guided by the integration of mixed land use along transport corridors (Cervero, 1995).

When Jaime Lerner became governor of Paraná in 1995, he advocated the importance of putting in place an integrated network of services that the state will help provide. He worked with the concept of an Integration Ring – creating corridors for transport, energy and communications linking the eight economic regions of the state and promising the availability of “high-level social, medical, and educational services” within two-hour’s travel (Lowry, 2002, p 93). The Integration Ring (see \textbf{Figure 5}) links the major cities of Ponta Grossa, Londrina, Maringá, Cascavel and Guarapauva – all identified as ‘development poles’ influencing smaller municipalities around it.

The configuration is aimed at improving the economic and political relationships of the municipalities of the state whose history showed that the municipalities dealt more with other cities outside of Paraná than within (Lowry, 2002). As discussed in Lowry (2002) and Diacon (1991), the topography and development of infrastructure within Paraná has since the early days made it easier to trade and interact with its immediate neighbours.

\textsuperscript{11} As discussed in Lowry, I. S. 2002, \textit{Municipal Development in Paraná: Policies and Programs, 1981-2001}, Paranacidade, Curitiba. p 32: this theory has its roots from Johann Von Thünen’s spatial economics and later Alfred Weber’s industrial location theory. Discussed by Walter Isard in his seminal work \textit{Location and Space Economy} in 1956 proposing “the natural emergence of a hierarchy of urban functions related to city size; and an orderly spatial distribution of cities according to their sizes and functions.”
such as São Paulo for the northern municipalities, Santa Catarina and Rio Grande do Sul in the south, and Paraguay and Argentina for those in the west (refer to Figure 5).

In the 1990s, Brazil’s inflation was still at a record high and only got a break in 1995 when the Real Plan\textsuperscript{12} was introduced by then Finance Minister Fernando Henrique Cardoso who later became President from 1994-2002. During this economically trying period, alternatives to agricultural production led to the consideration of tourism as a source of income for some municipalities rich in history, culture and natural environment. In the entire state, only Foz do Iguaçu had a tradition of tourism due to the popularity of the Iguaçu Falls and later the city of Curitiba because of its planning (Poitevin, 2005, Hartmann, 2005). In 1998 EcoParaná another “quasi-public corporation – in Brazilian administrative law described as an ‘autonomous social service entity’ ” (Lowry, 2000, p xvii) was tasked to identify and plan for alternative tourism sites across the state taking into consideration sustainable development (EcoParaná, 2003, Poitevin, 2005). Tourism planning involved studying the state’s natural corridors along the rivers and mountains as well as the regions shaped by the Integration Ring (EcoParaná, 2003).

The statewide tourism planning done by EcoParaná provided the regions and communities with concepts to work with (de Moura quoted in EcoParaná, 2003). These plans utilise the existing transport networks and recommend the improvement/rehabilitation of some corridors leading to the identified tourist destinations. There are very few instances where roads are constructed specifically to create access (Poitevin, 2005). The building of the nautical centres at various points along the Itaipu Lake in the West Coast (Costa Oeste) region required the construction of access roads because the development called for it and the State government was willing to invest on this (Poitevin, 2005). The major points of entry into the State are through the Afonso Pena International Airport in Curitiba and the Foz do Iguaçu International Airport.

\textsuperscript{12} The Real Plan introduced the \textit{real} as the new currency, replacing the \textit{cruzeiro}, and whose value pegged to the US Dollar successfully reduced inflation to 4\% in 1997 from 50\% in 1994.
Figure 5  Paraná Integration Ring
Source: Lowry, 2002
Figure 6  Municipality of Foz do Iguaçu showing major access points
Note: highlighted details by author.
Source: Base map provided by FozTrans, June 2004.
FOZ DO IGUAÇU AS A TOURISM DESTINATION WITHIN THREE FRONTIERS

The unique and strategic location of Foz do Iguaçu, 637 km from Curitiba, borders Paraguay to the west and Argentina to the south (see Figure 6). The attraction of the waterfalls is the main reason for the area’s popularity both in Brazil and internationally, making Foz do Iguaçu the fifth most visited city by foreign tourists as reported by a study developed by EMBRATUR in 1998 (Medonça, 2000). Tourism has ensured much of the economic development of the city. From statistics gathered by the Municipal Tourism Office (SMTU), there are 147 establishments employing 656 individuals in permanent positions and 432 in temporary ones as well as 332 industry partners that provide further support (Secretaria Municipal de Turismo, 2005).

Total number of tourists per year outnumber locals by an average of 3.5 to 1 for the last six years as shown in Figure 7. Although tourists only stay for an average of 3.6 days, in the last three years the equivalent tourist population compared to that of the locals is greater by 14.93% in 2003, 11.05% in 2004 and 25.16% in 2005 as reflected in Figure 8. This statistic is significant when looking at how the city’s transport network and services hold up to the pressure from tourism. The question of sustainability is two-fold: one involves the conservation of the city’s natural attractions that visitors come to see. The other concerns the mobility of the city’s large number of visitors given the impacts of the different modes.

Figure 7  Local vs Annual Total Tourist population, 2000-2005
Source: SETU 2006, SMTU, 2006
Though Foz do Iguaçu is able to attract international tourists, the majority of those who come and visit are Brazilians. From the tourist survey covering 1996 to 2003 in Table 6, an average of 65.7% of those interviewed came from the various states of Brazil with 28% of these coming from within the state of Paraná (Secretaria de Estado do Turismo, 2004). Argentina remains the largest source of foreign tourists with an average of 12.89% of the 34.3% that foreign tourists take. The majority of travel between the states and the immediate neighbouring countries (i.e. Paraguay and Argentina) are based on the strength of its linkage, road network and access.

The improved access via the federal highway BR 277 and the international bridges to Paraguay (1965) and Argentina (1985) opened Foz do Iguaçu to investors and businesses as well as to migrants. Development came late for the city whose history includes military activities and wars against its neighbours.

As early as 1765, Brazil’s military has ensured the integrity of its boundaries. From the 1800s to mid-1900s, the wars amongst Brazil’s neighbours have been cause for concern over the years especially when the boundaries were perceived to be threatened.\footnote{The War of the Triple Alliance or the Paraguayan War in 1850 saw the cooperation of Argentina, Brazil and Uruguay to suppress the Paraguayan dictator Francisco Solano López’s support of Uruguay’s ruling}

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Brazilian Tourists</td>
<td>70.0</td>
<td>65.5</td>
<td>64.5</td>
<td>65.7</td>
<td>63.7</td>
<td>65.4</td>
<td>68.8</td>
<td>62.0</td>
<td>65.7</td>
</tr>
<tr>
<td>Paraná</td>
<td>27.6</td>
<td>24.1</td>
<td>21.0</td>
<td>30.2</td>
<td>27.5</td>
<td>31.9</td>
<td>30.2</td>
<td>31.5</td>
<td>28.00</td>
</tr>
<tr>
<td>Rio de Janeiro</td>
<td>4.6</td>
<td>5.2</td>
<td>4.3</td>
<td>3.1</td>
<td>3.9</td>
<td>3.0</td>
<td>5.0</td>
<td>3.8</td>
<td>4.11</td>
</tr>
<tr>
<td>Rio Grande do Sul</td>
<td>8.2</td>
<td>5.8</td>
<td>6.5</td>
<td>5.1</td>
<td>5.1</td>
<td>5.1</td>
<td>6.0</td>
<td>5.3</td>
<td>5.89</td>
</tr>
<tr>
<td>Santa Catarina</td>
<td>4.2</td>
<td>4.8</td>
<td>5.2</td>
<td>6.6</td>
<td>4.5</td>
<td>5.1</td>
<td>5.6</td>
<td>4.8</td>
<td>5.10</td>
</tr>
<tr>
<td>São Paulo</td>
<td>16.0</td>
<td>16.9</td>
<td>17.9</td>
<td>12.3</td>
<td>14.4</td>
<td>12.6</td>
<td>14.1</td>
<td>9.7</td>
<td>14.24</td>
</tr>
<tr>
<td>Others</td>
<td>9.4</td>
<td>8.7</td>
<td>9.6</td>
<td>8.4</td>
<td>8.3</td>
<td>7.7</td>
<td>7.9</td>
<td>6.9</td>
<td>8.36</td>
</tr>
<tr>
<td>Foreign Tourists</td>
<td>30.0</td>
<td>34.5</td>
<td>35.5</td>
<td>34.3</td>
<td>36.3</td>
<td>34.6</td>
<td>31.2</td>
<td>38.0</td>
<td>34.3</td>
</tr>
<tr>
<td>Argentina</td>
<td>9.7</td>
<td>14.5</td>
<td>17.4</td>
<td>9.6</td>
<td>12.4</td>
<td>13.3</td>
<td>11.0</td>
<td>15.2</td>
<td>12.89</td>
</tr>
<tr>
<td>Germany</td>
<td>3.2</td>
<td>2.7</td>
<td>2.1</td>
<td>3.8</td>
<td>2.8</td>
<td>1.9</td>
<td>1.8</td>
<td>1.5</td>
<td>2.48</td>
</tr>
<tr>
<td>Paraguay</td>
<td>0.6</td>
<td>0.9</td>
<td>0.8</td>
<td>1.2</td>
<td>1.0</td>
<td>1.0</td>
<td>1.3</td>
<td>4.1</td>
<td>1.36</td>
</tr>
<tr>
<td>USA</td>
<td>1.9</td>
<td>2.2</td>
<td>2.9</td>
<td>2.9</td>
<td>2.8</td>
<td>3.5</td>
<td>3.3</td>
<td>3.0</td>
<td>2.81</td>
</tr>
<tr>
<td>Others</td>
<td>14.6</td>
<td>14.2</td>
<td>12.3</td>
<td>16.8</td>
<td>17.3</td>
<td>14.9</td>
<td>13.8</td>
<td>14.2</td>
<td>14.76</td>
</tr>
<tr>
<td>Total Visitors</td>
<td>1,360,749</td>
<td>879,420</td>
<td>802,728</td>
<td>1,074,898</td>
<td>800,102</td>
<td>732,725</td>
<td>769,387</td>
<td>986,090</td>
<td>925,762.38</td>
</tr>
</tbody>
</table>

Note:  e - for 1997 and 2002, the numbers are estimated percentages
Source:  SETU, 2004

In 1888, the Strategic Commission under the Department of War based in Guarapauva\(^{14}\) dispatched soldiers headed by a military engineer to Foz do Iguaçu to establish a Military Colony as well as build strategic roads to open it up to settlers. In 1910 immigrants from Europe, mostly Germans and Italians settled in the area growing mate herb and engaging in logging.

The Chaco War in 1932 between Paraguay and Bolivia was carefully watched by the Brazilian Foreign Office (Itamaraty) and the military for fear of it extending to Brazil (Smith and Vinhosa, 2002). Diplomats from Argentina, Brazil, the United States and other Latin American countries assisted in resolving the boundary conflict. In 13 September 1943, then President Getulio Vargas passed Decree No. 5812 creating the Federal Territory of Iguaçu covering various municipalities in the west of Paraná and Santa Catarina, principally to safeguard its boundaries by encouraging settlement to the west (Batisti and Souza, 2004). By 1946, this territory was integrated with the State of Paraná.

---

Blanco Party whose fights with the opposing Colorado Party spread to Brazil’s territory of Rio Grande do Sul. Troops invaded Paraguay in 1866 with the death of López in 1870 ending it. This war strengthened and increased the marginalised military population of Brazil since Dom Pedro II assumed power in 1840. His anti-military views and politicking within the ranks along with the abolition of slavery in 1888, all contributed to the unpopularity of the monarchy and the establishment of a republic in 1889. Smith, J. and Vinhosa, F. 2002, History of Brazil, 1500-2000: Politics, economy, society, diplomacy, Pearson Education Limited, London..

\(^{14}\) A municipality 381 km to the east of Foz do Iguaçu.
Due to its proximity to the other countries, Foz do Iguaçu is currently the official centre for Mercosul (Mercado Comum do Sul) affairs. Mercosul is the South American version of the European Union (EU) and is an agreement amongst Brazil, Paraguay, Argentina and Uruguay taking into consideration the economic and trade interests of the member countries (SMTU, 2005). However, prior to attaining this respectable position, Foz do Iguaçu was closely linked with the infamous black market that thrived in Ciudad del Este in Paraguay.

**Immigration and Growth of a City**

The signing of the Treaty of Itaipu between Brazil and Paraguay on 26th April 1973 for the construction of the Itaipu Hydroelectric Power Plant on the Parana River greatly helped spur the growth of the city. With construction of the dam commencing in 1975, an influx of around 40,000 construction workers arrived in Foz do Iguaçu to help build the dam. In 1970 there were only 33,966 inhabitants, but the figure rose to 136,321 in 1980; 190,123 in 1990, and 293,646 in 2004 (SMTU, 2005).

After the conclusion of the project, the majority of the workers stayed on or migrated to the other regions (Peris, 2002). A second wave of migration occurred during the 1980s when what was then called the ‘ciclo de compras’ or ‘shopping cycle’ stimulated by the sale of imported goods in Ciudad del Este in Paraguay led to a migration flux to Foz do Iguaçu (Kurten and Vandre, 2005).

Several milestones in the city’s history influenced the increase in population and tourism activity in the region. In 1939, the creation of the Iguaçu National Park brought to focus the potential and importance of tourism in the area. The Ponte Internaçional da Amizade (Friendship Bridge) was inaugurated in 1965 followed by the conclusion of the construction of federal highway BR 277 in 1969 and the opening of the International Airport of Foz do Iguaçu in 1970. Prior to the construction of the Tancredo Neves Bridge (1985) linking Brazil with Argentina, the role of Porto Meira in the southern part of Foz do Iguaçu was important in ferrying passengers and cargo across the Iguaçu River (Peris, 2002). Peris (2002) further notes that it was only in 1985, due to the strengthening diplomatic and business ties between Brazil and Argentina, that the construction of the said bridge commenced. The creation of Mercosul also coincided with the improved relationship between the two countries (Peris, 2002).
The increase in commerce, tourism and population growth put tremendous pressure on private and public services especially regarding health, housing, education, telecommunications, transport and public safety. The poor state of affairs encouraged the federal government to invest in and provide support infrastructure to the rapidly growing city (Peris, 2002, Daluz, 2005).

The Black Market in Ciudad del Este, Paraguay
In the 1970s and 1980s, a different kind of tourism developed in Foz do Iguacu fuelled by the thriving black market in Paraguay (Peris, 2002). BR 277 provided the conduit for duty free products shipped from overseas from the Paranaguá port, where Paraguay operates its shipping under special agreement with Brazil, to Ciudad del Este.

The development of this enterprise played a significant role in the development of the region in terms of economics, urban growth, and population makeup. This highly economic activity brought in around 3.2 million tourists a year, mostly through the city’s International Bus Station (SMTU, 2006). Shopping in Paraguay became so popular that majority of Brazilians visiting Foz do Iguacu were there for shopping and only a small percentage visiting the city’s attractions and Argentina (Noguiera-Paes, 2005, Peris, 2002). A new breed of entrepreneurs called ‘sacoleiros’ emerged, buying goods from Paraguay and Argentina to sell in the south and south-eastern parts of the country (Peris, 2002). In turn, Foz do Iguacu became the export-trading centre for Brazil’s products.

By 1990s, the advent of Mercosul and the economic agreement amongst the three countries had the situation under control. The business nicknamed ‘comércio formiguinha’ (roughly translated as ‘business of an ant’ due to the way the imported goods were transported from one country to another in a small and steady stream to bypass customs) was slowly being curtailed by stricter rules and cooperation amongst the administrations (Peris, 2002).

The cities along the Foz do Iguacu-Cascavel corridor benefited much from the black market. Businesses ranging from restaurants, hotels, transport companies, machine shops, commercial and other services created jobs during a period when Brazil’s economy was struggling with inflation (Peris, 2002). However, inflation practically disappeared when the Real Plan took effect in July 1994 (Peris, 2002). The strengthening of the Real (R$), the Mercosul agreement and the imposition by the Brazilian government of a maximum spending allowance of US$150 per person, led to the

The impact of the Foz do Iguaçu-Cascavel corridor in the development of the region encouraged the federal government to invest in support infrastructure, and in the planning of Foz do Iguaçu due to its strategic location and importance in improving its relations with its neighbours (Peris, 2002).

A History of Natural Area Protection

Owing to its rich natural resources, spatial occupation and resource use, Brazil has a long history of natural resource use and protection dating as early as 1911 (Costa, undated). Cashing in on the fertile lands and export demands, there has been a progression of products/raw materials such as dyewood, sugarcane, gold, coffee, rubber and soybeans whose extraction and cultivation threatened some of the rich natural areas with its growth and expansion (May, 1999).

Natural resource policy in Brazil used to be distributed among various ministries, making coordination and implementation a problem. Specialised environmental agencies were created in the federal level and in some states, while national parks and reserves were set up. By 1992, thirty-four national parks and fifty-six biological reserves had been established (Costa, undated).

The debt crisis of the 1980s led to the redefinition of the role of the government in defining development paths. This meant “the privatisation of state enterprise, the opening up to foreign investments of various sectors previously reserved for domestic firms, a drastic reduction in import tariffs, transport costs, and other trade barriers, and the formation of regional trade blocks” (May, 1999, p 4).

The National Environmental Policy in 1981 saw the decentralisation of functions, the creation of the National System for the Environment (Sistema Nacional do Meio Ambiente, SISAMA) composed of government agencies in charge of creating and checking policies regarding natural resource use and environmental quality, and the National Environmental Council (Conselho Nacional do Meio Ambiente, CONAMA) which provides the technical and administrative guidelines for the implementation of the environmental policies (May, 1999). CONAMA is composed of seventy-six members: fifteen representatives of non-governmental organizations (NGOs) and associations,
seven syndicates’ confederations, all of twenty-six state governments, one Federal District government and twenty-seven representatives of the federal government ministries and some federal institutions (Medonça, 2000). Aside from the government agencies, CONAMA’s membership included the “presidents of principal trade unions, industrial and agricultural federations, two nongovernmental environmental assemblies, and five civil organizations representing environmental concerns pertinent to distinct macroregions” (May, 1999, p 7).

The 1988 constitution further stressed the importance of protecting the environment in achieving socioeconomic development and identified the roles the various government departments have to play in order to secure the natural environment (May, 1999). What is significant about this new constitution is that it empowered the various states to come up with their own laws regarding the environment; and municipalities, in turn, were in charge of creating and enacting master plans in keeping with the environmental direction (May, 1999).

In 1989, the Brazilian Institute for the Environment and Renewable Natural Resources (Instituto Brasileiro do Meio Ambiente e dos Recursos Naturais Renováveis or IBAMA) was created to bring together several agencies and departments dealing with pollution control, ecological reserves, environmental education, forestry, fisheries and natural rubber policy (May, 1999). This super agency became a subordinate of the Ministry of the Environment (MMA) which was created in 1992 after the Earth Summit conference with the mandate for Amazon protection added in 1994 and water resources in 1995 (May, 1999).

To promote the protection of forested areas and promote ecotourism, the government came up with the Ecological Value-Added Tax (ICMS Ecologico). The initiative encourages private property land owners to register their land as a permanent nature reserve and receive tax breaks in return (Hinchberger, 2004). This has resulted in the increase in the number and size of protected areas which has greatly helped in the recuperation and regeneration of degraded forestlands; Paraná is one of the states active in the program, ensuring almost a million hectares of protected forestlands (Stratos Inc, 2004).

Foz do Iguaçu never had much to offer the settlers over the years. Logging soon gave way to agriculture and the farming of soy, cotton, wheat, mate herb, etc. The
acknowledgement of the importance of the Iguaçu National Park as early as 1915 and its proclamation as a national park in 1939 is probably its redeeming feature. Through the years, deforestation has persisted despite the lowering of agriculture subsidies due to agriculture expansion, the strong domestic and international demand of timber, and the investment in extensive transport networks (Lele et al., 2000). The World Bank report (Lele et al., 2000) concluded that though reforms on forest policy are undertaken, it would only slow deforestation and not stop it altogether. The report further noted that earlier talks in the 1990s with the economic and work sector concluded that the only way to protect forests is to either isolate or make inaccessible to the people as well as the need for an intensive rather than extensive transport network.

**IGUAÇU NATIONAL PARK**  
**(PARQUE NACIONAL DO IGUAÇU - PNI)**

It was in 1542 when Álvar Nuñez Cabeza de Vaca discovered the waterfalls of Iguaçu (IBAMA, 2000). In 1897, the military scribe Edmundo de Barros wrote about the waterfalls and created a plan for a park. However, it was not until the visit of airplane inventor Alberto Santos Dumont in 1916 that the area around the waterfalls became a protected area. State Decree No.653 allotted initially 1,008 hectares of land for the reservation but since Paraná at that time could not afford to purchase the land, the task fell on the federal government to expropriate the area, since then it has been under its jurisdiction. Federal Decree No.1035 created the Iguaçu National Park in 1939.

Paraná possesses over twenty-eight national parks. Iguaçu National Park is the most significant, receiving an average of more than 750,000 visitors per year (SETU, 2004). UNESCO declared the Iguaçu National Park a Natural World Heritage Site in 1997. It is home to the world’s largest waterfalls, which extends over 2,700 metres, and safeguards threatened fauna, which includes two species of otter, giant anteater and harpy eagle.

IBAMA manages the park but several concessionaires operate in the park. Each concessionaire has a contract of 10-15 years with IBAMA specific to the activities they offer the public (Pegoraro, 2005).

**Figure 9** BR 469 inside the park showing the 20-40 metre easement for powerlines  
Photo by author.
Figure 10  Iguaçu National Park showing its boundaries and the Old Colonial Road

Source: Horizonte Geografico, Guia Philips Parque Nacionais with IBAMA, MMA
Iguacu Falls is 28 km from the city centre. The park entrance is located at Km 18 of federal highway BR 469 which extends from the city centre and terminates at Canoe Port (Porto Canoas), 12 km south. It is a two-lane, two-way asphalted road with a soft shoulder and a 20-40 metre easement from the side of the road which accommodates power lines (see Figure 9). As with the Vila Velha State Park in Ponta Grossa, the crossing of the power lines through the park has been a problem because it requires the clearing of setbacks and maintenance by the park. IBAMA hopes to be able to come up with enough funds to locate these lines underground so the forest can reclaim the area.

The park has a current area of 185,262.50 hectares with only 3% developed and open to the public. The park has a perimeter of 420 km and is bound to the north by the Old Guarapauva Road (Estrada Velha de Guarapauva), Iguaçu River to the south, and the Gonçalves Dias River to the east. Fourteen municipalities contribute to the present area of the national park with the main access through Foz do Iguaçu (refer to Figure 10).

From interviews with IBAMA officials, Noguiera-Paes and Arruda in 24 May 2005, the park administration goes by the first objective of a national park as a conservation unit and not for visitation. The fact that the Iguaçu National Park receives the greatest number of visitors of all the national parks in Brazil, its economic significance, the compounded impacts of visitation, and the conservation of its biodiversity required the creation of a management plan.

From the history of the planning documents cited in IBAMA (2000), four management plans were put together from 1979-1999. The first one published in 1981 was up for evaluation in five years, followed by the Public Use Plan (Uso de Publico) of 1982. The scheduled evaluation never took place, which led to the creation of the 1994 Emergency Action Plan (Plano de Ação Emergencial - PAE).

The PAE was conceived as an alternative guide to the previous plan, which was created without using any instruments of planning and whose directives were now outdated (IBAMA, 2000). An analysis of the proposed programs of the 1981 Management Plan showed that barely 27.3% of activities were implemented (Auer, 1994 cited in IBAMA, 2000). Furthermore, the activities for the Subprograms on Inquiry, Monitoring, Education, Tourism and Administration were never carried out given the thirteen years that elapsed since its publication (IBAMA, 2000).
The 1982 Public Use Plan acknowledged the importance and significance of the biodiversity of the park. This document emphasized the need to control access and identified areas for development and public use as well as the creation of activities that will increase the environmental awareness and educate the visitors about the importance of the biodiversity of the park (IBDF and FBCN, 1982).

The creation of the 1999 Management Plan brought together several representatives from the communities surrounding the park, NGOs, IBAMA, and the private sector interested in bidding for the proposed various activities. This new plan is timely since most of the 1981 plans have been realised and needed evaluation, while the new data collected by IBAMA would be advantageous to the new plan (Müller, 2005).

Two identified areas of management relevant to the study are discussed as follows: the first involves the installation of an internal transport system and vehicle regulations; and second, the change in the management set-up where a concessionaire system in the operations of activity centres is introduced.

**Internal Transport Scheme**

Prior to year 2000 all visitors were given free access to the park. Everyone passed through the Old Gate, paid their fees and drove their way around the park. Table 7 shows the types and number of vehicles entering the park from 1981 to 2000. This practice created long queues that stretched for miles and resulted in a high incidence of wild animals being run over (h2foz, undated). The levels of degradation that resulted from this practice helped shape visitor guidelines of the 1999 Management Plan. With the problems and issues related to the number of vehicles accessing the park, the 1999 Management Plan identified the need to provide public transport and limit public access. With the access restrictions imposed by the new system in 2000, there is only anecdotal evidence that the number of roadkill has decreased (Müller, 2005).

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Private Car</td>
<td>95,323</td>
<td>104,011</td>
<td>116,542</td>
<td>130,766</td>
<td>105,032</td>
</tr>
<tr>
<td>Bus</td>
<td>14,871</td>
<td>22,549</td>
<td>25,266</td>
<td>20,224</td>
<td>14,042</td>
</tr>
<tr>
<td>Motorcycle</td>
<td>7,849</td>
<td>931</td>
<td>627</td>
<td>669</td>
<td>798</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>118,043</td>
<td>127,491</td>
<td>142,435</td>
<td>151,659</td>
<td>119,872</td>
</tr>
</tbody>
</table>

In 2000, an internal public transport system was introduced. Eight 72-passenger double-decker buses (Figure 11) leave the Visitor Centre every 10-20 minutes depending on the number of visitors in queue. Visitor behaviour reminders and the various attractions are brought to the attention of the passengers over the bus’ public address system. According to a survey done by Cataratas SA, the major concessionaire who installed the new system for IBAMA, the majority (90%) of those who answered their feedback survey greatly appreciated the system. Benvenutti (2005), the President of Cataratas SA during the interview on 24 June 2005, echoed this sentiment by saying that it has proved to be a good system of managing visitors as well as providing for their comfort and safety.

Environmental considerations were taken into account in the choice of vehicles. According to Benvenutti (2005), the double-decker buses have a combustion system in compliance with CONAMA\textsuperscript{15} IV and EURO II, which means that it is less polluting as its carbon exhaust is minimal and is better for the environment. Benvenutti (2005) further asserts that these buses utilise a special diesel, commonly known as Metropolitan Diesel and not the same type used by cargo trucks. He affirms that this is the same fuel used by the buses of the greater metropolitan areas such as Curitiba, São Paulo, Rio de Janeiro, and Belo Horizonte because it is less polluting.

From the initial documents gathered regarding the national park, there was no mention of private vehicles still being allowed entry into the park even after 2000. I only discovered the special arrangements that local tourist agencies operate by during data gathering in Foz do Iguaçu in June 2005. IBAMA has continued to monitor the vehicles entering the national park. Statistics shown in Figure 12 that from the introduction of the bus system in 2000, the number of vehicles inside the park have been reduced by 70%. The municipal tourism officer France Chou (2005), agrees that the present system is much better than the previous one wherein it was a free-for-all. However, he believes

\textsuperscript{15} Conselho Nacional do Meio Ambiente, CONAMA - National Environmental Council of Brazil which comes up with various standards to improve air quality amongst others.
that the pressure applied by the tourism agencies on the management of the park and poor passenger logistics are the key reasons why so many vehicles are allowed inside the park, a situation that could still be improved on.

With the expected increase in visitation, the operator has plans to add two more buses by next year. These additional buses can accommodate more visitors and thereby decrease the number of tourism agency vehicles entering the park.

From the interview with Müller on 21 June 2005, a program to reduce the number of vehicles inside the park was put in place from the start. The first phase involved not allowing visitors to bring their cars into the park and installing an internal transport mode. The second phase discouraged travel agencies of other municipalities to bring in their vehicles. IBAMA would like to eliminate the practice where travel agencies based in Foz do Iguaçu are allowed to bring in their visitors using their own cars, vans, and buses. However, it remains a complex issue involving pressure from the public and politics (Müller, 2005). Further to the program of reducing the number of vehicles inside the park, there are plans of constructing a cycling strip along BR 469 up to the Porto Canoas Space (IBAMA, 2000).
The campaign to eliminate vehicles inside the park entails the consideration of various personalities and realities. The presence of the Hotel Tropical das Cataratas inside the park allows for the entry of airport taxis ferrying guests, delivery trucks/vans that service the hotel, hotel vehicles and official cars. According to Müller (2005), vehicles granted access are those of the various concessionaires, the officials and employees of IBAMA and the very few people who live within the park, which includes the Park Chief.

Table 8

<table>
<thead>
<tr>
<th>Year</th>
<th>Suppliers/ Services</th>
<th>Concessionaires</th>
<th>Staff members</th>
<th>Tourism Agencies &amp; Hotel Taxis</th>
<th>Agency vehicles</th>
<th>Bus Concessionaires</th>
<th>others</th>
<th>Totals</th>
</tr>
</thead>
<tbody>
<tr>
<td>2002</td>
<td>6,689</td>
<td>8,805</td>
<td>5,077</td>
<td>37,768</td>
<td>20,583</td>
<td>15,591</td>
<td>4,059</td>
<td>98,572</td>
</tr>
<tr>
<td>2003</td>
<td>4,399</td>
<td>6,697</td>
<td>3,665</td>
<td>22,891</td>
<td>13,736</td>
<td>10,983</td>
<td>2,393</td>
<td>64,764</td>
</tr>
</tbody>
</table>

Note: Data covering “others” include Private Guests and Park Residents’ Visitors
Source: IBAMA – Iguazu National Park, 2004

From Table 8, statistics on the number of vehicles granted access from January to August of 2002 and 2003 show that vehicles of tourism agencies and taxis serving the hotel are frequent reaching 37,768 in 2002 and 22,891 in 2003. The main reason behind this according to the interviews with tourism agency representatives, Gonzales and Santos, on 17 June 2005 is their belief that to ensure their clients’ safety and comfort it is their duty to bring them close to the various activity centres, thus discouraging the utilisation of the public transport provided by the national park.

The most common criticism of visitors from the survey that Cataratas SA regularly collects is the number of vehicles in the park (Benvenutti, 2005). The data collected by IBAMA from January to August of 2002 and again in 2003 shows a drop of 33,808 in the number of vehicles (Table 8). This decrease is significant given the aim of reducing the number of vehicles inside the park, but is still not enough because IBAMA would like the non-entry of private vehicles inside the park imposed strictly.

After 2000, visitors arriving by private vehicle are required to leave their vehicles at the parking area beside the Visitors’ Centre which can accommodate 170 buses, 20 vans and 676 small vehicles with corresponding parking fees of R$10.50 (A$5.13) for buses and R$6.50 (A$3.18) for vans and small vehicles.16 The park buses are then utilised to reach the waterfalls stopping at three stations namely Black Well Trail, Macuco Safari, and Waterfalls Trail, before reaching the final stop at the Canoe Port, which is 12 km from

---

16 Rates and exchange rates as at 31 January 2005. The figures may have changed but are retained for consistency of the context for data gathered from mid-May to June 2005. See current prices at www.cataratasonaguazu.com.br/precos_en.asp
the Visitors’ Centre. The trip takes approximately twenty minutes given the 40 km/h speed limit inside the park. From anecdotal evidence, the reduction in speed limit has been beneficial to the wild animals that cross the street and has reduced the number of roadkill.

**The Issue of the Old Colonial Road** (refer to **Figure 10** *Iguaçu National Park*)

Access into the park cannot be discussed without bringing up the controversy of the 18-km Old Colonial Road connecting Medianeira in the north and Capanema in the south cutting through the Park. A small port constructed at Iguaçu River completes the link with Capanema with boats plying the short course. From archival records, the road may have been constructed anywhere between 1953 and 1955 and utilised by people to either get to Capanema or Medianeira (IBAMA, 2000).

The road was closed in 1986 when the state highway PR 182 was paved and Santa Tereza do Oeste was linked with Realeza to the south creating a 150 km paved ring road from Capanema to Foz do Iguaçu going around the park (IBAMA, 2000). According to Pegoraro in the interview on 14 June 2005, the road remained closed for eleven years but underhandedly reopened in 1997 by the communities until its closure in 2000. The issue revolved around the economic and social concerns of the municipalities and IBAMA’s stand in the preservation of the environment (IBAMA, 2000). The park was in the List of World Heritage in Danger from 1999-2001 due to this issue after the UNESCO and IUCN mission to the site in 1999 (UNESCO, 1997). The incident made IBAMA evaluate its relationship with its neighbours.

**IBAMA - Concessionaire System**

The Iguaçu National Park installed the concessionaire system in 2000. Public-private partnership set-ups allow the government to manage the operations without spending too much on infrastructure, maintenance and personnel. The private entity invests in the necessary infrastructure following the guidelines set in the 1999 Management Plan, hires the personnel, and manages the service for a fixed number of years (from 10-15 years) as outlined in the contract.

---

17 Details of the proceedings of the case between IBAMA (then Instituto Brasileiro de Desenvolvimento Florestal - IBDF) and the municipal officers of Capanema and Jardinopolis regarding the opening of the road are outlined in the 1999 Management Plan. IBAMA 2000, ‘Plano de Manejo, Parque Nacional do Iguaçu’ report by Instituto Brasileiro do Meio Ambiente e dos Recursos Naturais Renovaveis, Brasilia-DF.
A unique relationship is formed between IBAMA as the environmental arm of the government focused on ecological conservation and the concessionaires who provide tourist services. IBAMA’s role is confined to the promotion of the attraction of the waterfalls, protection of the Park, monitoring of visitor activities, environmental education and administration of the Park (Pegoraro, 2005). The concessionaires work within the parameters set by IBAMA and charge for guided tours into the forest, boat rides to the waterfalls or trips upriver or eco-adventures such as abseiling and rapelling.

Six concessionaires serve the park and provide visitor activities. Cataratas SA is the major concessionaire and manages the Visitors’ Centre, Canoe Port Area with its restaurants and shops, as well as the public transport inside the Park. Macuco Ecoaventura manages the Macuco Safari, Black Well and Banana Tree Trails. Campo de Desafios manages Cânion Iguaçu offering adventure ecotourism; and Helisul, based outside the boundaries of the park and offers helicopter rides over the falls. The operation of Helisul is a sour point between Argentina and Brazil. In 1997, the presidents of the republics created a Bi-National Commission (Comissão Binacional) to provide a venue for discussions regarding park management. According to Medonça (2000), several studies regarding the impacts of helicopter operations were done but very little changes have been carried out.

Prior to the revamp in 2000, park infrastructure was minimal and visitor amenities were of poor quality, but this did not deter the visitors from coming as shown in the visitor statistics in Figure 13. The park’s popularity has been established by the attraction of the waterfalls for decades yet the potential of the park as an ecotourism destination and environmental education centre had not really taken off as set out in the 1981 Public Use Plan.

It can be said that the park offers two types of tourism: mass tourism and ecotourism (Müller, 2005, Skaf, 2005, Noguiera-Paes, 2005). With the Iguaçu Falls as the main attraction, mass tourism involves the free and accessible Waterfalls Trail (Trilha das Cataratas) which allows the visitor to view the falls at various points along the trail. The paved trail is 1,200 metres in length with a path width capable of accommodating three to four persons walking abreast. The trail is a series of paths that hug the cliffside, affords the visitor views of the falls, and terminates at the Naipi Area (Espaço Naipi) which has a panoramic elevator right next to the waterfalls. The trail from Naipi leads to the Canoe Port Area (Espaço Porto Canoas) with its restaurants and shops.
The Waterfalls Trail was designed for eighty people on the trail at one time but given its popularity, it can be packed with 2,000 people, resulting in long queues with minimum visibility of the falls (Müller, 2005). This scenario can be observed during peak season and visitor control is difficult. The dilemma of turning away tourists who come from far off places to see the falls is an acknowledged visitor management predicament that IBAMA and Cataratas SA have to work out given their different thrusts.

**Ecotourism and Visitor Management**

As stated earlier, mass tourism is confined to the Waterfalls Trail and ecotourism activities are managed by the concessionaires. Ecotourism involves regulated tours through the forest, upriver and near the waterfalls and requires engaging in activities such as hiking, cycling, kayaking, snorkelling, etc. The activities are monitored and entail the utilisation of environment friendly modes.

Ecotourism activities do not come cheap with entrance fees falling anywhere between R$30 (A$16.70) to R$50 (A$27.80) and can go as high as R$160 (A$90) for a guided activity. According to Pegoraro (2005), IBAMA worked out these fees and target international tourists who can afford the rates. Takahashi (pers. comm. 8 June 2005) believes the high rates isolate Brazilians from enjoying their country’s attractions. Only

---

**Figure 13** Number of visitors to the Iguaçu National Park, 1980~2004
Source: IBAMA, 2005
those who have paid the fees have access to the trails, a system totally unlike that in Argentina where a tourist is free to go anywhere and all the trails are open for exploration (Muniz, 2005). A free-for-all system reminiscent of the type which predominated in the Iguaçu National Park prior to 2000 and which the foreign tourists seem to have a hard time adjusting to after they have gone to Iguazú National Park in Argentina first.

All activities offered by the present concessionaires were roughly laid out in the 1981 Public Use Plan (IBDF and FBCN, 1982). Areas where old structures once stood are utilised by present sites, while trails once used by the Tupi-Guarani Indians have been developed and re-used. Maintenance of the trails is the obligation of the concessionaires with clearing and repair works usually done on Monday mornings when the park is closed to the public.

IBAMA has a special monitoring group that randomly checks the operations of the concessionaires. Attention is given to the number of visitors, the way the tour is conducted (whether the visitors are educated about the flora and fauna), the maintenance/condition of the trails and equipment, and whether all activities are carried out as approved by IBAMA (Müller, 2005). Proposals for new activities need the approval of IBAMA prior to implementation.

The concessionaires are aware of the importance of the environment. From the interviews with Marcelo Skaf (Director, Cânion Iguaçu on 22 June 2005) and Ana Claudia Muniz (Biologist, Macuco Safari on 22 June 2005), their organisations have developed systems to improve the experience with nature without increasing the pressure on the environment. Though IBAMA has outlined the minimum design requirements to safeguard the environment in the 1999 Management Plan, it is up to the concessionaires to come up with detailed designs of structures and layout of proposed activities. Examples of these would be the installation of raised platforms for trails going through the forest, design and utilisation of hybrid modes of transport and continuing research in improving the current services.

The various activities discussed below emphasise the mobility and modes utilized by the visitor(s):

**Black Well Trail (Trilha Poço Preto)** (refer to Figure 14)

The Trilha Poço Preto or Black Well Trail with its nine kilometres of trail can be accomplished either on foot or on a bicycle. The first 320 m of the 9-km trail is on a raised platform through the forest. At the junction, visitors are given the option of doing the rest of the trail on a cariton (a big 4-wheeled motorcycle pulling a 10-seater open-air vehicle) or on foot which takes around four hours or by bicycle which takes around three hours. The 2-metre wide dirt trail, which winds in some places and rolls in others, passes through the forest and enables one to be up close and personal with the vegetation and animals. The trail terminates at the dock where a bi-motor diesel-fuelled boat is waiting with kayaks. Prior to the boat ride the group walks another 500-metre trail to the Alligator Pond (Lagoa do Jacare) where a 10-metre observation tower allows one to view the birds and animals living around the area. The 30-minute boat ride upriver through the various small islands allows twenty minutes of leisure time to those going for a kayak ride around the isles or those snorkelling.

Group size is maintained at a maximum of fifteen and requires half the day to do everything from the walk to the boat ride with groups leaving every hour. This trail opened to the public in January 2005 and still needs evaluation.

![Figure 14 Transport Modes (L-R) – 10-seater Cariton, Bicycles, Diesel-powered boat](Photographs by the author.)

**Banana Tree Trail (Trilha Bananeiras)**

This trail is relatively new, operated in conjunction with Black Well Trail, but the trail is much shorter at only 2 km. The trail can be undertaken by walking or riding a bicycle to the boat dock (the same one used by Black Well Trail) where the group embarks for a trip to the islands upriver. As with the Black Well Trail, the trip terminates either at the Canoe Port Area or at the Banana Tree Port (Porto Bananeiras). However, unlike the Black Well Trail, this trip takes only 2 hours and 30 minutes to complete, with groups departing every 30 minutes.
Incidentally, several archaeological artefacts discovered at a site beside this trail have led to considerations of creating a historical exhibit (Müller, 2005).

**Macuco Safari**

Macuco Safari is the second station from the Visitors’ Centre and offers the most popular activity in the Park with its boat ride to the waterfalls. Macuco Safari has operated in the park for eighteen years under an ‘Authorized-to-Operate’ contract with IBAMA, similar to Hotel das Cataratas’ agreement with IBAMA yet unlike the current concessionaire-IBAMA contract wherein a specific time period is stipulated in the contract (Muniz, 2005).

They offer a 3 km guided tour through the forest using an electric powered vehicle with the guide bringing to the visitors’ attention the various flora and fauna along the way. At the 3 km junction, visitors have the option of continuing on the vehicle or taking a 600 m walk through the forest with a side trip to the Macuco Falls (Salto do Macuco) before proceeding to the boat station. From there, a 30-minute boat ride to the waterfalls proves to be a very cold and wet experience with the pilot doing his best to bring the boat as close to the waterfalls as possible drenching everyone in the process. Depending on the volume of water, the boats try to go upriver as close to the Devil’s Throat (Garganta de Diablo) with the greatest volume of water. Afterwards, everyone hops on to an alcohol-fuelled jeep for the return journey. (Figure 15)

The whole experience takes almost two hours with departures from the station every ten minutes. Macuco Safari receives an average of 800 visitors per day but this figure can reach over a thousand during the peak months (Muniz, 2005).

Communication becomes of utmost importance with guides and drivers coordinating the flow of visitors (Muniz, 2005).
There are six electric vehicles, each of which can take 26 passengers – 24 on the pulled platform with fixed seats, and two persons sitting behind the driver. This mode has only been in use for the last two years and prior to this they were using alcohol-fuelled jeeps of which they have seven (Muniz, 2005). The inflatable boats can accommodate the same number of passengers whereas it takes two jeeps to ferry the same number. Only four boats are employed during the regular season and two more are added to cope with the increase of visitors during peak season. The design of the vehicles and platform are borne of the genius of the director of Macuco Safari/Macuco Ecoaventura, Ademir Santos, who has continued to develop vehicle prototypes to decrease impacts on the environment.

**Cânion Iguaçu**

Cânion Iguaçu provides several types of eco-adventures to visitors. There is a Canopy Tour and Zipline (Arborismo e Tirolesa) which is undertaken ten metres above ground doing various challenges and normally takes 30 minutes to complete. Indoor Climbing (Escalada) entails climbing walls with different difficulty levels. Abseiling (Rappel) allows one a good view of the canyon and the waterfalls as one goes down a 55-metre drop. There is also Cascading which involves rappelling underneath some of the 25-metre waterfalls and Whitewater Rafting on the rapids of the Iguaçu River. The trail leading to the Whitewater Rafting and Abseiling activities near the waterfalls is new but whose placement was determined with minimum disturbance to the growing vegetation around. As with the other walkways, it is 0.60 metres above ground allowing for the crossing of small animals underneath (Skaf, 2005).

The maximum number of people they can receive in a day is around a hundred. Prior to executing the various challenges, one is given an overview of the exercise and made to undergo a training of sorts regarding the necessary skills that will be employed. A guide supervises all activities. There are eighteen people working in the team but during peak season, they add another five or six.

**In retrospect: Iguaçu National Park Management**

The 1999 Management Plan is a good planning document resulting from undertaking comprehensive reviews of the 1981 Public Use Plan and 1994 Emergency Action Plan. There is a genuine concern to protect biodiversity and plan for sustainable tourism. This is evident in the inclusion of the surrounding communities in the planning process as
well as the establishment of private-public partnerships in the operations of the tourist activities once the necessary guidelines and safeguards were in place. The problem with the Old Colonial Road serves as a reminder of desperate neighbours and poor monitoring of the territory.

The policies that govern visitor management of the Iguazu National Park are anchored on decreasing the number of vehicles inside the park. The toll of the previous years’ non-management on the environment and wildlife has been the basis for the restrictions and the installation of an internal public transport. Given an average of 2,000 visitors everyday, it will only take twenty-eight trips for one 72-seater bus or an average of 3.5 trips for each of the eight PNI buses in a 9-hour day with a 19.28-minute frequency. This shows that the present fleet which departs every 10-20 minutes is barely enough to ferry visitors to and from the Visitors’ Centre to the last station at the Canoe Port Area efficiently. Though the operations of Hotel das Cataratas inside the park is something that IBAMA can regulate once its contract is over, the strong lobby of the local tourism agencies makes the elimination of private vehicles inside the park difficult to realise.

The conscious mode choices made by the concessionaires indicate how much the system has matured in terms of operation and reflect their dedication to achieve the identified goals in the 1999 Management Plan. The awareness of the environmental impacts of transport modes by the various concessionaires has led to the utilisation of environmentally sensitive forms of transport for their activities such as electric-powered vehicles, alcohol-fuelled jeeps, diesel powered boats, and bicycles. This awareness of the impact of transport to the environment has seen changes in modes through the years e.g. Macuco Safari used only alcohol-fuelled jeeps prior to utilising electric vehicles.

The public-private partnership between the environmental agency and the private businesses has worked well in this setting. In the previous years, even with the 1981 Public Use Plan, the federal government through its environmental agency was not able to uphold the objective regarding access control and biodiversity protection. Although only basic infrastructure was provided, the sheer popularity of the destination made it

---

19 Calculation as follows: 2,000 visitors/72 seats ≈ 28 bus trips; park operates nine hours, from 8 a.m. to 5 p.m. 540 minutes/28 bus trips = 19.28 minutes. Each bus departs from the Visitors’ Centre every 19.28 minutes.

20 Alcohol fuel is seen as “clean” fuel due to its low emission of carbon monoxide, hydrocarbons and sulphur, and when used as an additive to gasoline it reduces the octane levels by replacing the hazardous tetraethyl lead. Ribeiro, S. K. 2000, 'The Brazilian Fuel Alcohol Programme', in Intergovernmental Panel on Climate Change (IPCC), accessed on 6 June 2006 from <http://www.grida.no.climate/ipcc/tectran/336.htm>.
profitable. The number of visitors the park receives daily works in favour of the private businesses who need to recoup their investment, while for IBAMA it means it has a partner that can help implement the management plan. A win-win scenario is created with investors assured of a profit and IBAMA, freed from the business aspect of managing a park, can now focus its attention to the management of the environment.

At present, the major point of entry remains in Foz do Iguaçu via federal highway BR 469 even with new trails open to the public in São Miguel do Iguaçu and Céu Azul. The transport network that serves the national park has good infrastructure provided by the federal government. Although the park is under the jurisdiction of the federal government and it remains one of the most lucrative national parks, the transport policies of Foz do Iguaçu do not exploit the potential of creating better linkage or providing better services. The following section presents the bigger picture regarding policy-making in Foz do Iguaçu and the influence of the state government of Paraná.

**FOZ DO IGUAÇU AS A TOURIST DESTINATION AND ITS TRANSPORT NETWORK**

Foz do Iguaçu has an area of 617.70 km² and a population of about 293,646 in 2004 (SMTU, 2005). For a city registering only 80,000 vehicles, the city provides services for 120,000, which is proof of the level of investment the federal government has placed on the city’s transport infrastructure. It means that the city is well linked by good roads and bridges, which encourage interstate, inter-municipal, and international road travel. The increased number of visitor vehicles in the city is a situation that Mantovani asserted during the interview on 20 June 2005 can take its toll on the city’s resources. She attributes the number to both inter-municipal and interstate visitors because most of those coming from Curitiba (637 km) and the states of São Paulo (1,047 km), Rio Grande do Sul (Porto Alegre 799 km), and Santa Catarina (Florianopolis 829 km) take long drives to reach the city. The influx of tourists is greatly dependent on the time of the year with summer (usually January), school breaks (July), the Carnival, and Easter registering the most number of visitors (Chou and Vandre, 2005, IBAMA, 2005).

**National and International Linkages**

Foz do Iguaçu is linked to the rest of Brazil by federal highway BR 277, with Ciudad del Este in Paraguay through the Friendship Bridge, and to the city of Puerto Iguazú in Argentina by Tancredo Neves Bridge.
Good road infrastructure is critical for a country as vast as Brazil and a public transport network anchored on land transport, where buses ferry about 140 million passengers every year along its road network of 1.8 million kilometers (ANTT, undated). The years under President Kubitschek (1956-1961) were those of building intensively. The national transport network especially the highway sector and particularly federal and state roads, grew by 47.7% (Lessa quoted by Alexander, 1991). This highway building coupled with the boost to the automobile manufacturing and industrial sector provided the impetus for Brazilian mobility. These highways, aside from linking the country terrestrially, facilitated the movement of goods from south to north and stopped the north’s dependence on the more expensive maritime transport of goods (Alexander, 1991). The resultant good road infrastructure continued from the Kubitschek years and the government’s support for its alcohol program by regulating the cost of alcohol to 60% the price of gasoline (IEA, 2004), has definitely made the car a very attractive alternative to the bus.

The public transport system is composed primarily of buses and airlines plying inter-municipal, interstate, and international routes. From Figure 16, tourists going to Foz do Iguaçu from 1995-2001 show no significant mode preference, which may be by airplane, bus or car. It was only in 2003 when 48% of tourists drove, followed by 26.5% who took the bus and 22.4% who took a flight (SETU, 2004). With a well-developed road network and a variety of buses connecting the different states and city centres, it is no surprise that land transport will always have a greater mode share than air.

The popularity of the car as the mode of choice, as seen in Figure 16, is due to several factors. From the report of the US-based Renewable Fuels Association, about 40% of the cars in Brazil run on 100% ethanol while the remainder run on a mixture of 22% ethanol and 78% gasoline (Pahl, 2005). The government has always tried to maintain alcohol prices at a maximum 60% of the price of gasoline (IEA, 2004) e.g. prices per litre in 22 June 2005 were R$2.26 (A$1.25) for gasoline, R$1.67 (A$0.93) for diesel, and alcohol was R$1.21 (A$0.67). With cheaper fuel for the cars and good roads linking the major cities, travel by car becomes a convenient option21. There is also the reality that even if intrastate or interstate bus services are well provided; if the destination city’s public transport system is inefficient, the incentive of taking the car increases.

---

21 Calculating Curitiba-Foz do Iguaçu trip (637 km), sleeper buses (leito) cost R$141.18 (A$78.43) while fuel costs would amount to R$64.23 (A$35.68) at 12 km/L usage and R$1.21 (A$0.67) per litre of alcohol fuel.
The International Bus Station (Rodoviaria) located 4.4 km from the Urban Transport Terminal (Terminal Transporte Urbano –TTU) is under the management of the federal government and run by the National Agency for Land Transportation (Agencia Nacional de Transportes Terrestres – ANTT). Buses from Chile, Uruguay, Paraguay and Argentina as well as inter-municipal and interstate buses utilise the station. Figure 17 shows passenger movement from 1995 to 2003.

From 1995 to 2003, the volume of passengers in the bus terminals of Parana’s major cities has gone down and in Foz do Iguaçu alone, the number of passengers decreased from over 1.3 million passengers in 1995 to just a little over 500,000 in 2003. Movement in the International Bus Station in 1996 reached a little over 1.9 million while from 2000 to 2003 (see Figure 17) the volume of passengers played around the 1.15 million mark. The decrease in patronage can be attributed to two factors. The first reason is the decrease in the number of shoppers or ‘sacoleiros’ that go to Paraguay to purchase merchandise ever since a crackdown on illegal activity was put in place in mid-1990s. The second reason is derived from conversations with locals and tourism officials attributing the dive in number of bus passengers to the emergence of GOL Lineas.

Figure 16 Modes utilised by visitors to Foz do Iguaçu
Source: SETU, 2006
Aéreas Inteligentes a ‘low-cost, low-fare’ airline, which started operations in 2001. It is interesting to note that Grupo Áurea that started GOL is a ground transport group operating around Brazil for over fifty years (Shifrin, 2004).

Three international airports service the region namely, the Foz do Iguaçu International Airport in Brazil, Ciudad del Este International Airport in Paraguay, and the Puerto Iguassu International Airport in Argentina. Due to the proximity of these airports to Foz do Iguaçu, these also utilize its radar approach control. Infraero manages the Foz do Iguaçu International Airport which operates twenty-four hours a day and has an average of ten flights (both national and international) per day and 48,000 passengers per year (ICVB, 2005). It is located at Km 16.5 of federal highway BR 469 and is 16 km from downtown, 12 km from the Iguazu National Park entrance, 10 km from the Tancredo Neves Bridge, 20 km from the Friendship Bridge, and 25 km from Itaipu Hydroelectric Dam.

Based on SETU’s (2004) data, since 1995 the Foz do Iguaçu International Airport has consistently received over 200,000 passengers each year and is second only in volume received to that of Afonso Pena International Airport in Curitiba. Figure 18 shows the passenger movement at the airport from 1995 to 2003. The decrease in 2002 is due to post 9/11 reaction and terrorism rumours in the region. In 1987 there were only three
airline companies operating in Foz do Iguaçu, this number increased to eight by 1996 but decreased to just six in 2004 (SMTU, 2005). From interviews with the Marketing and Promotions Department of the State Tourism Office (Parana Turismo-PARANATUR) and the president of the Syndicate of Tourism Agencies in Curitiba (Sindicato das Empresas de Turismo -SINDETUR), their agencies believe the present number of flights is not enough (Hartmann, 2005, Gruber, 2005). They believe that the potential of Foz do Iguaçu as a tourist destination is not fully exploited given the low visitor turnout in relation to the tourist infrastructure provided. The city has an accommodation capacity of 18,000 beds in various sectors, from hotels, apartments to camping sites and has the fourth largest hotel in Brazil (ICVB, 2005). Obviously, tourism is a very important source of economic revenue of the city given the level of infrastructure and support services provided for it.

FozTrans and Transport Management

Foz do Iguaçu's local public transport system is composed of buses, taxis, and moto-taxis. The latter is the legitimisation of motorcycle drivers taking passengers to various points of the city and whose operation was founded on the illegal ferrying of passengers across Friendship Bridge to Paraguay (Mantovani, 2005). In 2005, with 196 public
transport buses serving the municipality, a total of 23,591,268 passengers were transported (FozTrans, 2006).

Changes to the Brazilian National Transit Code took effect in January 1998, decentralising the management of the transit system to the various municipalities. Prior to this, the municipalities only provided and maintained the transport infrastructure, while the transit services especially public buses were under the state government -- a practice which resulted in the uncoordinated provision of services (Mantovani, 2005).

The process of municipalisation led to the creation of the Institute of Transportation and Transit of Foz do Iguacu or FozTrans. The agency, tasked to “plan, organize, conduct, coordinate, execute, delegate and control the public services relating to public transport, passengers, traffic, transit system and the urban planning of the municipality” gave the municipality leverage to improve on the prevailing services (Law 2.116, 1997).

FozTrans’ ‘regime de concessão de serviço’ is in theory similar to Örn’s (2005) model on controlled competition wherein a ‘Public Transport Authority’ (in this case FozTrans) bids out the routes and services to private enterprises for a period of 10-15 years (Mantovani, 2005). The zoning of the municipality with each bus operator serving a specific zone has vastly improved services: Irmãos Rafagnin took the north; Transbalan Ltda., the south; Viacao Itaipu Ltda., the east; and Expresso Cidade de Foz servicing the northeast. Only Itaipu offers inter-district (interbairro) services and Irmãos Rafagnin takes on the University (Universitario) route. There are buses called the Madrugadão22 plying the “dead hours” from 12 midnight til 5 a.m. at the latest but only operate three specific routes serving highly populated areas: Vila C (34,952) to Ponto Meira (37,469), Morumbi (falls under the São Francisco region with a population of 45,298), and Tres Lagoas (27,124) (Mantovani, 2005, Chou and Vandre, 2005). Locals agree that this has greatly improved the bus services compared to the years when a free market system was in place. (Figure 19  Municipality of Foz do Iguacu showing the Regions, Population and Zone Bus Operators)

In 2002, FozTrans adopted the integrated transport system patterned after the big metropolitan areas of Rio de Janeiro, Sao Paulo and Curitiba. It took inspiration from the Curitiban model, which is based on an integrated bus network serving a linear city.

---

Figure 19: Municipality of Foz do Iguaçu showing the Regions, Population and Zone Bus Operators

Source: FozTrans
The Curitiban network services more than two million passengers every day and operates on a trunk and feeder system. The integrated bus network is composed of feeder, inter-district, crosstown and express buses which operate throughout the city. The increase in ridership in the 1980s led to the improvement in services and installation of the Direct Line (Ligeirinho) with limited stops, and the utilization of bi-articulated buses to increase the capacity of express busses from 57 to 270 (Cervero, 1998, PCE, 2002). Aside from dedicated busways, other infrastructures of note include the design of the Tube Stations that have eliminated passenger queuing to validate/purchase tickets and improved the efficiency of passenger entry/exit. Another is the Transfer Station that allow passengers to change from one line to another without paying an additional fare, a feature which supports the social fare implemented in 1980 where everyone pays a single fare and short trips subsidise the cost of long haul trips (Cervero, 1998, PCE, 2002).

The system is managed by the Urbanization Agency of Curitiba (Urbanização de Curitiba or URBS), which is in charge of setting the time tables and performance standards, negotiating contracts with bus companies, monitoring operations for compliance, planning new routes and services, collecting and distributing revenues, and the maintenance of the transfer stations (Cervero, 1998). On the other hand, long-range planning is under the jurisdiction of the municipal agency of the Institute of Research and Urban Planning of Curitiba (IPPUC) (Cervero, 1998). IPPUC and URBS coordinate their operations so that a good service is provided. They operate on a system of ‘permissions’ which has no fixed contract periods, making it easier to execute and terminate a contract (Cervero, 1998). With URBS running the system, this dynamic relationship between the agency and bus operators ensures that the quality of service is upheld by compensating operators by kilometres travelled rather than number of passengers (Cervero, 1998, PCE, 2002).

FozTrans, committed to improve its transport system, put in place the necessary infrastructure that would facilitate its implementation. The aim was to make possible a fast system similar to Curitiba’s Ligeirinho complete with twenty-one tube stations in the middle of thoroughfares with dedicated bus lanes and employing the integrated flat passenger fare. The Urban Transport Terminal serves as the transfer station where all public buses (with the exception of the inter-district routes) are required to pass through, enabling free transfers from one line to another – awarding the commuter cost savings but increasing travel time due to the limited inter-district services. Mantovani (2005)
acknowledges the inefficiency of this system. She shares that at present, there are plans to integrate more stations through electronic linkage, utilizing existing bus stops rather than constructing new transfer stations.

Comparatively, FozTrans is Foz do Iguaçu’s equivalent to Curitiba’s URBS, and is in charge of the operation of its bus services. The concept behind the system of management and governance is similar for both cities except for several aspects that have made the difference in the delivery of services between the success of the Bus Rapid Transit system in Curitiba and that installed in Foz do Iguaçu.

The major reason for the failure of the system is the method of service compensation that FozTrans employed. FozTrans collects a fixed monthly tax from the bus operators rather than pools fare revenue as Curitiba does and where service compensation is according to kilometre travelled variable to the type of bus and service rendered (Cervero, 1998, PCE, 2002). Mees (2000) contends that it is imperative to pool the collected fare in order to avoid disputes between operators regarding fare revenues. This inefficiency is proven by the conflict resolution sessions between FozTrans and the bus concessionaires as explained by Mantovani (2005).

FozTrans’ resultant system of operations is no different from the market-led one prior to the integration, with only the fixed tax collected and the allowance of passengers to free transfers at integrated stations as the major differences. As with any system run by market forces, the bus concessionaires half-heartedly supported the integrated system that required them to carry non-paying passengers who have transferred from another service because this lowers their fare revenue.

It is also not surprising that FozTrans, according to Mantovani (2005), has had great difficulty in extending bus routes or increasing the frequency of services especially to low-density areas with 40-minute service intervals because it would mean increasing the fares. Providing such services without the fare increase would mean lower income because of the non-compensation for the increase in distance covered. The only way for bus operators to agree to such a proposal is when an increase in its profit is a guarantee. The conflict of interest between the bus operators and FozTrans is palpable; the former is interested in increasing economic gains while the latter is keen on improving transport services.
The non-consideration of certain essential differences in ridership patterns has led to the unsustainability of the introduced system. First, Figure 19 shows that Foz do Iguacú’s 280,000 population is distributed in twelve regions with the most populous region having 45,298 inhabitants and the least having only 2,796. The uneven population distribution and the collection of fares by bus companies make the more populous routes lucrative. This has led buses on fixed routes to extend their coverage just to pick up more passengers to increase their revenue.

Second, Curitiba’s system was conceived to better manage its increasing ridership and traffic flow, problems that are non-existent in Foz do Iguacú. The system experiences an increase during peak hours in the morning and early evening. The city is more like a town than a bustling urban setting that is Curitiba. The average monthly ridership in Foz do Iguacú is equivalent to Curitiba’s daily average of two million.

Third, the economics of maintaining personnel in the stations given the limited ridership did not sit well with the bus operators. Fourth, the idea of taking on transferring non-paying passengers was another thing they were not keen doing. Lastly, the non-utility of the tube stations during summer when temperatures reach over 40°C has been a cause for aggravation.

Owing to the lack of technical people in the agency to do proper surveys and research, the creation of new routes is usually based on common sense and obvious demand; a case in point is the creation of the University route which plies the areas where most of the universities are located which is to the north-northeast (Mantovani, 2005).

With FozTrans still within its first ten years, most of the operations are on a trial and error mode but the system is deemed to be an improvement from the previous years (Mantovani, 2005, Chou and Vandre, 2005). Present concerns are geared more to improving the efficiency of the integrated system, frequency of bus services which is currently based on the population and ridership of the various zones with intervals ranging from 15 to 40 minutes, and easing the conflict between the agency and the concessionaires given the different interests which drive them (Mantovani, 2005).

**Transport in Tourism**

Foz do Iguacú as a tourist city with fifteen tourist attractions spread out in an area of 617.70 km² has a public transport network that is not very clear. It may be easy for the
locals who are used to the system, but a visitor to the city may find it incomprehensible given its lack of signage. The city has more tourists than locals and therefore the need to improve its legibility is crucial. Even Mantovani of FozTrans admitted during the interview on 20 June 2005 that their network lacked good maps, routes and timetables at the bus stops. A case in point are the two bus stops along Juscelino Kubitschek Avenue, one of the city’s major thoroughfares, spaced thirty metres apart catering for different routes. Given this set up with not enough signage, it would be easy to wait for a bus at the wrong stop.

Because transport services are demand-led and correlate with the populations of the regions, the timetables and services can be quite inconsistent. Regions with larger populations have extra services that run the early hours (Madrugadão) and technically have a 24-hour service, while other regions have to be content with services at 15, 30 to 40-minute intervals. To further compound matters, the timetables are quite forgettable due to the erratic intervals. From the timetable for the Parque Nacional - Urban Transport Terminal (TTU) route shown in Table 9, only the 30-minute interval on Sunday is regular and easy to remember.

<table>
<thead>
<tr>
<th>Hr</th>
<th>Monday to Saturday</th>
<th>Sunday</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Parque Nacional</td>
<td>TTU</td>
</tr>
<tr>
<td>5</td>
<td>42</td>
<td>25 42</td>
</tr>
<tr>
<td>6</td>
<td>04 26 48 PQ</td>
<td>04 PQ /26 PQ 48 PQ</td>
</tr>
<tr>
<td>7</td>
<td>10 PQ 32 PQ</td>
<td>10 PQ /32 PQ 54</td>
</tr>
<tr>
<td>8</td>
<td>16 PQ 38</td>
<td>16 PQ 38</td>
</tr>
<tr>
<td>9</td>
<td>00 PQ 22 44</td>
<td>00 22 44</td>
</tr>
<tr>
<td>10</td>
<td>06 28 50</td>
<td>06 28 50</td>
</tr>
<tr>
<td>11</td>
<td>12 34 56</td>
<td>12 34 56 PQ</td>
</tr>
<tr>
<td>12</td>
<td>18 40 PQ</td>
<td>18 PQ 40</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>After 6 p.m.</th>
</tr>
</thead>
<tbody>
<tr>
<td>18</td>
</tr>
<tr>
<td>19</td>
</tr>
<tr>
<td>20</td>
</tr>
<tr>
<td>21</td>
</tr>
<tr>
<td>22</td>
</tr>
<tr>
<td>23</td>
</tr>
<tr>
<td>24</td>
</tr>
</tbody>
</table>

Notes:
- Park operating hours: 9.00~17.00 (until 18.00 in summer)
- PQ – Trip begins/ends inside the national park at the School Park
- RG – Remanso Grande
- VC – Vila Carimã
- AR – Arroio Dourado

Source: FozTrans, 2005
Sometimes the provision of transport services in the fringes i.e. rural areas with very low population densities drops the further it is from the city centre. Iguaçu National Park, which is 18 km from the city centre, has its popularity to thank for the 22-minute service interval it receives in a region with a population of only 2,796. However, the regularity ends after 18.00 hours where the average interval becomes 36.7 minutes, ranging from a minimum of 22 to a maximum of 52 minutes as evening advances with the last trip departing the TTU at 24.00 hours as detailed in Table 9.

The unreliability of services especially to tourist attraction routes with very few visitors can lead to cuts in services with no warning or given replacement. From personal experience, the trip to Mark of the Three Frontiers 6 km outside of the city started out fine with the Porto Meira Ponte bus arriving on time, but getting back to the city centre was another matter altogether. Two hours after arrival, there was still no bus entering the area despite the fact that the destination has supposedly a 40-minute service interval. The locals finally took pity and organised for one of the local tourists who had come by car to drop me off at the city centre. The scourge of market-led services in a tourist city is that it further marginalises the very people who rely on it. The buses on the Porto Meira Ponte route have a regular 20-minute service interval with every second bus continuing on to the Mark of the Three Frontiers. Having no passengers aboard their vehicles is a disincentive for bus operators to run this last kilometre through a forested area to the Mark of the Three Frontiers where there is no guarantee that they will carry passengers on the way back. It is not as if this destination attracts 2,000 visitors every day, as does the Iguaçu National Park that it would warrant regular services.

<table>
<thead>
<tr>
<th>Services evaluated</th>
<th>Year (% indicating good level of service)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Agency Services</td>
<td>87.2</td>
</tr>
<tr>
<td>Taxi Services</td>
<td>72.0</td>
</tr>
<tr>
<td>Public Transport</td>
<td>70.1</td>
</tr>
</tbody>
</table>

Note: e - for 1997 and 2002, the numbers are estimated percentages
Source: SETU, 2004

A tourist city with unpredictable public transport services and illegible network further increases the attractiveness of hiring the services of tourism agencies to get around.

Table 10 shows the evaluation of tourists of the level of services provided by the city. As argued earlier, Foz do Iguaçu as a tourist city has inadequate public transport services. With the higher level of services these agencies provide to tourists compared with the
public transport system’s, it is not surprising that tourists gave the agencies an average of 88.83% good rating compared to the 70.5% that public transport received from 1996 to 2003 (see Table 10 from SETU, 2004). Even with the changes in transport management in 2002, the perceived level of service for public transport is not competitive enough for the services provided by the agencies. The inability of public transport to compete with the agencies means the entry of private vehicles inside the national park continues, making it difficult for IBAMA to keep private vehicles out of the park.

Table 11  Foz do Iguaçu Tourist Population and Travel Organisation

<table>
<thead>
<tr>
<th></th>
<th>2000</th>
<th>2001</th>
<th>2002</th>
<th>2003</th>
<th>AVE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Foz do Iguaçu Total Number of Tourists</td>
<td>800,102</td>
<td>*732,725</td>
<td>769,387</td>
<td>986,090</td>
<td>822,076</td>
</tr>
<tr>
<td>Iguaçu National Park Visitor Numbers</td>
<td>767,157</td>
<td>735,775</td>
<td>645,832</td>
<td>764,709</td>
<td>728,368.25</td>
</tr>
<tr>
<td>EMBRATUR</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Non-Agency assisted (%)</td>
<td>71.0</td>
<td>56.1</td>
<td>44.0</td>
<td>55.0</td>
<td>56.53</td>
</tr>
<tr>
<td>Agency Assisted (%)</td>
<td>29.0</td>
<td>43.9</td>
<td>56.0</td>
<td>45.0</td>
<td>43.48</td>
</tr>
<tr>
<td>Municipal Tourism Office</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Non-Agency assisted (%)</td>
<td>75.1</td>
<td>69.7</td>
<td>72.1</td>
<td>78.6</td>
<td>73.13</td>
</tr>
<tr>
<td>Agency Assisted (%)</td>
<td>24.9</td>
<td>30.3</td>
<td>27.9</td>
<td>24.4</td>
<td>26.88</td>
</tr>
</tbody>
</table>

Note: For 2001, the number of tourists to Foz do Iguaçu is an estimate, SETU, 2004.
Source: Estatísticas (Síntese), SMTU, May 2005

From Table 11, the data gathered by the Municipal Tourism Office from 2000-2003 shows that an average of 73% of tourists independently organised their travel. This statistic is very different from the numbers gathered by EMBRATUR which shows a drop from 71% in 2000 to 55% in 2003, an average of 56.53%. Taking the case of Iguaçu National Park where roughly 50% of its visitors are foreigners (see Figure 20), the number of visitors hiring an agency to plan their travel is significant. The convenience that these agencies provide has easily filled the gap in services of the public transport, making these more popular with tourists. As expected, an increase in the number of vehicles being rented out for tourism purposes has been observed, from only 287 in 2000 to 1,427 by 2005 (SMTU, 2005, SMTU, 2006).

‘Agency assisted’ trips can be either the ones run by local agencies and therefore have access into the park or international tours from Argentina and Paraguay denied vehicle entry into the park and therefore use the park’s internal public transport. The first type has park access and remains the problem of IBAMA who is trying to eliminate private vehicles inside the park.

Non-agency assisted travel can take many forms: it could be travel by Brazilians, mostly interstate, who drive west to Foz do Iguaçu. It could be the residents of Foz do Iguaçu playing host and driving their visitors around the various attractions. Moreover, it could
be travel by what tourism literature calls the FITs – free independent travellers e.g. backpackers. The first two types once had vehicle access inside the national park prior to year 2000 and are now users of the internal public transport provided by the park; while, the FITs are very much dependent on the city’s public transport network.

For those who go independently to Foz do Iguaçu, this tourist city is not easy to read. The system is not legible enough to facilitate ease of movement for those striking out on their own as it lacks signage, good maps and timetables at bus stops. It is safe to say that given Foz do Iguaçu’s infrastructure and linkage to the rest of Brazil, Argentina and Paraguay, not much has been done to improve transport services for tourists not utilizing tourism agencies for their travel. Unlike in Curitiba where, aside from the fact that all the attractions are accessible by its bus network, a dedicated bus now plies the Tourist Route (Linha Turismo). For the cost of R$15 (AU$8.35), one can visit five of the twenty-five tourist attractions in the city on the hop-on, hop-off tour bus.

Despite the fact that Foz do Iguaçu is a popular tourist destination, its transport services are not adequate to support the city’s various tourist destinations; a breach in public service that the private sector has filled. The city’s public transport network does not take into consideration the importance of providing better services to the Iguaçu National Park that receives on average 2,000 visitors per day. For a city that thrives on
tourism and the popularity of its national park, bus services departing the city centre every 22 minutes and bus stops lacking the necessary maps and schedules reflect the influence of local tourism lobbyists. With the inefficient public transport services, tourists are encouraged to contract local private agencies given special access to the national park. This situation keeps IBAMA from realising its goal of decreasing private vehicles inside the park.

CONCLUSIONS
The case of Iguaçu National Park illustrates how unsustainable visitation practices can be reversed for a popular ecotourism destination. First, it is important to draft a management plan that underlines the importance of biodiversity protection and proceeds to create guidelines to facilitate visitor management. Second, involving the private sector, organisations, academics and the neighbouring communities in the management and planning of the national park can facilitate changes. The adoption of a ‘concessionaire’ system saw the realisation of plans for the various attractions, which has increased the national park’s revenue and allowed IBAMA to focus on monitoring the environment. Third, private vehicle access can be limited by providing internal public transport, seeking an end to the impacts of the years where unregulated access has resulted to the increase of wild animals killed on its roads and the gradual degradation of the environment.

It makes a difference when the private sectors are also working to minimise the impact of their operations to the environment. The utilisation of sustainable modes of transport for the various activities such as electric-powered vehicles, alcohol fuelled jeeps, diesel powered boats, and bicycles; and the subsequent improvement in the design in the succeeding years is an indication of their regard for the value of the park.

Though access to ecotourism attractions may be either off-limits or limited to protect the setting, the limited transport service provided by FozTrans has fostered an unsustainable practice with tourism agencies providing a very convenient service. Given the attraction’s popularity, an improvement in public transport service would be favourable to the environment and be an advantage to the various establishments and communities along the route. Politics may drive the relationship between FozTrans and the tourism agencies, providing the private sector the advantage; a similar situation that IBAMA finds
itself in, with the strong lobby of the local tourism agencies and their demand for access inside the park.

Though the transport problems in the national park has more or less been resolved with the implementation of a new system, the city of Foz do Iguaçu still has to refine its transport system after it adopted the municipalisation policy and created the autarchy of FozTrans. Though Foz do Iguaçu modelled its transport system after Curitiba’s, it did not adopt the ‘sub-contracting’ system employed there; rather, it adopted the ‘concessionaire’ system that left the service planning to the private operators. Though the private operators initially cooperated with the local service plan, they soon limited the ‘free transfer’ system to the Urban Transport Terminal and abandoned the purpose-designed interchanges because individual operators were not prepared to suffer a loss by offering further free transfers. While public transport has improved, the project did not fully deliver the planned benefits because the institutional arrangements that made Curitiba’s interchanges function effectively were not adopted.

Given the fact that it has jurisdiction to a city with a population of over 290,000 in an area of 617.70 km², FozTrans as a transport autarchy is still not efficient as it should be. Transport service is poor and inadequate especially in areas with very low populations with service intervals as long as forty minutes. Its shortcomings are due to the market-led system that remained in force even after the installation of the integrated system, with the bus companies keen on getting high revenues rather than provide the necessary service. Add to this is the fact that most of the employees of FozTrans are not technically trained in transport matters; they only have one traffic engineer who does everything concerning traffic planning and management.

For cities that have popular tourist destinations, it should have a transport network that provides good linkage to its various attractions without the tourist resorting to contacting an agent to get around. A destination with good linkage and public transport service can reduce the competition provided by the car in inter-municipality travel. As with the Foz do Iguaçu experience, though international and inter-municipality linkage is well provided, intra-city travel can still be improved on by increasing public transport services, providing maps and routes at bus stops; thus making the city more legible to the visitor.
5. A DEVELOPED COUNTRY’S PERSPECTIVE: SWISS NATIONAL PARK Graubünden, Switzerland

The objective of this chapter is to provide the perspective of a developed country to the question of sustainability of a transport network serving a national park. To see how planning is carried out and the difference in service provision given that financial limitations are much less of an obstacle.

SWITZERLAND: CREATING AN IDEAL?

Efficiency and continuity are the characteristics which Martin (1931) credits for the success of Swiss institutions. From the documentation of the country’s colourful history where alliances were created and broken and where religious affiliation made a big difference, stability of economics and commerce became the focus of the new Confederation of 1848 (Dändliker, 1899, Martin, 1931). Rhinow and Huber-Hotz (1996, p 17) agree that the system of government is “designed for stability, continuity, and balance between the various minority interests in the state.”

Martin (1931) stressed the importance of continuity in the light of the political upheavals that eventually led to the creation of the 1848 Federal Constitution. This document outlined the role of the federal government and the authority of the cantons thereby creating an efficient organisation and system of management. Martin (1931) even describes the relationship between the federal government and the cantons as that of board directors and shareholders. The former is “concerned with the solution of technical problems... [and] its chief preoccupation is the success of the concern” and the latter should be vigilant to ensure efficiency of services (Martin, 1931, p 268).

Kübler and Heinalt (2005) classify Switzerland under the North and Middle European model of governance where the emphasis is on the functional capacity of the local government to deliver public services with much stress on local democracy. The Swiss system of government is formally decentralised with the cantons exercising different forms of democracy. For example, the cantons of Appenzell, Glarus and Unterwalden
have the Landsgemeinde or an outdoor assembly of its citizens who by a show of hands agree or deny a particular request in place of elections and voting. It also reflects the operation of the subsidiarity principle where the local governments enjoy strong constitutional status and high degree of policy-making autonomy and financial independence (Kübler and Heinelt, 2005).

Though Switzerland has a federal system, it is unlike the system of the United States or Australia where the personalities of the President or Prime Minister are conspicuous. What they have is a Federal Council composed of seven members elected to the position by the Federal Assembly\textsuperscript{27}, who act as administrators. These members head the seven major departments\textsuperscript{28} and govern Switzerland as a collective. One of the members is president for a year.

The federal constitution (Bundesverfassung) identifies the protection of the country and its citizens, the provision of postal, telephone and telecommunications services, monetary system, transport (motorways, railway), military, customs and diplomatic relations with other countries as the duties of the central government. The people can influence the change or extension of the constitution or the law through either an initiative or a referendum\textsuperscript{29}. The significance of the referendum is that it ensures the presentation of decisions of the Federal Assembly to the people for final approval (Rhinow and Huber-Hotz, 1996). This opportunity to influence the legislation has given voice to institutions, specialised organizations and opposition groups capable of calling a referendum (Rhinow and Huber-Hotz, 1996).

\textsuperscript{27} The Federal Assembly (Parliament) is the highest power of the Confederation composed of the National Council and the Council of States. The National Council has 200 members and represents the Swiss people; the number of canton representatives is dependent on the cantonal population. The Council of States with forty-six members represents the cantons, two representatives each and one for the six half-cantons. Rhinow, R. and Huber-Hotz, A. 1996, 'The Future of the Political System', in \textit{The New Switzerland: Problems and Policies}, (eds Kieser, R. and Spillman, K. R.) The Society for the Promotion of Science and Scholarship, Palo Alto, California.


\textsuperscript{29} An initiative requires 100,000 voters to request a vote for change or extension of the “constitution” or the “federal law”; whereas laws or changes in laws are subject to an optional referendum which can be called by 50,000 voters and needs to be approved by a majority of the people. Rhinow, R. and Huber-Hotz, A. 1996, 'The Future of the Political System', in \textit{The New Switzerland: Problems and Policies}, (eds Kieser, R. and Spillman, K. R.) The Society for the Promotion of Science and Scholarship, Palo Alto, California.
The governments of the twenty-six states or cantons (Kantone) are defined by the ‘cantonal constitution’ (Kantonsverfassung) and are responsible for the education, transport (state roads) and social institutions. Several districts (Bezirke) make up a canton and are in charge of education and justice (judicature). Districts are composed of a number of municipalities (Gemeinden) which at present number to 2,929. The municipality is the smallest political unit and is in charge of providing local services such as electricity, water, fire brigade, police, transport (local roads), schools and the collection of taxes. All levels have legislative, executive and judicial authorities independent of each other.

**Development of the Swiss transport network**

Transport and education are the common services that are provided by all levels of the government. Transport figured prominently in the country’s history given its terrain and location. From Dändliker’s (1899) account, the military roads constructed during the Roman Period ran north to south with two roads originating from Italy. One goes through the Great St Bernard Pass (Martigny) at the lower Valais passing through Avenches and Soleure to Basel. The second one crosses the Julier and Splügen passes of Graubünden leading up to Chur and on through the Rheintal along Lake Constance to Bregenz. A road that runs from Basel through Konstanz (Windisch), Winterthur, Pfäff and Arbon reaches Bregenz in Germany. These networks are still evident in the present network as shown in Figure 21.

Improved access resulted in the rapid development of commerce and trade, with products from Northern France and Germany passing through Switzerland into Italy. Swiss products such as cheese, wax, honey, pinewood and resin were developed and found a wider market (Dändliker, 1899). The roads built by the Romans in the beginning 200-300 AD not only allowed trade of Gaul and Italy to reach the Swiss territories of Geneva, Valais and Graubünden; it also facilitated the spread of Christianity and the ensuing construction of Bishoprics in larger towns such that of Geneva, Avenches, Basel, Konstanz, Martigny and Chur (Dändliker, 1899). The influence of religion soon manifested itself in the politics of state and confederation until the Sonderbund war, which saw the Protestant/Liberal confederation prevail over the Catholic cantons (Dändliker, 1899).
These early transport corridors established the influence of the cities of Zurich, Basel, Berne, Lausanne and Geneva located in the west; Chur in the east; and Martigny and Bellinzona in the south up until the present as shown in Figure 21 where these routes are delineated by the amount of traffic which pass through these cities. Development of the industries in Switzerland came before the introduction of the steam engine in 1839 in St Gall. Though the country has very little natural resource, it is abundant in water and has long since harnessed its power to support its industries. Tourism in Switzerland began in earnest during this time with the romantic period of literature describing its many attractions, with the Alps still unscaleable (Bernard, 1978). Martin (1931) reported that in 1828 52,000 travellers passed through Geneva.

Tourism and the intellectual reformation of the 1830s changed the landscape of Switzerland through improvement in what Dändliker (1899) called ‘externals and in material culture’. In Dändliker’s (1899, p 291) account, “from the year 1830 the fortifications, medieval walls, towers and gates were torn down …[and]… fine, broad streets, bordered by tasteful buildings; handsome school-houses, churches, townhalls and museums were erected; magnificent hotels, fitted with every comfort, fine promenades and quays, monuments and statues became the ornaments of modern towns.”
The popularity of Berne and Graubünden as tourist destinations according to Dändliker (1899) is mainly due to previous construction of carriage roads, high roads and passes over the Alps since 1840. These have inspired other cantons to build mountain roads and replace old wooden bridges and footbridges with artistic bridges of stone and iron. Movement of products and passengers increased in earnest with the introduction of the use of steam in the 1830s allowing steamers to ply the lakes, bringing passengers and products to other shores (Martin, 1931). Major access points are Lake Geneva, Basel by means of the Rhine River, Lake Constance, Lago Maggiore and Lake of Lugano.

Mode of Choice: the Swiss Railway

Before rail caught on in Switzerland, public transport was provided by the post coaches, whose fees were not regulated by the government until 1798 when the Helvetic Republic worked out a system but only along the major corridors (Bernard, 1978). There was also the issue of the state of the roads which were generally neglected for fear of an invasion and made passage difficult (Bernard, 1978).

When rail building took off in Europe in the mid-1820s, its significance was not lost to the Swiss businesspeople who saw the opportunity of a rapid conveyance of products to the market and a chance to further increase the number of visitors for tourism (Bernard, 1978). However, Federalists saw it as a “detested instrument of centralization” while some cantons, such that of Basel and Zurich began to develop their own railway schemes (Bonjour et al., 1952, p 292).

The first track was laid in 1844 as an extension of the Alsatian line from Strasbourg, France to Basel. The first Swiss rail line, known as the Spanisch-Brötli Bahn (Spanish Rolls Railway), began operating in 1847 between Zurich and Baden as part of the line that would eventually link Basel with Zurich (Hughes, 1974, Slater, undated, Hunt, 2004). Only 30 km of rail was laid over this time and a Swiss railway network had yet to be built.

The construction of the Swiss railway sparked debates between those for state control and the advocates of privatisation. Those for state control under Stämpfli argued that the railway should serve the common welfare and should not be left to the whims of the private sector, further stressing that the railway as a national matter should be under federal legislature (Bonjour et al., 1952). Escher, who represented the opposition, reasoned that private companies are more efficient and can produce the necessary capital.
than the state, a reality which had the whole country rebelling against “a national debt of a hundred million francs” (Bonjour et al., 1952).

The Railway Law was passed in 1852 which saw the Federal Council retain only their power to object on military grounds rather than transport policy (Bonjour et al., 1952). Full responsibility was given to the cantons who in turn left the construction and management to the private sector but subject to the sanction of the Federal Council, who retained their supervisory and veto power over the planned routes (Hughes, 1974, Slater, undated). Though this was seen as a reversion to the centralisation of services that was desired, it provided the needed impetus for railroad building so much so that between 1854 and 1864 alone, over 1,300 km of track were laid (Martin, 1931).

With no national plan as basis, the network grew where it was needed and soon an extensive rail network linked the major cities as well as the agricultural areas, a service that was seen as important for the economic development of these areas. The railways became an integral part of Swiss life and perceived as a public service in the same league as roads, schools and hospitals (Slater, undated). Hughes (1974) also attributes the delay in the motor age especially in Graubünden, where until 1926 there were no motor cars, to the resulting network of services by railway and PostBus.

It was soon apparent that not all lines were profitable and mergers between railway companies eventually left control to only four companies (Bonjour et al., 1952). Debate regarding the management of the railway was re-opened in the light of this development in 1862. Stämpfli pursued his advocacy for a state-controlled railway but lost to local and private interests (Bonjour et al., 1952). Due to the rail disputes throughout this period, the necessary level of service was not provided which greatly affected the public with the “arbitrary rates, continual changes in locomotives, suspicious financial manoeuvring, foreign influence, financial difficulties, [and the] ruthless competition among themselves” (Bonjour et al., p 323). Mediation fell upon the Federal Council but because its powers were very limited, it was not very effective.

A revision of the constitution in 1872 entailed changes to the system: it awarded the Federal Council more powers and eliminated the cantons’ rights to grant concessions. The Council was allowed to determine the timetables and ticket prices, and the right to control the building of the Gotthard line which commenced construction in 1872 after the signing of a treaty with Germany and Italy (Bonjour et al., 1952, Martin, 1931).
When the construction costs for this line were underestimated, it fell upon the Federal Council to bail it out by a special law in 1878 (Bonjour et al., 1952, Thürer, 1970). Finally, in 1898, after an extensive campaign and the strong representation of the Radicals, Democrats and workers, the nationalisation of the railway was realised; setting a milestone for the principle of state ownership (Bonjour et al., 1952).

The Swiss Federal Railways (SBB) was created in 1902 as a response to the increasing number of foreign shareholders in the private rail companies (Martin, 1931, Miserez, 2004). SBB operated its first train on 1 January 1902 when it arrived in Bern. At present, the SBB is 100% owned by the Confederation and has split into three divisions – passenger traffic, goods traffic and infrastructure – in the light of the changing economies in Europe of which Switzerland has maintained its status as a non-European Union (EU) member.

**Swiss Transport Policy**

The geographic location of Switzerland and its non-involvement with the European Union has placed it in a position where it has to maintain and improve its ties with its neighbours to secure its economy and the privileges of its people within the region.

Through the years, the SBB had to contend with not just the changes outside its borders but also within Switzerland itself. Though some lines that were highly profitable, others were operating on losses, but cutting services to remote areas was not an option. The Department of the Environment, Transport, Energy and Communications (DETEC, 2001) echoes this in its policy on sustainable mobility where “all sectors of the population and parts of the country have access to mobility.”

The changing mobility patterns of the Swiss have led to the reformulation of its transport policy to ensure that its transport network and services are able to address the issues of sustainability and its integration with the European framework. The five pillars of the Swiss transport policy are identified as Rail 2000, Railway reform, the Land Transport Agreement (LTA) between Switzerland and the European Community (EC), the enforcement of the Mileage-Related Heavy Vehicle Tax (MRHVT) and the Traffic Transfer Act in consonance with the MHVRT (Bundesamt für Verkehr, 2005). These initiatives aim to strengthen the position of the Swiss railway and improve public transport services.
Table 12  Passenger Transport Statistics (in passenger-kilometre)

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Rail*</td>
<td>7,703</td>
<td>9,156</td>
<td>10,625</td>
<td>11,290</td>
<td>14,356</td>
<td>16,432</td>
<td>14,914</td>
</tr>
<tr>
<td>Road, Public Transport</td>
<td>550</td>
<td>874</td>
<td>1,885</td>
<td>2,486</td>
<td>2,318</td>
<td>4,572</td>
<td>4,855</td>
</tr>
<tr>
<td>Road, Private Transport</td>
<td>6,400</td>
<td>18,590</td>
<td>45,882</td>
<td>67,041</td>
<td>77,759</td>
<td>85,086</td>
<td>91,945</td>
</tr>
</tbody>
</table>

Notes:
* Rail totals include all types: train, tram, cable train (except for 2004); Public Road Transport totals include Trolleybuses, PostBus, concessionaire automobile enterprises.

` Statistics from the SFSO may not include all types considered by LITRA which is why the number is lower than expected.

Source: *LITRA (Public Transport Information Service), Swiss Federal Statistics Office (SFSO), 2006

Through the years, rail lost its hold on the commuting public due to the development of the motor vehicle and the improvement in infrastructure, with rail taking an average of 13.5% of the annual total passenger-kilometres travelled in 2000. Figure 22 shows how the mode share changed after 1950 when the motor vehicle became the mode of choice. With a mode split that does not bode well in the sustainability area, this led to a review of the direction of the country’s transport policy.

The competition posed by the motor vehicle led to the creation of Rail 2000, which was approved by the people in 1987 and aims to provide “faster, more frequent and direct services” through the revitalisation of its train lines (Swiss Federal Railways, 2006a, p 36).
The railway revitalisation programme entailed the introduction of new trains utilising better technology such as tilting trains and high-capacity\textsuperscript{30} double-decker coaches.

The coordination of timetables at hub stations was important to ensure smoother connections. This meant having the “trains and buses arrive either shortly before the full hour or half hour, or at the minutes 15 and 45, and leave shortly afterwards” (SBB, 2006b, p 2). With the hub system discussed above, it became possible to decrease travel times from major cities such as the Bern-Chur route from 177 minutes to just 133 minutes and the Bern-Zurich route from 69 minutes down to 58 minutes (SBB, 2006b). Frequency of trips also increased along selected routes such as Geneva-Lausanne, Bern-Basel, and Zurich-Chur, from once every hour to every half hour throughout the day with more trains running during the peak hours for certain lines (SBB, 2006b).

The internal changes in management due to the special law of 1 January 1999 that liberalised the railway sector allowed it more entrepreneurial freedom and responsibility (SBB, 2002). The SBB management changed from a federally controlled one to a public-sector joint-stock company owned by the Swiss Confederation and governed by special legislation – Swiss Federal Railways Act (SBBG) of 20 March 1998 (SBB, 2002, SBB, 2006c). Stakeholder groups include the “Confederation as the sole shareholder, SBB customers, employees and business partners, the general public and the political sphere” (SBB, 2006c, p 68).

The 1999 Railway Reform allows for four measures (OECD, 2006, Berndt, 2004): the first one involves the accounting and organisational separation of infrastructure and transport (OECD, 2006). Directive 91/440 of the EU which advocated the separation of railway infrastructure and operation was studied by the SBB prior to concluding that such an arrangement will only lead to poor planning and inefficiency as experienced in the United Kingdom (Frey, 2003). Rail 2000 is based on an integrated system where the planned operations including the new equipment are in consonance with its present and planned infrastructure (SBB, 2006b).

The second measure allows other players access to the railway network to provide certain services; while the third measure liberalised the freight transport market (Berndt, 2004). Total liberalisation is given for combined transport while partial liberalisation for goods

\footnote{These are IC2000 trains with seating capacity reaching 1,400 and ply the lines with high demand. www.sbb.ch/rail2000}
and passenger transport on international routes on the basis of the EU bilateral agreement (OECD, 2006).

And lastly, it allows for competitive tendering for railway lines supported by the federation and the cantons so that a compensation agreement is reached prior to operations as outlined in SR 742.122 Eisenbahn-Netzzugangsverordnung (Railway network access regulation) (Schnell et al., 1999). When the Swiss Federal Railways Act (SBBG) of 20 March 1998 was passed, one of the stipulations of the Act required SBB to a Performance Agreement upon which the spending limit for infrastructure will be based (SBB, 2006c). The Performance Agreement is important because the grant for SBB’s infrastructure is from the federal government and dependent on the quality of its facilities and the access it allows other railway companies to its network. The federal government has cut funding in the last year but the increase in passenger services and in the number of trains have compensated for the loss (SBB, 2006c). The figures in the 2005 SBB Annual Report show that SBB has been able to provide more services with lower public funding.

For Switzerland to remain competitive with her neighbours in rail services, her network needs to connect with the Trans European Network. The construction of the base tunnels at Gotthard and Lötschberg will not only serve freight trains but high-speed passenger trains as well; shaving an hour off the 3 hours 40 minutes travel time on the Zurich-Milan route, makes rail competitive with road and air modes (AlpTransit, 2005).

The popularity of road transport remains a challenge to Swiss mobility. Article 83 Section 5 of the Swiss Constitution legislates that the construction of a network of national highways is a federal matter, with cantons tasked to build and maintain their national highways under the Confederation’s supervision (1999b). The Confederation still allocates funds for the construction of roads and expressways and then counteract these by imposing speed restrictions and promoting the use of environmentally friendly fuels (Benninghoff et al., 2004). These policies on ‘sustainable automobility’ encourage the people’s mobility and their choice of travelling by car.

Maintaining traffic infrastructures with a high level of service is important for the future economic development and prosperity of Switzerland (Werder, 2006). In Werder’s
report to LITRA\textsuperscript{31} as the General Secretary of DETEC in March 2006, he reiterates the statement of the Federal Council that “infrastructure networks are our life veins…of its efficiency hang economic growth and prosperity directly from.”\textsuperscript{32} The cantons uphold the same view. They acknowledge the results of the research done by ETH Zurich regarding infrastructure development and its economic impacts, and the importance of allowing for selective extensions of the local road network and improving the attractiveness of public transport (Bösch, 2006).

\begin{table}[h]
\centering
\caption{Construction Expenditures in CHF million, at year 2000 prices\textsuperscript{1}}
\begin{tabular}{|l|c|c|c|}
\hline
 & 2002 & 2003 & 2004 \\
\hline
\textbf{Total} & 43,259 & 44,307 & 45,939 \\
\textbf{Public Sector\textsuperscript{2}} & 16,243 & 15,833 & 15,854 \\
Civil Engineering & 9,870 & 9,638 & 9,571 \\
Of which roads & 4,300 & 4,325 & 4,351 \\
Building construction & 6,373 & 6,194 & 6,283 \\
Of which apartment buildings & 279 & 329 & 332 \\
\textbf{Other\textsuperscript{3}} & 27,017 & 28,474 & 30,086 \\
Infrastructure & 2,973 & 3,026 & 2,952 \\
Housing & 16,164 & 18,823 & 20,684 \\
Agriculture and forestry & 581 & 577 & 606 \\
Industry, small-business, services & 7,299 & 6,048 & 5,844 \\
\hline
\end{tabular}
\end{table}

Notes:
\begin{itemize}
\item \textsuperscript{1} Construction deflators based on SFSO National Accounts
\item \textsuperscript{2} Construction expenditure of the Confederation, the cantons, the municipalities and corresponding public enterprises, including public maintenance work
\item \textsuperscript{3} Excluding private maintenance work
\end{itemize}

Data from the Swiss Federal Statistical Office (SFSO), Annual Construction and Housing Statistics. Total for ‘Other’ adjusted to reflect the correct total of 27,017 rather than 27,018 as it is on page 537 of the SFSO (2006) document.

Source: Table TE 6.2.2, page 537, SFSO, 2006

Table 13 illustrates the increase, at a constant of CHF25 million (note highlighted area) in road building expenditure every year from 2002. Figure 23 shows the discrepancy in expenditures for rail and road infrastructure from 1950 to 2003. From the 2006 Statistical Yearbook, in 2004 there were 3,811,351 private vehicles for a population of 7,364,000 creating a ratio of almost 1:2 (Swiss Federal Statistical Office, 2006c). The

\textsuperscript{31} LITRA is the Public Transport Information Service. It is a cross-party organization who is in favour of public traffic in Switzerland and as a traffic forum helps shape public opinion over the current and future tasks of the traffic economy and traffic politics. Its members include those from the enterprises of public transport, the cantons, traffic economic and scientific organizations, those active in the traffic industry sector, business enterprises and services, universities as well as members of the Swiss Räte. Details translated from <http://www.litra.ch/Wir_uber_uns.html>, accessed 12 April 2007.

\textsuperscript{32} This is the online translation of the quote made by the Federal Council (Bundesrat) during its legislative planning for 2003-2007 as quoted by Hans Werder: “Infrastrukturerste sind unsere Lebensadern … Von ihrer Leistungsfähigkeit hängen Wirtschaftswachstum und Wohlstand direkt ab.” Werder, H. 2006, ‘Verkehrsubinfrastruktur als Schlusselfaktor der wirtschaftlichen Entwicklung (Traffic infrastructure as a key factor of the economic development)’ report by DETEC General Secretary in a session report to LITRA on 22 March 2006, Bern.
The results of the 2000 microcensus showed that 54% of those surveyed believe that the current transport policy is not effective in solving the prevailing problems. Moreover, according to the 2000 report of the Federal Office for Spatial Development (ARE) and SFSO, the majority approve of the government “action on the environment, the promotion of public transport, and the standard of development of the road network.” On the issue of further expanding the road network, 48% believe it is not necessary compared to the 46% who still think it is, while 6% are undecided on the matter (ARE and SFSO, 2000).

In 1984, the government began collecting a toll for large-goods vehicles (LGV). The levies that the government collects are used to subsidise the construction of highways, fund the maintenance of cantonal main roads, landscaping and environmental protection and sometimes to finance combined transport (Fagagnini, 1996). The acceptance of the Swiss electorate in 29 November 1998 of the proposal of financing of public transport infrastructure (FinöV) projects has greatly facilitated the construction of the tunnels and the upgrading of the rail system (AlpTransit, 2005). Figure 24 shows where the revenue comes from and that under FinöV, approximately CHF30 billion is set aside to fund the improvement of rail infrastructure and its services. This increased funding for rail has
decreased the gap between rail and road expenditures as shown in Figure 23 in the latter years from 2000 to 2003. The latest report by LITRA (2006) shows that by 2005, investment on rail infrastructure has totalled CHF4,471.80 million, overtaking road investment which is at CHF4,219 million by CHF252.8 million.

### Figure 24 Transport revenue and expenditure under FinöV


The acceptance in February 1994 of a popular initiative, the Alpine Initiative, regarding the protection of the Alpine region called for the reduction of through freight transit traffic and the transfer of freight from road to rail by 2004 (Ladner, 1995). The Alpine Initiative was launched by “environmental supporters and left-wingers” from the Swiss mountain cantons of Graubünden, Uri, Ticino and Valais (AlpineInitiative, undated). The success of the initiative was something the federal government did not see coming, “a slap in the face for government and Parliament” according to Ladner (1995, p 489) given its rejection by the Federal Council (February 1992), the National Council (December 1992) and the Council of States (June 1993) (AlpineInitiative, undated, Ladner, 1995). In February 1994, the Swiss people accepted the Alpine Initiative by a majority (51.9%) and nineteen of the twenty-six cantons, with the canton Uri where the Gotthard road and rail routes pass providing the most support (Benninghoff et al., 2004, AlpineInitiative, undated, Ladner, 1995).
The Alpine Convention is an international treaty which aims to protect the Alps. It promotes a ‘harmonized approach’ regarding “mountain farming, mountain forests, conservation of nature and the countryside, regional planning and sustainable development, tourism and recreation, soil protection, energy, transport, and settlement of disputes” (Swiss Agency for the Environment Forests and Landscapes, 2002, p 73).

Most of the countries signed the protocol on transport in October 2000. The transport protocol stressed the importance of consultation between countries where new construction or significant changes to the existing transport infrastructure is likely. Environmentally friendly forms of transport are promoted, “no new trans-Alpine roads are to be built” and the costs for new transport infrastructure are to be funded by the instigator (SAEFL, 2002, p 74).

Leisure Traffic

In 2000, a micro census of Swiss mobility was undertaken by the Swiss Federal Office for Spatial Development (ARE) and the Swiss Federal Statistical Office (SFSO). Results showed that Switzerland has a high mobility rate with 90% of its population making at least one journey per day and the car as the mode of choice for 67% of the journeys (ARE and SFSO, 2000).

According to ARE, leisure travel has grown so much through the years and has had a great effect on the economy. In turn, it has placed tremendous pressure on the spatial development and quality of the environment leading to the re-assessment of the transport policy on the federal-level which has for years focused on commuter and long-distance traffic (ARE, 2003). From the survey, private motorised transport accounts for a majority of leisure traffic. This prompted the creation of strategies which include the promotion of the use of public transport and non-motorized transport, reducing the use of private motorised transport by creating “attractive, competitive and commercially viable leisure travel services,” and allowing for shorter journeys by having attractive destinations near residential areas (ARE and SFSO, 2000).

### Table 14 Modal Split for Year 2000 Micro Census (in %)

<table>
<thead>
<tr>
<th>Mode Choice</th>
<th>Distance Travelled per Day</th>
<th>Time Spent Travelling</th>
</tr>
</thead>
<tbody>
<tr>
<td>Walking / Cycling</td>
<td>7.2</td>
<td>39.8</td>
</tr>
<tr>
<td>Motorized private transport</td>
<td>69.5</td>
<td>43.6</td>
</tr>
<tr>
<td>Public Transport</td>
<td>17.7</td>
<td>11.4</td>
</tr>
<tr>
<td>Other</td>
<td>5.6</td>
<td>5.2</td>
</tr>
</tbody>
</table>

Source: ARE and SFSO, 2000

The ARE, to support leisure projects that satisfy their criteria, created a Leisure Traffic Programme of Action (LTPA). One of these projects is the Schweiz Mobil (Swiss Mobile) whose planning is ongoing. The project aims to promote Human Powered Mobility (HPM) modes from cycling, walking to in-line skating with trails/paths all over the country. It can be noted that though walking/cycling only cover 7.2% of the distance travelled per day, it takes 39.8% of their travel time (see Table 14).

From Figure 25, 43.9% of travel done each day is attributed to leisure followed by work/education at 28%. With 40% of journeys made for leisure purposes, it becomes important to see where the Swiss travel for leisure activities.

#### The value of Swiss tourism

“Switzerland is known worldwide as a tourist country” according to Krippendorf and Müller (1996, p 109). Hughes (1974) and Bernard (1978) attribute the attitude of the early innkeepers to the influx of foreign travellers (from the early pilgrims to the sick coming for the cures), in upgrading and professionalising ordinary hospitality to the success and good reputation that Swiss guest management enjoys at present.
Tourism is important to Switzerland and accounts for 5.1% of the country’s GDP (Schweizer Tourismus-Verband, 2006) with almost 9% of its population employed in the sector (Eisinger and Schneider, 2003). The 2006 edition of the report of the Swiss Tourism Association highlights the contribution of the domestic sector at 43% or CHF9.7 billion (equivalent to A$10.21 billion)\(^{34}\) of the total revenue in 2004 while the revenue from international tourists contributed 3% to the country’s GDP (STV, 2006).

Switzerland’s tourism can be traced to the early days of the Grand Tour, which highlighted the unscaleable beauty of the Alps (Bernard, 1978). According to Krippendorf and Müller (1996), Swiss tourism is synonymous with the Alpine region that covers two-thirds of the country. It was only in 1815 that voluntary journeys to the mountains for relaxation began (Hughes, 1974). Appreciation for the natural beauty of the environment such as the sunrise from Rigi Kulm opened Lucerne to tourism according to Hughes’ (1974) documentation.

Gilg (1998) identifies three types of tourism that developed in Switzerland in the early twentieth century. First, he credits genteel tourism to the construction of grand hotels along lakeshores such as Geneva and Thun. Second, the resorts of Grindelwald and Zermatt at the foot of the Eiger and Matterhorn in the Alpine valley became the hub for mountaineering. Lastly, the health-based tourism that developed on the Alpine terrace resorts such as Davos and Leysin. Gilg (1998) categorizes the Swiss tourism product as based on its landscape and can be either “lakes and mountains” or “winter sports tourism.”

Winter sports such as skiing and ice skating were later developed by the younger and healthier members of families undertaking health cures to fill in their time (Gilg, 1998). Bernard (1978) acknowledges that the popularity of winter sports changed Switzerland’s landscape with the construction of ski lifts, hotels and apartment blocks. The increase in affluence and mobility brought in more visitors and established Switzerland as one of the more popular winter tourist destinations before the First World War in 1914 (Hughes, 1974).

This increase in visitation later brought problems of capacity and oversupply of infrastructure in times of crisis, prompting the federal government to assist the hotel sector after the First World War in 1914 (Gilg, 1998). For a country with a strong federal

\(^{34}\) Exchange rate as at 20 November 2006, CHF1 = A$1.05.
system of government, the notion of adopting state or central government measures to
aid a state’s economy is “anathema to the Swiss view of federalism, local political power
and free enterprise” (Gilg, 1998, p 161). Nevertheless, the Swiss National Tourist Office
was created in 1917 to promote Swiss tourism utilising state finances. The Federal
Consultative Commission was established in 1973 to manage the tourism crisis in the
mid-1970s. These developments formalised the role the federal government is to play in
tourism issues (Gilg, 1998).

Gilg (1998) compared several reports that document the state of tourism in Switzerland,
which focused on the importance of the product and the role played by the Federal
government in its management and growth. The ‘Concepts’ report of the Federal
Consultative Commission released in 1979, saw the role of tourism as imperative for the
relaxation and health of society having social, economic, and environmental factors;
stressing the dependence of tourism on a good environment and the need to respect it by
observing ecological constraints (Gilg, 1998).

As early as then, the three pillars of sustainable development have been considered in the
planning and as bases for measures to mitigate further impact of tourism on the
environment. The Krippendorf report in the mid-1980s followed on the ‘Concepts’
report by advocating that tourism growth be based on quality rather than quantity (Gilg,
Report came up with ‘Four Perspectives for Swiss Tourism’ recognizing the economic
importance of tourism to the country especially to the tourism-dependent mountainous
regions. The report also aimed in increasing the awareness of the Swiss people of their
cultural identity, making them appreciate the importance of protecting their environment
(Gilg, 1998).

Krippendorf and Müller (1996) analysed the development of tourism in the Alpine region
and came up with ten basic principles for the development of tourism that are in
harmony with man and nature. The principles point out the importance of “pursuing an
active policy of land planning and land use,” which can minimise development
encroachment and safeguard the loss of more land in a limited landscape (Krippendorf
and Müller, p 119). Since tourism is always a consumptive industry, the tourism growth
machine was identified to be fuelled by the building of infrastructure facilities, large areas
reserved for the building of vacation or second homes, and the construction of transport
facilities for tourists (Krippendorf and Müller, 1996).
Eisinger and Schneider (2003, p 15), taking into consideration the threat of global warming and its impact on the number of ski slopes, suggest the need to strengthen summer tourism by “extending the natural reserves and by enlarging the potential for hiking, rafting and cycling.” At present there is only one national park in a country rated among the most forested in Europe with trees and bushes covering 30.8% of its land area (Eisinger and Schneider, 2003). Gaining more forest area through the years due to the devaluation of agriculture according to Eisinger and Schneider (2003) means an increase in wildlife area, soil protection from erosion, an increase in the stability of the snow masses in winter, and the absorption of CO₂ emissions.

GRAUBÜNDEN: A TRADITION OF TOURISM AND THE DEVELOPMENT OF ITS TRANSPORT NETWORK

Graubünden, with a population of 187,803 as of the last census in 2005, is located in the southeastern part of Switzerland, bordered by Liechtenstein and Austria on the north and Italy to the south (refer to Figure 26). Though the canton with 7,106 km² has the biggest land area and occupying almost a sixth of Switzerland, only a tenth of it is arable. At present, the state’s major sources of income are tourism, hydroelectricity, and agriculture.

![The Swiss Cantons](http://switzerland.isyours.com/images/rg.maps.cantons.pdf)

*Figure 26 The Swiss Cantons locating canton Graubünden (GR)*

Graubünden is the biggest tourist region in Switzerland followed by Eastern Switzerland and the Zurich Region (STV, 2006). Graubünden is composed of seven vacation regions offering different attractions as shown in Figure 27: (1) the Rheintal, Heinzeberg/Domleschg, (2) Surselva, (3) National Park region (Zuoz-Zernez); Lower Engadine, Samnaun, Val Müstair, (4) Engadin/St Moritz, Val Bregaglia, Valposchiavo, (5) Prättigau, Davos, (6) Val Schons, Rheinwald, Avers, Val Mesolcina, Val Calanca, and (7) Mittelbünden, Schanfigg (Graubünden, 2006d).

As an important holiday region, Graubünden is dependent on the tourism sector which generates 30% of its GDP (Graubünden, 2004). In 2005, the canton had a room occupancy rate of 48.4% of its 23,773 rooms and bed occupancy rate of 42.4% of 48,163 beds (STV, 2006).

Graubünden is a popular holiday region not just for international tourists but for the locals as well. From the tourism statistics of the region for 2005, the Swiss accounted for 51.4% of the total nights spent in hotels and wellness centres and stayed for an average

---

**Figure 27** Holiday regions in Graubünden
Source: Graubünden, 2006d
of 2.87 days (Graubünden, 2006a). The Germans make up 25.6% and stay for a day longer than the Swiss at 3.87 days, while the average length of stay by Europeans was 4.03 days (Graubünden, 2006a). The statistics show that most who visit the region are not day-trippers.

Taking the case of the Swiss National Park (SNP) and the data gathered in the 1993 survey, it mirrors the region’s visitor profile, the Swiss at 61% and the Germans composing 20% (Lozza, 1996). Although 28.3% of the SNP visitors surveyed stayed in Zernez, the choice of village is usually along the rail network of the valleys of the Lower Engadine (Scuol) and Upper Engadine (Zuoz, S-chanf, St Moritz) (Lozza, 1996).

There are two distinct tourist seasons in the region with very different tourist behaviour characteristics according to Caflisch during the interview on 11 September 2006. The summer tourists have a tendency to establish a base in one of the villages but are very mobile throughout the entire period. In winter, one generally stays in the area where one prefers to ski. The levels of mobility during specific periods of the year have led to the creation of different timetables to accommodate the differences according to Brugger during the interview on 4 September 2006.

**Graubünden as a tourist destination**

Roman soldiers discovered the curative powers of the waters of Baden in Zurich. The practice of taking to the waters regained popularity in the Middle Ages with the discovery of other mineral-rich springs such as Fideris (located between Landquart and Klosters) in Graubünden and Leuk in Valais (Bernard, 1978). The mineral baths of Scuol in the Engadine Valley also date back to the Middle Ages and first mentioned in literature in 1369, only gaining popularity from the mid 19th century when a road to the valley was constructed (Scuol Tourism Team, 2005).

The importance of roads to reach the mountain valleys in the region is illustrated in the bid to develop Davos as a spa in the 1820s. From Bernard’s (1978) documentation of that era, the difficulty of transporting the sick over the poor roads led to the closure of early bathhouses. The road to Klosters was only completed in 1852 followed by the stretch to Landquart in 1859, by then travel time to Landquart from Davos on a 4-horse coach took only six hours and to return in four (Bernard, 1978). The increased access to Davos came at an opportune time for the discovery of a cure for tuberculars by Dr Alexander Spengler whose advice restored the health of two afflicted German doctors.
who came in 1865. Doctors Unger and Richter settled in the village and opened a health facility for tuberculars. With the success of the cure and treatments requiring months of therapy, Davos came to have more foreign visitors in winter than in summer by 1874 (Bernard, 1978).

The success of Davos as a health resort inspired St Moritz and Arosa. By then the challenge for most resorts was to extend visitor stays well over to winter. Those taking the cures and the healthier members of the family enjoying sports such tobogganing, skating, and eventually skiing filled the inns and hotels in winter (Bernard, 1978).

The geography of Graubünden with 90% of its area higher than 1,200 m has made it a popular walking destination in summer and a skiing holiday destination in winter (Stirnimann, 2006). In a survey where tourists were asked what they liked about Switzerland, the top answer was swimming, followed by walking/hiking, and then skiing (Stirnimann, 2006). He further explained during the interview on 5 September 2006 that during the revision of the federal law on road and traffic three years ago, the concern for Human Powered Mobility (HPM) was fourth on the list and brought up by 6% of the respondents to the survey.

The release in 1998 of a document entitled Cycling Switzerland (Veloland Schweiz) led to the increase in popularity of the mode (Stirnimann, 2006). The Cycling Association had identified nine routes nationwide with Route 6 passing through Graubünden running from Bellinzona-Thusis-Chur-Thusis-Scuol (Capirone et al., 2006). Stirnimann (2006) attributes the success of this endeavour to the current project, the Swiss Mobile (SchweizMobil), which accommodates mountain biking, hiking, walking and skating – all human powered modes. The project will consolidate all the routes through the mountains and the target opening will be in 2008 (Stirnimann, 2006). A major feature of the network of the Swiss Mobile is its connections with the public transport network that allow cyclists and walkers to hop on and off the buses and trains along the way (Stirnimann, 2006).

**Transport network in the canton: Trains and Buses**

It was due to tourism that a good part of the transport network in the canton of Graubünden was established. For years, Splügen and Gotthard passes placed the canton at the crossroads of the Alpine transit route between Italy and the rest of Europe and linked major destinations such as Davos and St Moritz (Bernard, 1978).
Transport in Graubünden is a network of rail and buses. The railway is the backbone of the transport network while the PostBus operates as a feeder and distributor to the railway (PostBus, 2005). Timetables and frequency of services for regional passenger traffic are coordinated by the canton with the Federal Office of Transportation (FOT) taking into consideration the international timetables as set out in the law SR 742.151.4 FPV (1998).

The revitalisation of the railway in 1995 gave the cantons more responsibility for regional traffic (Benninghoff et al., 2004). Public transport services in the canton operate at the minimum requirements set out by the Federal State Law. The Office for Public Transportation (Fachstelle öffentlicher Verkehr) under the Building, Traffic and Forest Section (Bau-, Verkehrs- und Forstdepartement Graubünden) of the canton’s administration is in charge of promoting the use of public transport in the various municipalities in the canton as stipulated in BR 872.100 GöV (1993).

Under Section II Article 4 of BR 872.150 (1994), the transport service to an area is dependent on the population and the number of jobs it generates. Other factors such as the structure of the population, the number of rooms for rent (Logiernächte), mobility needs of the community, traffic relations with central places and railway connection all determine the frequency of public transport services to communities (Appendix 1, BR 872.150 RAB z GöV of 1994).

The Rhaetian Railway (RhB) is the rail company of the canton of Graubünden. The canton owns 51% of the capital shares, the Confederation takes 43% and the remaining 6% are divided amongst municipalities and private companies (RhB, 2006a). The RhB receives compensation of CHF150 million a year from the federal government to run services every hour. SR 742.101.1 ADFV (1995) details the level of assistance a regional railway can receive from the federal government so that it can provide the minimum level of service that is required. Brugger (2006) affirms that if RhB only provides services dependent on passenger demand, the timetable would be different and there would be no hourly services. With the federal government’s contribution to the running of the railway, the RhB is able to run its trains regularly every hour even with few passengers onboard.

The PostBus with its supporting role in the transport network provides services in consonance with the railway (PostBus, 2005).
law in 1996 as Buehler stated in the interview on 8 September 2006, “the Post[Bus] decided where to go and how many times to go in the day.” But since 1996, “every line will have an official who orders this service” in consonance with the federal law which required that every line in public transport has to be ordered by the confederation or by a canton (Buehler, 2006). In the region, the canton Graubünden is their major client as it decides the frequency of services to a community. Since the federal government will only pay for services to areas with an all year round population of at least 100, it therefore falls on the cantons to provide services to villages with less than 100 inhabitants (Section 2, Article 5, SR 742.101.1 ADFV of 1995).

The village of Lü in Val Müstair has a PostBus service as shown in Table 15. The mountain village only registered sixty-three inhabitants, ten of whom are school children (Graubünden, 2006b). Of the working population, 43% are involved in agriculture and forestry, 33% in business and industry, and 24% in the service sector. From the timetable, services are dependent on schooldays and times, as well as season, with trips after 17.30 hours only available over summer. Because it is the highest village in Val Müstair at 1,920 m above sea level and not located along the OfenPass (refer to Figure 28), a mini-bus with a 16-seating capacity services the village. Passengers going to Lü change buses at the Post Office stop in the village of Fuldéra, which is along the OfenPass. For Lü residents going to Müstair or Zernez, they have to change buses at the Fuldéra post, which leaves every third minute of the hour for Müstair and every 47th minute for Zernez (Graubünden, 2006c).
### Table 15 Lü Village Timetable

<table>
<thead>
<tr>
<th></th>
<th>Fuldera, post</th>
<th>Lü, post</th>
<th>Fuldera, post</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>/10 7.48</td>
<td>9.04</td>
<td>10.04</td>
</tr>
<tr>
<td></td>
<td>/10 8.00</td>
<td>9.16</td>
<td>10.16</td>
</tr>
<tr>
<td></td>
<td>/10 6.50</td>
<td>7.33</td>
<td>8.33</td>
</tr>
<tr>
<td></td>
<td>/10 7.02</td>
<td>7.45</td>
<td>8.45</td>
</tr>
</tbody>
</table>

**Notes:**

/10 Monday – Friday on Schooldays except 1 Nov 06
/11 Monday, Tuesday, Thursday and Friday on Schooldays
/12 25 June – 22 October 06

**Source:** Graubünden, 2006c

Graubünden is not a rich canton by Swiss standards, only contributing 2.3% to the national income in 2003 (SFSo, 2006b). Its total population of 187,000 widely dispersed in villages of low populations in an area of 7,106km² means service to some parts of the region is demand-led. BR 872.100 GöV (1993) stipulates that the canton’s contribution to the provision of services may amount to 20-55% dependent on the population and the financial power of the municipalities involved who are expected to cover the costs of local traffic. Minimum services mean once in the morning, noon and afternoon such as that serving Scuol-Sent-Val Sinestra route during the summer (Graubünden, 2006c). Public transport service schedules usually factor in the journey to work and school times.

Thirty-one of the 208 municipalities have fewer than a hundred inhabitants, and the PostBus and the RhB connect all of these to the network.

**The Rhaetian Railway (Rhätische Bahn, RhB)**

The opening of the railway over the Gotthard Pass in 1882 and the Arlberg Pass in 1884, prompted fears of putting the canton out of the loop because it was not linked to the railway (Bernard, 1978). The railway was seen to greatly increase tourist numbers compared to the horse-drawn carriages and mail coaches used during that time (Dringenberg, 1996). This led hotel owners in Davos headed by the Dutchman Willem Jan Holsboer, to initiate a campaign for the construction of a railway from Landquart to Davos (Bernard, 1978). The railway proposal was not taken seriously at first but with pledges from the villages providing construction materials and half a million francs in subsidy, the rail line began construction in 1887 and became operational by 1890 (Bernard, 1978). Holsboer later continued to build the Landquart-Thusis line which opened in 1896, extended this line through Filisur to link St Moritz by 1904 and closed the loop with the link from Davos to Filisur in 1909 (Bernard, 1978). The plans to

---

35 Arlberg Pass links Switzerland with Austria.
extend this line through the Maloja Pass to Chiavenna, Italy were aborted with the onset of the First World War (Dringenberg, 1996). The Albula line provided competition for the Bernina line when it began operating from Filisur to St Moritz in the summer of 1903. (See details in Figure 30 Canton Graubünden Transportation Network)

The present 384 kilometre network is the longest narrow-gauge railway in Switzerland and connects the farming villages with the world famous resorts of Davos, St Moritz, Klosters and Flims-Laax Falera (Graubünden, 2006e). The invention of the rack-and-pinion system (cogwheel) in the 1870s carried the trains up the mountains (Hunt, 2004). In the canton of Graubünden, the cogwheel never took hold; trains utilise adhesion engines and engineers slowly increase the gradient so the trains reach higher altitudes. The resulting infrastructures are attractions by themselves such as the popular circular viaduct in Brusio and the 102-year-old Landwasser viaduct along the Albula route from Tiefencastel to Filisur. To date, there are 566 bridges, and 114 tunnels with a total length of 58,601 metres with the Vereina tunnel taking 19,042 metres (RhB, 2005).

The RhB complements the canton’s leisure image with the promotion of its popular lines (see Figure 29) which display the canton’s natural attractions. These lines have been in operation since the Bernina line began in 1890.

The Bernina Express is the most popular line beginning from Chur, Davos or St Moritz and goes
southeast through Val Poschiavo to Tirano, Italy. This line, first conceived to transport only summer visitors into the region, soon extended its services into winter in 1910 to link the villages in Val Poschiavo with the rest of Switzerland (Dringenberg, 1996). The RhB took over the management of the line in 1943, which today is a candidate for UNESCO World Heritage listing (RhB, 2006b).

Glacier Express is a joint operation of the RhB with the Matterhorn-Gotthard Bahn (MGB) based in Brig, canton of Valais. According to Brugger (2006) RhB’s rail network ends at Disentis/Mustér where MGB takes over by changing the system from RhB’s adhesion engine to MGB’s cogwheel system. Brugger (2006) shared that between the two companies, they have already invested in four trains. The Glacier Express begins in Chur, Davos and St Moritz and travels to Andermatt, through Brig to the slopes of Zermatt.

The Arosa-Chur railway was completed in 1914 and managed independently by the Chur-Arosa railway (ChA) (Canavan, 1997). Arosa at present remains a car-free village that is only accessible by train (Brugger, 2006).

The Aquilino Scuol line links the easternmost Lower Engadine Valley and the ten villages in the area particularly Scuol and Tarasp; known for their mineral springs and considered the centre for health and wellness.

The Engadin Star on the other hand travels to the Upper Engadine Valley and plies the St Moritz-Landquart route. This train passes through Zernez, which is the transfer point to the PostBus that passes through the Swiss National Park to Müstair.

Tourism is important for RhB, accounting for 80% of its income; 60% of trips are for leisure while the remaining 40% by the local population are mainly work trips (RhB, 2006b). This reliance on tourist receipts has led to the restructuring within RhB and the creation of a Marketing department effective 1 January 2007 as explained by Brugger during the interview on 4 September 2006. He says that this move was initiated because “Marketing needs more power to be able to put more passengers on the trains.” The previous system, where the Traffic and Infrastructure department created the timetables and expected the Marketing team to fill it with guests, did not allow Marketing to have a say on how things should be done (Brugger, 2006).
Figure 30 Canton Graubünden Transport Network
Source: Graubünden 2006
With work trips significant for daily travellers, considerable attention is given to arrival times and lunchtime service as well as after-work departure times from the main stations. From the key data of the canton in 2000, only 12.1% of its ‘economically active population’ goes to work utilising public transport while 35.5% use the private car (SFSO, 2006a).

From the interview with Brugger (2006) and as stipulated in SR 742.151.4 (1998), timetables are worked out with the SBB first, because RhB has to know when the trains arrive in Landquart or Chur. RhB then prepares its timetable in consonance with the arrival times, while the PostBus accommodates the connections (Brugger, 2006).

Creating a seamless connection is important, as Brugger (2006) attests, but sometimes a passenger will have to wait for “maybe ten minutes because … it is impossible to have the connection in five minutes.” In smaller stations in the region, connections between 3-4 minutes are possible (Brugger, 2006).

**PostBus**

Post coaches have been transporting passengers since the 18th century and were operated by the various cantons until 4 June 1849 when services were centralised and the federal government took over management (Martin, 1931). “The history of Swiss PostBus is closely linked to the development of tourism and the Swiss population’s mobility needs” (PostBus, 2005, p 5).

PostBuses came onto the scene in 1906, but were only introduced in Graubünden in 1919; prior to this, horse-drawn stagecoaches provided the service. It took a while for the public to appreciate the PostBus due to the dust and noise it produced, but once the advantages of shorter travel times became apparent, the last of the horse-drawn stagecoaches ceased to operate by 1930 (PostBus, 2005). Today, the horse-drawn stagecoaches are a tourist attraction plying Davos-Flüela Hospice via the Flüela Pass.

PostBus has ninety-seven lines in the region of Graubünden covering the whole canton of Graubünden and a little part of the canton of St Gallen in the north including the towns of Bad Ragaz, Sargans, Walensee and Buchs; serving a total population of 256,300 and covering an area of 8,326 km² (Buehler, 2006, PostAuto, 2006). There are seven organisations within the region, which includes Chur, Ilanz, Thusis, Davos, St Moritz, Scuol and Triesen in Liechtenstein. In Graubünden alone, the PostBus moves around 10 million passengers in a year (Buehler, 2006).
With a network length 380% longer than the railway at 1,460 km, the PostBus is able to provide services even to the most distant mountain village in the region such as that of Lü and Pigniu. It is important that the connections with trains are well integrated so that the system is efficient (Buehler, 2006). Waiting times depend on the arrival of the trains, e.g. 2-3 trains of the SBB arrive every hour between 45 and 52 minutes after the hour and buses depart at the top of the hour (Buehler, 2006).

Buehler (2006) shared that some lines are contracted out to partners, such as those operating in Ilanz, Disentis and Zernez. The PostBus has an agreement with forty-four transport partners in the region who provide services for them (PostAuto, 2006). The services provided by these private organizations are difficult to recognize from those operated by the PostBus because the insignia, tickets, driver’s uniform and the physical appearance of the PostBus are adopted (Buehler, 2006). The quality of service is the same, as if there is only one company providing the service. The private companies are compensated for the services they provide for the PostBus (Buehler, 2006, 1999a).

With the canton bordering Austria and Italy, the PostBus operates four international connections namely: (1) Scuol to Landeck, Austria, (2) Zernez to Mals, Italy, (3) the Palm Express from St Moritz through Italy to Lugano in the canton of Ticino, and (4) Campocologno to Tirano, Italy where the PostBus replaces the first train in the morning as well as the last train in the evening (Buehler, 2006). The 1999 bilateral agreement between Switzerland and the EC details the reciprocity in the carriage of goods and passengers. Buehler (2006) attests to the need of securing a license to operate in the areas outside of Switzerland as well as working with international companies in providing services along certain lines such as the Scuol-Landeck route where both Austrian and Swiss buses ply the route.

Like the RhB, the PostBus has its own tourist lines that crisscross the whole country. Of the ten Route Express Lines, four are in the region as shown in Figure 31 below and pass through routes established as early as the 18th century. Reservations for certain routes are required while some buses allow passengers to transport their bicycles.

---

The Julier Route Express (1) begins at Chur then on to the villages of Lenzerheide and Savognin through the Julier Pass to reach St Moritz. The Palm Express (2) is a multi-altitude experience beginning from St Moritz (at 1,822 m) crossing the Maloja Pass (1,815 m) going down to the Italian towns of Chiavenna (333 m) and Menaggio (202 m), finally on to Lugano (278 m) in the canton of Ticino. The Engadin-Meran Route Express (3) is quite recent and begins in the village of Zernez, passes through the Swiss National Park before reaching Müstair where the Monastery of Müstair is listed with the UNESCO World Cultural Heritage, and proceeds to the village of Meran in Italy. Finally, the San Bernardino Express (4) begins in Chur just like the Julier Express and passes through the San Bernardino Pass through the mountain villages to reach Bellinzona, the capital of the canton of Ticino.\(^\text{37}\)

The PostBus is acknowledged as an “important link in the overall mobility chain” where it provides the necessary connection to the main transport line as well as substitute for the rail where it is impossible to reach mountain villages (PostBus, 2005, p 7). For over a

\(^\text{37}\) The descriptions of the various routes are all from the promotional material of the PostBus and because Switzerland is famed for its mountains, village elevations are important. PostBus 2005, Swiss Alps 2006: Travelling on the most scenic PostBus lines' report by Swiss PostBus Ltd Tours and Travel, Interlaken.
The PostBus has served its varied clientele from schoolchildren, working professionals, locals on errands to tourists on holiday (PostBus, 2005).

THE SWISS NATIONAL PARK
The Swiss National Park (SNP) located in the Engadin valley in the canton of Graubünden is the only national park in Switzerland at present and there is a general feeling that a larger area is needed in order to protect its flora and fauna (SAEFL, 2004). The establishment of the Swiss National Park in 1914 was inspired by the creation of the Yellowstone National Park in the United States in 1872. From an initial area of 129.95 km² (129,950 hectares), it has grown to the present area of 172.3 km² (172,300 hectares). Pro Natura, a non-profit organization founded in 1914 to create and manage the Swiss National Park, have since helped establish almost half of the present wildlife reserves in the country (ProNatura, 2005).

The Swiss National Park is a federal association under the Office of Landscapes of National Importance Section of the Nature and Landscape Division of the SAEFL. The National Park Federal Commission (NPFC) as explained by Tester (2006) sets the guiding structure of the association. Pro Natura manages the park according to these guidelines. The Swiss National Park is managed as a wilderness area where human activities are discouraged and mainly intended for research, information and total nature protection (Swiss National Park, 2006c). In 2000, when a consultative referendum was undertaken regarding the expansion of the park, the electorate who were worried about the intrusive nature of tourism, ruled out the proposal (SAEFL and SFSO, 2002). The results disappointed the proponents who had proposals of non-intrusive forms of tourism which could be carried out in the planned zone of the national park whereby making it more attractive to visitors (SAEFL and SFSO, 2002).

At present, there is an ongoing bid for the villages in Val Müstair namely Tschieriv, Fuldera, Lü, Valchava, Sta Maria VM and Müstair to become a biosphere reserve under UNESCO (SNP, 2006a). With a population of only 1,700, the valley is seen to benefit

---

NPFC is composed of nine members with one representative from the canton Graubünden, one member representing the municipalities of SNP, three from ProNatura, two from the Swiss Academy of Science, and the president and a second representative named by the Confederation. All these members are nominated by their respective groups but the decision is left to the approval of the federal government. Tester, U. 2006. ProNatura, Abteilungsleiter Biotope und Arten, Basel. Interview: 1 September 2006., www.nationalpark.ch., 1981. SR 454. Bundesgesetz über den Schweizerischen Nationalpark im Kanton Graubünden (Nationalparkgesetz - National Park Law).
from the alliance, as it will ensure that the environment is kept intact, jobs are available to the locals, and sustainable development is practiced (SNP, 2006a). This development is welcome news to the national park administration whose plans for expansion years ago ended in disappointment. If successful, this will redefine the area covered by the national park to comply with the biosphere reserve criteria set by the Seville Strategy for Biosphere Reserves. 39

Graubünden in summer caters to nature tourists who enjoy walking, hiking, cycling, and those who seek peace and quiet. The national park has twenty-one trails and a hiking network of 80 km. Park regulations prohibit cycling and bringing in pets even on a lead and require visitors to follow marked trails and strongly discourage them from straying (SNP, 2006b). The wild animals, which do not go away because the boundaries where humans can venture are set, are a major attraction of the national park (Lozza, 2006). This is validated by the 1993 survey where 71% of those who visit the national park do so to observe the animals (Lozza, 1996).

Given the stringent park regulations, visitor numbers still reach 150,000 every year which is considerable given the fact that it is only open May to October and closed for winter (SNP, 2006b). Winter sports are not allowed in the area and the closure of the park in winter is important because majority of the area is prone to avalanches (Tester, 2006). Lozza (2006) shares that the Swiss National Park does not charge entrance fees because the Swiss people already support its administration and management with their taxes. The park administration has set no limit to the number of visitors (Lozza, 2006), but requires groups of twenty or more to let the park staff know of their arrival (SNP, 2006c). He concedes that with this visitation policy, overcrowding sometimes occurs on certain trails, but impacts are kept to a minimum because everyone is forced to keep to the trails.

**Park Access**

Getting to the SNP is straightforward as it is accessible by both public and private transport. Since the National Park is only open for the summer, the public transport timetable presented here is valid from 20 May to 22 October 2006. It only takes about 2.5 hours from Zurich to Zernez with a change of trains in Landquart and inter-regional

---

39 At present, the Swiss National Park is not seen as a real biosphere reserve due to the fact that it only has one zone (core zone) and does not have the other zones (buffer zone and flexible transition area), as identified in the Seville Strategy for Biosphere Reserves. Lozza, H. 2006. Communications Manager, Swiss National Park, Zernez. Interview: 7 September 2006.
trains leaving Zurich every half hour for Chur through Landquart. The Rhaetian Railway (RhB) stops at Zernez twice every hour, one from the north on the Sagliains-Zernez-Pontresina line and from the south on the Pontresina-Zernez-Scuol-Tarasp line. From Zernez, a PostBus plying the Zernez-Müstair-Mals route leaves every 15 minutes after the hour from 7 a.m. to 10 p.m. (7.15, 8.15, 9.15 etc). The bus’ timetable coincides with that of the train from Sagliains, which arrives in Zernez a few minutes before the bus schedule at 7.12, 8.12, and every sixth minute of the hour thereafter i.e. 9.06, 10.06, etc. There is a special trip departing at 9.32 a.m. (train arrives at 9.30) rather than on the hourly interval, which requires reservation.

The route from Zernez to Mals cuts through the national park and there are six PostBus stops within the park (refer to Figure 33) (SNP, 2006c). Trails also begin and end at these points along the OfenPass making it easy for walkers to hop on and off along this stretch at their convenience. The configuration of the trails also allow visitors the flexibility of starting in one valley and finishing in another, for example Trail 18 takes one through Val dal Botsch and through Val Mingèr to the village of S-charl.

Though the park is well serviced by both rail (RhB) and the PostBus, the mode of choice by over 70% of its visitors is the car (refer to Figure 32). Lozza (1996) expressed disappointed that even with good PostBus services along the OfenPass where majority of the trails begin and end, the car is still the mode of choice. Moreover, a visit to the national park does not guarantee the adoption of a more ecologically sound behaviour (Lozza, 1996). He acknowledges that it was mainly due to school and group visits that there was an increase in public transport usage during the survey for September. There is the proposal that the park administration should take an active role in encouraging mode shifts even if it is one visitor at a time by promoting the trails beginning and ending along the OfenPass as well as the villages serviced by both the RhB and the PostBus (Lozza, 1996).

Figure 32 Mode share observed over June to October 1993
Source: Lozza, 1996
Figure 33 Swiss National Park showing PostBus stops and Parking Areas along the OfenPass (Pass dal Fuorn)
Note: The red lines are trails.
Source: Promotional Material, Swiss National Park
Getting to the national park by car has been greatly alleviated with the opening of the Vereina Tunnel in 1999 and the operations of the car train between Klosters and Sagliains; it reduced travel time from Zurich to the Lower Engadine Valley by about an hour. Prior to the tunnel, everyone had to go to Davos to catch the PostBus that travels through Flüelapass to Susch then Zernez. The length of the trip makes it impossible to do round trips to and from the region (Caflisch, 2006). Just to compare travel times utilising public transport, taking the train from Zurich to Davos and the PostBus to Zernez will take three hours, while the route through Vereina Tunnel shaves thirty minutes off (refer to Figure 34 The Swiss National Park and the RhB and PostBus lines).

Along the OfenPass are ten parking areas with very limited number of spaces (refer to Figure 33). The capacities vary from a minimum of eight to about twenty-five spaces for the Hotel Il Fuorn. Total number of spaces may reach a hundred or so according to

---

**Figure 34** The Swiss National Park and the RhB and PostBus lines

Note: The map does not reflect all RhB and PostBus lines in the region.
Source: Base map from Graubünden, 2006d, highlight of details by author.
Lozza (2006). The uncertainty of the figure is due to the unpaved and informal plan of the parking areas with the exception of the one at the Hotel Il Fuorn as shown in Figure 35. During summertime, it is difficult to secure a space so car-driving visitors have to arrive early to get hold of one.

![Figure 35: Parking areas P6 in the Hotel Il Fuorn (Left) and P5 along the OfenPass (Right)](image)
Photographs by the author.

Though the SNP does not allow vehicles to enter the park and there are limited parking spaces along the OfenPass, the mode split still favours the car and demand has led to an increase in parking spaces in Val Trupchun. Tester of ProNatura expressed concern during the interview on 1 September 2006 over this facility because no parking fees are collected and the expansion has been due to the pressure placed by the public. Lozza (2006) shared in an email dated 15 November 2006, “[t]here have been around 50 until 2005, now there are 30 more and space for another 50 along the road.” One of the important trails of the national park begins in the valley and during September, the visibility of the red deer in the area makes it a popular destination (Tester, 2006). In all these areas, no parking fees are collected in consonance with the policy of the whole region.

Though no parking fees are collected, one would think that the limitation of parking spaces is a natural deterrent to car-driving visitors and expect a modal split favouring public transport. However, this is not the case as shown in the 1993 visitor survey done by the SNP administration as shown in Figure 32.

Visitors to the national park are mainly composed of families (36%) followed by pairs at 32%, then groups at 27%, while those on company trips and on their own take 2% each (Lozza, 1996). From the age distribution, the largest group (34%) are within the 26-45
age group, 27% from the 46-59 age bracket, and 18% from 0-15 years old (Lozza, 1996). For families with children from 0-15 years old, the convenience of driving the family car would outweigh the convenience of taking public transport.

Lozza (2006) thinks it is fortunate that their visitors are not day-trippers; otherwise, the impact of their journeys would be greater given the mode split favouring private vehicles. From the interviews with Tester and Lozza (2006) of the SNP Administration, the question of space for parking areas is never an issue. They would rather have more space for the wildlife than cars (Tester, 2006). As a strict nature reserve and only operating on a series of visitor guidelines, what is important is the respect for the boundaries of the national park and the adherence to the rules.

Another reason for the number of car-driving visitors is the location of the SNP. Although it is in the easternmost part of Switzerland and quite far from major Swiss city centres, it is quite accessible to Italy, Austria and Germany. With the reciprocity agreement on road transport between Switzerland and the EC, it is faster to drive into the region than take the train. From Singen, Germany to Klosters by car will take around 2-2.5 hours taking the direct route through Bad Ragaz and along Lake Constance; whereas, if one takes the train it will take at the minimum 3.5 hours with transfers in Schaffhausen, Zurich and finally Landquart. The SNP is very accessible to Italy through the OfenPass and Livigno while the Scuol-Landeck route links Austria.

At present, the Swiss National Park is working with the Germans on the Fahrtziel Natur project whose main goal is the promotion of public transport to the various national parks and biosphere reserves of the country. The SNP is the first non-German protected area to join the project (Lozza, 2006). With the RhB, PostBus, SBB and the Deutschebahn, the SNP is encouraging the use of public transport to visit the national park. Lozza (2006) believes getting to the national park by public transport should be promoted more given that the public transport serving it is very convenient, runs on good timetables and is quick and reliable.

---

40 Singen-Klosters driving time shared by German tourists who drove from Singen to Klosters taking the described route, while rail times can be inputted on the SBB website: http://sbb.ch/en/index.htm, use Singen (Hohentwiel) as departure point and Klosters as destination.

41 Literally meaning Travel Goal Nature but may be translated to mean “sustainable transport for nature tourism”, www.bahn.de/regional/view/bundesweit/index_fzn.shtml
The advantage of taking public transport is evident in the convenience of the schedules. The majority of the trails in the SNP take more than forty minutes with three trails taking over six hours to complete, and depending on how the excursion is planned may require an overnight stay at the Chamana Cluozza inside the park. The PostBus services in the neighbouring valleys where trails terminate or cut across allow one to plan a walking circuit without having to worry about going back to the parking area for the car. Overnight parking is strictly prohibited along the OfenPass.

**The OfenPass and the Swiss National Park**

The International Union for the Conservation of Nature (IUCN) Protected Area Management has categorised the Swiss National Park as a strict nature reserve under Category 1a.\(^{42}\) A major road cutting across a national park can have a great impact on its biodiversity. Forman (2004) equates the road to a break in connectivity in wildlife habitat therefore increasing the incidence of roadkill, degrading roadside habitat, and creating a barrier effect that limits their area. In the case of the Swiss National Park, the OfenPass that cuts across it has been in existence way before the creation of the national park in 1914. Moreover, prior to 1920, only horse-drawn carriages and coaches were allowed to pass through in consonance with the traffic regulation passed by the cantonal government at the end of the 19th century banning automobiles on the streets of Graubünden (Bernard, 1978). Bernard (1978) alleges that the noise of automobiles spooked the horses.

The cantonal road links the villages of Tschierv, Fuldera, Lü, Valchava, Sta Maria VM, and Müstair in the Val Müstair valley with the rest of Switzerland as well as connects Italy with Switzerland with links to Mals, Umbrio and Stelvio. The villages in the Val Müstair region have a combined population of 1,720 as of the last community survey in 2005; a number that has not changed much from the 1,440 population counted in 1880 (Graubünden, 2006b).

From the cantonal traffic volume figures, the traffic along the OfenPass corridor in 2005 totalled 487,822 vehicles (Tiefbauamt, 2005). The attraction of Livigno which is a custom-free zone in Italy but accessible through the Punt la Drossa tunnel from the OfenPass generates a lot of traffic (Lozza, 2006). About a fifth of those passing through

---

\(^{42}\) Under IUCN Protected Area Management Category 1a, the area is a strict nature reserve/wilderness protection area managed mainly for science or wilderness protection. [www.iucn.org/themes/wcpa/theme/categories/what.html](http://www.iucn.org/themes/wcpa/theme/categories/what.html) [www.nationalpark.ch](http://www.nationalpark.ch)
the OfenPass proceed to Livigno. The PostBus that travels from Zernez to Mals carry about 150,000 passengers a year, a figure confirmed by Buehler (2006) in an email dated 4 October 2006.

Given the significance of the road and the amount of traffic along the corridor, roadkill is just around 20-30 a year which is not a big number given the population of wildlife that thrives in the national park (Lozza, 2006). Tester (2006) affirms that the SNP monitors accidents between animals and cars and if the numbers are high, a study is done to find a solution. At present there are reflectors along the road which discourage the animals to cross the road, and there are no bridges over the road because the management of the SNP believes the artificial structure will have a bigger impact on the behaviour of the animals than the road itself (Tester, 2006).

Tester (2006) also commends the configuration of the road that cuts across the sections where the natural structure of the forest keeps the animals away from the road and the areas where the forest has been cut for security. These natural barriers have ensured that the road has minimal impact to the wildlife. However, he acknowledges that the stretch between Il Fuorn to Buffalora is problematic because the road cuts the park through the plains and is relatively straight. Lozza (2006) points out that it is the level of road toll that is worrying than roadkill. At present, the maximum speed is 80 km/h, but motorcycles go as fast as 150 km/h resulting in 90% of accidents over summer being motorcycle-related (Lozza, 2006).

IN RETROSPECT: THE NATURE TOURIST, THE SWISS NATIONAL PARK AND THE TRANSPORT NETWORK

In promoting tourism amongst its neighbours, especially those from Germany who make up 75% of its visitors, Switzerland banks on its strengths of having the “highest density of tourist establishments in the world linked by an attractive public transport system” (Gilg 1998, p 169). Yet it seems that this marketing line should be directed to the Swiss themselves as a reminder of the fact that tourist establishments are indeed linked by “an attractive public transport system.”

The Swiss National Park, though serviced by a good public transport network, showed a mode split of 72.2% for the private vehicle and 13.5% for public transport in the 1993
study done by Lozza (1996). The wide discrepancy in mode choice and the increasing mobility of the Swiss especially for leisure purposes questions its sustainability.

A study by Meier (2000) stressed the importance of making recreational traffic sustainable as all indicators point towards its continued increase and the private vehicle as mode choice. In his graph of the strategies put forward by experts, the strategies vary in the level of environmental impact and political acceptance. Two of the more favourable strategies i.e. good for the environment and politically feasible, include providing parking lots in built-up areas and fostering energy-efficient vehicles (Meier, 2000). These strategies fail to stem the increased use of private vehicles to leisure areas.

The following discussion presents several reasons, based on evidence, the interviews and regional reports as to why even with a good transport network, Switzerland still needs to look at other aspects of its transport policy to improve the sustainability of its network.

**The Transport Network and the Private Vehicle**

The skewed relationship in favour of the private vehicle can be explained by the imbalance between auto incentives and transit incentives (Vuchic, 1999). The following reasons have definitely made the private vehicle more attractive than public transport:

First, the highway network in Switzerland is of very high standard. As a landlocked country in the middle of Europe, the Swiss had to rely on its roadways for its existence (Fagagnini, 1996). Through the years, a sophisticated transport network has emerged with the configurations shown in Table 16, which includes the network of Graubünden.

Weiss (1996) describes how the automobile awarded the Swiss with the freedom of settling far from the city centres. He blames the road building that ensued in 1959 (see Figure 23), when the Parliament laid down its plans for a national road network to alleviate the resulting congestion. Weiss (1996, p 182) concedes “that the race between public transport and private vehicular traffic can no longer be won by extending the system of public transport.”

In canton Graubünden, the opening of the Vereina Tunnel in 1999 greatly eased traffic going to the Engadine Valley by cutting travel time anywhere from 30 minutes to an

---

hour. The construction of the Sunnibergbrücke, a bridge which bypasses the villages of Klosters and Klosters Dorf which used to contend with around 17,000 cars passing through during weekends in winter, easily shortens travel time from Landquart to Davos or to the Engadine Valley (Hübscher, 2005).

### Table 16 Transport Infrastructure, year 2005

<table>
<thead>
<tr>
<th>Infrastructure</th>
<th>Length (km)</th>
<th>Source</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Total Road Network</strong></td>
<td>71,297*</td>
<td>SFSO, 2006c</td>
</tr>
<tr>
<td>National Motorways (Trunk Roads)</td>
<td>1,734 *</td>
<td>SBB, 2006a</td>
</tr>
<tr>
<td>Cantonal Roads</td>
<td>18,117 *</td>
<td>SBB, 2006a</td>
</tr>
<tr>
<td>Municipal Roads</td>
<td>51,446 *</td>
<td>SBB, 2006a</td>
</tr>
<tr>
<td><strong>Canton Graubünden Total</strong></td>
<td>1,644</td>
<td>Graubünden, 2006e</td>
</tr>
<tr>
<td>Federal Roads</td>
<td>162</td>
<td>Graubünden, 2006e</td>
</tr>
<tr>
<td>Cantonal Roads</td>
<td>599</td>
<td>Graubünden, 2006e</td>
</tr>
<tr>
<td>Municipal Roads</td>
<td>883</td>
<td>Graubünden, 2006e</td>
</tr>
<tr>
<td><strong>Total Railroad Network</strong></td>
<td>5,312</td>
<td>SBB, 2006a</td>
</tr>
<tr>
<td>Swiss Federal Railways (SBB)</td>
<td>3,011</td>
<td>SBB, 2006a</td>
</tr>
<tr>
<td>Privately Run Railroads</td>
<td>2,143 **</td>
<td>SBB, 2006a</td>
</tr>
<tr>
<td>Rhaetian Railway, RhB</td>
<td>385</td>
<td>Graubünden, 2006e</td>
</tr>
<tr>
<td>Other Privately Run Railways</td>
<td>1,759</td>
<td>resultant</td>
</tr>
<tr>
<td>Rack Railway and Funiculars</td>
<td>158</td>
<td>SBB, 2006a</td>
</tr>
<tr>
<td><strong>Total Bus Route Network</strong></td>
<td>16,339</td>
<td>SBB, 2006a</td>
</tr>
<tr>
<td>PostBus Network Total</td>
<td>10,387</td>
<td>SBB, 2006a</td>
</tr>
<tr>
<td>PostBus Graubünden</td>
<td>1,253</td>
<td>Graubünden, 2006e</td>
</tr>
<tr>
<td>Licensed Bus Operators</td>
<td>5,952</td>
<td>SBB, 2006a</td>
</tr>
<tr>
<td>Regional Bus Graubünden</td>
<td>165</td>
<td>Graubünden, 2006e</td>
</tr>
</tbody>
</table>

Notes:
* 2005 figure reflects 2004 data, SFSO
** Simple network length, (LITRA, 2003)

Some 2005 figures for the public transport route lengths are estimates (LITRA) and therefore do not add up to the totals.

Sources: SBB, 2006a, RhB, 2006a, Graubünden, 2006e, SFSO, 2006c

The continued construction of automobile-supporting infrastructure such as tunnels through the mountains, bridges over valleys and road building has created an imbalance.

According to Fagagnini (1996), this is because rail operates through grants and loans from the federal government while roads have a steady source of money available from the government levy of customs tax, supplementary customs fuel tax, toll for large-goods vehicles (LGV) as well as highway levy for private cars. The cantons tax motor vehicles and use funds from general taxes to fund road costs (Fagagnini, 1996). The expected completion of the Swiss national road network by 2010 at a total length of 1,856 km may eventually mean resurgence for the rail development (Fagagnini, 1996).

Frey (2003) on the other hand recalls how a federal commission developed the “Integrated Transport Concept 1972-1978” to balance rail and road transport. He
describes the work as successful and supported by various groups. However, it failed to be implemented because the Swiss electorate declined the proposals in a plebiscite in June 1988 (Frey, 2003, Benninghoff et al., 2004). Frey (2003) concedes that it might have been the wrong time and the ecological debate too weak to sway the car-driving Swiss.

In 1994 the Alpine Initiative was successful in adding Article 84 in the Swiss Constitution, which stipulates the protection of the Alpine areas from negative effects of transit traffic (AlpineInitiative, undated). This meant transferring freight transit to rail thereby reducing the capacity of transalpine transit roads. However, this concern for the Alpine areas is mainly focused on transit traffic and not much on the leisure driving individuals who account for 60% of the total volume of traffic in Switzerland. With 70-80% of tourists driving to vacation spots in the Alps during tourist season, the magnitude of pollution this creates can be worse than in the cities (Weiss, 1997).

The second reason involves the continued provision of parking spaces. From the Swiss National Park experience, the limited number of parking spaces along the OfenPass has not discouraged the use of the private car. However, the case of Val Trupchun is different. The increase in number of private parking spaces in Val Trupchun as Lozza (2006) reported from just 50 to almost 130 after 2005 is worrying. Obviously, the residents in the valley are agreeable to it despite what Meier (2000) found in his study where experts interviewed agreed that the development of parking areas in outlying areas should be discontinued as this measure has little environmental relevance and politically difficult to support (Meier, 2000). It is interesting to note and reiterate that parking fees are not collected anywhere so the provision of the extra parking spaces is somehow out of character as the village does not stand to gain much from it aside from indirect income from other services it may provide.

The collection of parking fees and the limitation on parking capacities are part of Vuchic’s (1999) list of auto disincentives along with increase in fuel taxes. Though these proposals were made for the urban environment, these should still be upheld in the countryside where the environment is critical. Given the linkage of the national park, a lot has to be done to discourage visitors to drive their cars.

---

44 Meier found out in his study that leisure takes 60% of the total volume of traffic in Switzerland and the 43.9% figure of the 2000 census is a conservative result. Ibid.
Third, the RhB as acknowledged by Brugger (2006) is a leisure train "for people who [have] time." It does not travel as fast as the SBB and the only advantage it has over cars travelling to the region is the speed of the SBB, which takes the Zurich-Chur route between 1.25 hours (Intercity trains) to 1.5 hours (Inter-regional trains). A car will have to be fast to attain the same travelling time (Brugger, 2006). Although Brugger (2006) believes that for holidaymakers time is “not a big problem if [one] is on the train half an hour more or less,” travel time is indeed an indicator for mode choice. Table 17 shows that it is faster to take the car from Chur to St Moritz or Landquart to Davos. Meier (2000) also found that there is a general sentiment that “if public transport offers rapid, direct and comfortable transport and connections, opportunities to further improve the modal split in its favour are good.”

**Table 17 Travel Times of the various Modes within the Region**

<table>
<thead>
<tr>
<th>Route</th>
<th>Distance - km (Rail/Road)</th>
<th>Travel time – Rail (Hrs)</th>
<th>Travel time – PostBus (Hrs)</th>
<th>Travel time – Car (Hrs)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Chur – Arosa</td>
<td>30</td>
<td>1</td>
<td></td>
<td>0.75</td>
</tr>
<tr>
<td>2. Chur – St Moritz</td>
<td>90</td>
<td>2</td>
<td>2.5*</td>
<td>1.5</td>
</tr>
<tr>
<td>3. Landquart – Scuol</td>
<td>70/90</td>
<td>1.5</td>
<td></td>
<td>1.5</td>
</tr>
<tr>
<td>4. Bellinzona – Chur</td>
<td>120</td>
<td>2</td>
<td></td>
<td>2</td>
</tr>
<tr>
<td>5. Tirano – St Moritz</td>
<td>60</td>
<td>2.5</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>6. Landeck – Scuol</td>
<td>60</td>
<td>2</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>7. Scuol – St Moritz</td>
<td>60</td>
<td>1.5</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>8. Landquart – Davos</td>
<td>50/45</td>
<td>1.25</td>
<td></td>
<td>0.75</td>
</tr>
<tr>
<td>9. Lugano – St Moritz</td>
<td>125</td>
<td>3.75</td>
<td></td>
<td>3.5</td>
</tr>
<tr>
<td>10. Chur – Flims Laax Falera</td>
<td>20</td>
<td>0.75</td>
<td></td>
<td>0.5</td>
</tr>
<tr>
<td>11. Chur – Disentis Sedrun</td>
<td>70</td>
<td>1.25</td>
<td></td>
<td>1.25</td>
</tr>
<tr>
<td>12. Zernez – Val Müstair – Meran</td>
<td>54</td>
<td>1.5</td>
<td></td>
<td>1.25</td>
</tr>
</tbody>
</table>

Note: * Julier Express is a special tourist line by the PostBus  
Source: Graubünden, 2006d

Given the high mobility rate of the Swiss, the popularity of the car and the large percentage of domestic tourists in the region, it is safe to assume based on travel time alone, that the majority would be driving their cars rather than taking the train.

Fourth, there is no difference in fares for local passengers and visitors to encourage a group to shift modes. In an email from Rostetter of the marketing department of RhB, dated 4 October 2006, he writes, “[t]here are special offers for locals which reduce the fares, like for students, or multi-day cards for commuters. Another special reduction is a Half fare ticket, which is one year valid and entitles the holder to 50% reduction on all trains, busses and public transport system in Switzerland.” For tourists and visitors, there are special tickets such as the Swiss Pass that allows unlimited travel in the entire Swiss transport network and valid for 4, 8, 15, 22 days or 1 month. While the various
cants give special discounts to their visitors e.g. the Graubünden Holiday Pass, there are village passes as well. The local initiative of awarding their guests with free public transport is an incentive for these guests to leave their cars as they explore the villages. In Graubünden, nearby villages along a valley support one another by promoting a collective destination by offering free travel on the local bus and discounted passes, examples are the Davos-Klosters Mountains, Flims-Laax-Falera, and St Moritz-Engadine Inclusive programs.45

From the history of the canton Graubünden, tourism was influential in the improvement of its transport. The entrepreneurs of the tourist destinations of Davos wanted a railway to facilitate tourist travel, a faster alternative to the stagecoach. At present, the car has become the faster alternative.

Mode split and Mobility in canton Graubünden
The dramatic increase in passenger cars from 1970 to 2005 compared to the number of person trips by rail or bus as shown in Table 18 is due to the innate characteristics of the public transport network in Graubünden. RhB and the PostBus provide minimum services as required by the federal law. Because the canton has to pay for PostBus services to the thirty-one villages with less than a hundred inhabitants, and the RhB is dependent on the subsidy of the federal government to run services hourly, public transport is at a disadvantage compared to the good roads of the canton.

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Rhaetian Railway RhB (person trips in 000)</td>
<td>7,759</td>
<td>7,858</td>
<td>8,409</td>
<td>8,760</td>
<td>9,226</td>
</tr>
<tr>
<td>PostBus Graubünden (person trips in 000)</td>
<td>5,600</td>
<td>8,700</td>
<td>10,873</td>
<td>9,820</td>
<td>9,251</td>
</tr>
<tr>
<td>Passenger Cars per 1,000 inhabitants*</td>
<td>…</td>
<td>…</td>
<td>407</td>
<td>456</td>
<td>482</td>
</tr>
<tr>
<td>Passenger Cars</td>
<td>29,148</td>
<td>54,892</td>
<td>73,190</td>
<td>85,829</td>
<td>92,279</td>
</tr>
<tr>
<td>Population</td>
<td>162,086</td>
<td>164,641</td>
<td>173,890</td>
<td>187,058</td>
<td>187,803</td>
</tr>
</tbody>
</table>

Note: * mean residential population
Source: Swiss Federal Statistical Office, Road Vehicles in Switzerland; Graubünden, 2006b

The rail network is 95% single-track and according to Brugger (2006), “on a day’s average there are around 300 trains running.” Timetabling is crucial because otherwise there will be long waiting times for trains in stations. The network is full and cannot accommodate plans for expansion, and the only thing possible is to increase the number

45 All these programs courtesy of promotional materials from the various destinations. Graubünden Vacation, 2006.
of trips in the morning for daily travellers (Brugger, 2006). The present infrastructure cannot accommodate more trains and increasing the rolling stock would be of no use given the fact that most of the lines are single-track (Brugger, 2006). RhB’s inflexibility is reflected in the steady but minimal increase in person trips. From Table 18, there were 47.9 trips/person in 1970 that increased to 49.1 trips/person in 2005, an unremarkable difference of 1.2 trips within the last thirty-five years.

RhB improves its service by employing “stops on request” (Halt auf Verlangen) on its routes. This system makes travel time shorter with minimal stops along a route because the train does not stop at all the stations, only at requested stations as well as the main ones. Taking the route from Pontresina to Sagliains, the required stops would be Samedan, Zuoz, Zernez and Sagliains while the stations in the towns of Bever, La Punt, Madulain, S-chanf, Cinuos-chel-Brail and Susch are “stops on request” (refer to Figure 30) (Graubünden, 2006c).

The PostBus has not performed as well as rail, despite the increase in person trips from 1970 to 1990. This may be due to the changes in service provision discussed by Buehler during the interview 8 September 2006 where the federal transport law after 1996 requires transport services to be contracted by an official and not determined by a provider such as the PostBus. The subsequent PostBus services in the canton have obviously lower levels as evidenced by the decreasing number of person trips after 1990 (see Table 18).

Even with the integrated transport network, the hourly frequency of trips is no contest to the convenience of the private vehicle. From the cantonal traffic volume figures, the traffic along the OfenPass corridor in 2005 totalled 487,822 vehicles (Tiefbauamt, 2005). Comparing this figure with the average of 150,000 passengers a year carried by the PostBus between Zernez and Mals (Buehler, 2006), the PostBus is only able to provide services to a third of its catchment population (assuming that there is one passenger per vehicle). The numbers show the popularity of the corridor and it might be beneficial to the sustainability of the network if there is an increase in PostBus services, a sentiment echoed by Lozza during the interview on 7 September 2006.

**Promoting a sustainable alternative**

There is a conscious effort to reduce the country’s carbon dioxide emissions with the proposed rebuilding of its forests, the promotion of clean-fuel vehicles, strengthening of
its public transport system by coordinating bus and rail times, increasing rail and road services, and improving infrastructure. A DETEC (2001) strategy promotes sustainable mobility, coordinated transport policy, technical optimisation (infrastructure, vehicles and fuels), alignment with the European network, cost transparency, shift to public and non-motorised transport, and transport safety. The department works on the premise that strengthening the public transport network and operating it as a public service ensures better services.

The Swiss Federal Council also came up with a document entitled ‘Sustainable Development Strategy 2002’ to update the policy strategy created in 1997. This document identifies ten action areas that take into consideration the issue of sustainable development into the policy of the various sectors. Two areas most relevant to the research include Action Area 6 on the Environment and Natural Resources and Action Area 8 on Mobility. The former underlines the importance of nature and the countryside in the promotion of ‘gentle’ tourism and the protection of biodiversity. The latter aims to increase the volume of traffic accounted for by public transport and non-motorized transport with special attention given to agglomerations and leisure traffic. Attention to these areas shows that the country along with the European Union is working towards a stronger form of sustainability with aims such as halting the decline in biodiversity by 2010 (Swiss Federal Council, 2002).

The Alpine Convention has brought attention to the importance of protecting the Alpine region and the importance of international agreements in promoting sustainable development. The protocol on transport acknowledges the adverse impacts of certain modes to the environment as well as the continued construction of roads in the region.

The success of the Alpine Initiative is a reminder of the vigilance and influence of the people. Freight transit through the Alpine region contributed to congestion, air and noise pollution, and compounded damage to the countryside. The Alpine Initiative took over a year to lobby for the switch of transit freight from road to rail to decrease the environmental impacts in the region. The group has now focused its attention on policing useless transit traffic that delivers raw materials to a country with cheap labour and whose products Switzerland consumes (AlpineInitiative, undated).

The project with Fahrtziel Natur of Germany is significant as it specifically promotes trips to national parks using public transport particularly trains. The Alpine Pearls
project, which the canton of Graubünden together with Austria, Germany, Italy and France, advocate ‘nature-friendly mobility’ when travelling to holiday destinations such as Arosa in Graubünden and Interlaken in the Bernese Oberland (Alpine-Pearls, 2006). The group behind the Alpine Pearls put much faith on the tourists with their statement that “[if] tourists change their holiday behaviour and make the decision to leave their cars at home, tourism experts, hoteliers, publicans and also business people will be forced to allow for this” (Alpine-Pearls, 2006). Their campaign presents transport options open to the traveller and aims to increase the level of environmental awareness and appreciation.

The Swiss Mobile project is intent on providing a national network for human powered mobility activities. With their high leisure mobility rate, the promotion of environmentally friendly leisure modes ensures lesser impacts to the environment.

CONCLUSIONS

Even for a country like Switzerland with a sophisticated public transport network, the continued construction of highways, bridges, tunnels and parking areas have skewed the modal split in favour of the car. The prevailing mode split reflects the imbalance in policy incentives and disincentives between public and private transport.

The effect is pervasive. Graubünden as a tourist destination has a good network of trains and buses but is very dependent on the tourist season. Its level of services (frequency and travel time) cannot compete with the car, which is why only those on holidays appreciate it and it is under-utilised during the off-season. The promotion of tourist attractions along their routes or the destination itself by both the RhB and PostBus is commendable. Here is evidence of a transport network integrated with the tourist attractions in a region popular as a leisure destination.

The Swiss National Park easily reached by public transport and with limited parking space, still has a majority of its visitors utilizing their cars. Limiting parking spaces has not been a deterrent to car-driving visitors, and the demand for more spaces has been successful as shown in the increase in parking spaces in the Val Trupchun area. The non-collection of parking fees further increases the attraction of driving to the park. The park administration cannot do much on the issue due to local politics and the unpopularity of this proposition. All they can do is strongly encourage the use of public transport in visiting the park and the respect for park guidelines.
The Swiss collaborations with Austria, Germany, Italy, and France on the Alpine Pearls project as well as the Fahrtziel Natur project with Germany are good initiatives promoting sustainable leisure transport internationally. Such campaigns originate from well-meaning groups bent on improving leisure mobility by suggesting alternatives to the car. Taking inspiration from the Alpine Initiative experience, awareness campaigns can lead to changes in legislation. With the bilateral agreements between the European Community and Switzerland, this environmental awareness campaign may help lessen the number of international private vehicle trips in the region.

In Switzerland, everyone has a right to public transport services as stipulated by its federal law. A system that is service-led rather than demand-based ensures that even with high frequency of car usage and mobility rate, public transport always remains an option. However, for a country that has the means and the infrastructure, it is essential for Switzerland to improve the incentives for public transport to even out its mode split. Doing so will make it achieve a higher degree of sustainability and be an example that it can be done.
6. **TRAVEL, THE NATIONAL PARKS, AND THE TRANSPORT NETWORK IN PERSPECTIVE**

Chapters 4 and 5 discussed the background, practices and current relationship of two national parks and the transport networks that served these. The objective was to investigate an example from a developing country and a developed one to look at strategies that improved sustainability.

In this chapter, the experiences and current practices of the Swiss National Park (SNP) in Switzerland and Iguaçu National Park (PNI) in Brazil are analysed. **Appendix E Comparison of Case Studies** shows the basic characteristics of the regions and the national parks. In this chapter an evaluation and comparison of strategies that work and why these work are presented. The analysis considers national park management, local and federal government policies that define sustainability in transport and tourism.

**UNDERSTANDING ECOTOURISM AND THE ROLE OF TRANSPORT**

Ecotourism is sustainable travel to biodiversity-rich areas and promotes the utilisation of modes with minimal impacts to the environment. The hypothesis states that how governments define and understand ecotourism is reflected in the mix of transport services provided to an ecotourism destination. Moreover, those with a strong understanding of sustainability have taken into consideration the impacts of travel behaviour to and from the ecotourism destination. However, the reality is that the private vehicle is the prevalent mode of choice to protected areas, which is highly unsustainable and whose impacts can endanger the very environment that visitors are coming to see. The different perspectives that the government and the visitors have regarding ecotourism can explain the highly unsustainable behaviour.

Given the current practices, a behavioural overhaul is needed so that a conscious shift of modes occurs. The role of education and advocacy as well as the active promotion of public transport are critical to the sustainability of the destination.
Modes to the ecotourism destination

The fact that ecotourism destinations support biologically diverse areas does not seem to influence the travel behaviour of tourists. The major finding regarding travel to the national parks is that the private vehicle is the mode of choice even with reliable public transport services. The statistics gathered by the national park administrations provide evidence of the severity of the problem where the mode split for the Swiss National Park is 72.2% for car and 13.5% for public transport (Lozza, 1996), while it is 82.71% for car and 15.41% for public transport in Iguacu National Park (IBAMA, 2005). In this context, one can conclude the current level of service of public transport cannot compete with the private vehicle and/or that the incentives for the private vehicle far outweigh the accountability of its environmental impacts.

Second, the majority of those who travel to national parks are domestic tourists; therefore, the available modes to the public and the levels of service are critical in their decision-making. In SNP alone, the Swiss account for 68% of visitors while in PNI, 65% are Brazilians. Both national parks have public transport services. The Swiss National Park is along the route of the PostBus and linked by the RhB with the rest of the region. The Iguacu National Park is on a special bus route linking it with the rest of Foz do Iguacu and tourism agencies provide transport services as well.

The statistics show that the provision of public transport services to the ecotourism destination is obviously not an end in itself but an important step in encouraging mode shift. Other issues such as frequency, travel time, cost, etc. need to be considered to improve the service and make it competitive with the car. For destination regions where tourists far outnumber the locals, public transport is more important for the tourists than for the locals. In this setting, having a legible network is imperative for good service. This fact is well known to RhB and the PostBus who take it for granted given the fine integrated network that exists in Switzerland. FozTrans on the other hand, accepts the need to improve the integration of its public transport network. Meanwhile, the tourism agencies in Foz do Iguacu have stepped in to provide better transport services.

The immediate neighbours, on the other hand, dominate foreign visitors to the area. The large share of Germans (16%) of SNP visitors and Argentineans (17.10%) of PNI visitors are indicative of the high level of linkage between countries. Because both Switzerland and Brazil are part of a larger landmass, the level of linkage is critical to their
economic and social agendas. Their national road network policy and international transport vehicle policy, which are both under the jurisdiction of their federal governments, reflect the interrelationships.

Finally, it is apparent that visitors do not consider the sustainability of their modes important in getting to ecotourism destinations. This attitude affirms how Banister (2002) defines leisure travel, stating that its inherent characteristics do not fit into the usual assumptions of efficient travel patterns. Although the significance of the biodiversity is acknowledged, the ecotourism destination is treated as any ordinary destination where taking the car is the convenient mode choice. Even with the integrated transport network in Graubünden, the hourly frequency of trips is no contest to the convenience of the car.

Managing Ecotourism Destinations
The sustainability of an ecotourism destination is dependent on the park management, the support it receives from the government, the visitor management strategy it employs, and its attractions.

The case studies show that the structure of the park administration has an influence on the management of the park. Compared to IBAMA, which is a federal environmental agency under the Brazilian Ministry of Environment, the Swiss National Park Federal Commission (NPFC) is a federal association composed of representatives from all levels of government and the participation of important NGOs. Its operation is similar to a corporation where the directors create guidelines and decide how the Swiss National Park will be run for a financial year. This system with the representation from all stakeholders and financial support from the federal government ensures the security of the Swiss National Park every year.

Because IBAMA is a super agency that manages all conservation units in Brazil, it cannot be very effective given its limited resources and the immensity of the area it has to protect. For the Iguaçu National Park, the creation of the 1999 Management Plan with representation from the community, organisations and academics has provided IBAMA with a workable document. A management plan enables a popular destination such as the Iguaçu National Park to handle both visitation and conservation. The installation of the PNI internal transport system greatly decreased transport impacts to the environment.
The different circumstances and the options open to a developed and developing country show varying styles of management. There is also a marked difference in the intensity of protection and management according to how the park administrations perceive ecotourism and how governments value the resource. However, both SNP and PNI share the objective of limiting visitor numbers to control impacts in natural areas because both parks are living laboratories.

The Swiss National Park with the full support it receives from the federal government does not charge entrance fees but expects visitors to obey the park’s strict regulations by not straying from the marked trails. The SNP appeals to the visitors’ sense of propriety and reminds them that the privilege they enjoy is due to the adherence of previous visitors to the rules. The Iguaçu National Park, on the other hand, with little subsidy from the federal government has to survive by generating revenue. The attraction of the waterfalls ensures PNI that there will be 2,000 visitors paying the entrance fee every day. In this set up where the efficiency of environmental management is dependent on the revenue, the integrity of the park as a conservation unit is at risk. The perceived success achieved by the private-public partnership between IBAMA and the concessionaires in national park management and operations can be a good model for national parks in developing countries where revenue from ecotourism destinations is important for its survival.

The practice of collecting fees as a visitor management strategy obviously alienates those who cannot afford the fee from those who can. Because to engage in ecotourism activities in Iguaçu National Park costs a lot, this system is elitist and keeps majority of Brazilians from fully enjoying and knowing the richness of their natural attractions.

It seems that a rich society can afford to be altruistic and forge a symbiotic relationship with its environment, whereas, a developing country struggles to keep its environment intact from its citizens who rely on its resources to make a living.

**Encouraging sustainable travel behaviour**

The case studies confirm Lozza’s (1996) realisation after the conduct of the SNP visitor survey in 1993 that visitors who come and see the importance of the natural environment do not necessarily opt for sustainable modes. Moreover, it also means that travel to the national park is just part of the experience and does not necessarily change attitudes.
As with any reality where the prevailing practices are seemingly beyond the control of the authorities, the public are encouraged to change their behaviour. Under these circumstances, the role of organisations and interest groups is crucial. From the Swiss experience, organisations have taken the role in educating the public regarding the sustainability of their mode choices. As with the Alpine Initiative that successfully lobbied for the shift of freight transit from road to rail, Fahrtziel Natur and Alpine Pearls are organisations that advocate the utilisation of the integrated public transport networks in the region for travel to natural areas. The international character of these initiatives underlines the fact that tourism is an activity that knows no boundaries. It also stresses the importance of partnerships and cooperation amongst countries in a region in mitigating the environmental impacts.

While the public are not mindful of their modes to natural destinations, the park administrations are very clear on how they want the public to behave going to and within the national park. The natural geography of the Swiss National Park does not allow vehicles into its territory. However, the limited parking it provides along the OfenPass failed to discourage visitors from using their cars to get to the park; rather, the increased pressure at Val Trupchun led to an increase in parking spaces in that valley. The SNP, for its part, is very active in promoting the public transport that serves the park.

IBAMA, on the other hand, has no control over the public transport services to the national park and does not particularly care how visitors get to the park as long as vehicles do not enter the park. The PNI had to come up with several management plans in order to control its large number of visitors. The last management plan finally installed the internal public transport mode that the park sorely needed in order to mitigate the impacts of countless vehicles allowed entry prior to 2000. It was clear to IBAMA that the provision of this system was the only answer in order to protect the environment. The continued improvement in the choice of transport modes e.g. electric powered vehicles replacing alcohol-fuelled ones, used for ecotourism activities by the concessionaires is an indicator of increasing environmental awareness.

The current practices are obviously unsustainable and the environmental impacts fuel the sustainability debate of ecotourism travel. It has been said that transport is the ‘Catch-22’ of ecotourism. The increase in car use has had an impact on the air quality in the region and the city. Surveys done by the Foz do Iguaçu tourism office have shown a 3% decrease in the air quality index from the 2001 and 2003 surveys. In Graubünden,
reports show that 57% of the nitrogen oxide emissions are attributed to transport (Fehr and Sprecher, 1997). Switzerland acknowledges that the increase in leisure travel utilising the private vehicle can actually derail the goal set by the country under the Kyoto Protocol (SFSO and FOEN, 2006).

**WHAT IS DRIVING THE CAR? INCENTIVES, DISINCENTIVES AND THE AIM FOR SUSTAINABILITY**

One of the hypotheses points out that the sustainability of a network can be determined from the balance between transport incentives and disincentives. Because the public favours the mode with the higher level of service, in identifying the factors that drive the car, a transport network’s level of sustainability may be improved.

The factors that drive the car to ecotourism destinations are very much the same factors that drive it in any urban setting. This finding strengthens the applicability of Vuchic’s (1999) urban concepts regarding automobile disincentives and transit incentives in explaining travel behaviour. Research has shown that the utilisation of the car does not reflect the real costs of travel and the amount of subsidies it receives is far greater than the costs users pay. On the other hand, for public transport to gain ground where tourism is concerned, it has to improve its level of service to be able to compete with the car. The skewed reliance on the private vehicle is highly unsustainable and its impacts are compounded in the vulnerable setting of ecotourism destinations.

**Infrastructure**

Page (1994) acknowledged that while infrastructure need not necessarily be provided for tourism but may be for economic and social reasons, the level of service it creates has an impact on mode choice. Improved transport infrastructure means increased mobility through induced demand.

The continued construction of highways, tunnels and bridges across Switzerland may be fulfilling the highway network plan of 1959 but this has contributed much to the high car usage per person at 67.2% of total kilometres covered per person (SFSO, 2006). Amplified by the increase in free time and disposable income, the car becomes the most convenient mode of choice for leisure travel at 43.9% as seen in the 2000 microcensus.

The impacts of road building in developing countries are the same, and are further compounded by the inadequate public transport services. In Brazil, the years of highway
building have made travel by land all over the country possible. As in Switzerland where 75% of guests to Graubünden drive their cars (RhB, 2006), the good highways of the State of Paraná have seen domestic tourists take their car to visit Foz do Iguaçu (53.8% in 2005) and Iguaçu National Park (average of 82.71% from 1979-2000) (SMTU, 2006, IBAMA, 2005).

The good linkages of the national parks are maintained even though these are located at the periphery of the regions mainly because these abut international boundaries. The need to look at the bigger picture as Caflisch stressed during the interview on 11 September 2006 makes one see the importance of an internationally connected network because relationships do not obviously end at the boundaries.

Issues regarding security and bureaucratic procedures can hamper the delivery of international services. The connectivity of the public transport services may not necessarily be as good as the road network connecting the countries, which makes it easier for international tourists to utilise the private vehicle to visit the national parks. The German tourists have concluded that the amount of time on German and Swiss public transport with the number of transfers to get to Klosters from Singen is at a disadvantage compared to an easy 2-hr drive.

In Foz do Iguaçu, security is an issue and entails inspectors, customs and immigration officers stationed at the Friendship and Tancredo Neves Bridges to control vehicles and pedestrians. International public transport between the cities is governed by buses and moto-taxis, the latter are exclusive to Paraguay. There are regular buses to and from Argentina and Paraguay but as argued in Chapter 4, Foz do Iguaçu's network can be quite illegible and tourism agencies have thrilled in consequence of this. At this level, the integration of networks crosses over boundaries and the bid for sustainability requires the cooperation of the countries concerned.

The continued provision of parking facilities at the destination adds to the car’s incentives. The increased number of free parking spaces in the Val Trupchun area clearly negates the limitation set along the OfenPass. It also does not bode well for the advocacy of the Swiss National Park regarding the utilisation of public transport to get to the park. In contrast, although Iguaçu National Park charges parking fees according to vehicle type, it also meant the construction of a 50,000 m² parking area. The parking fees are not a deterrent for the public to drive to the national park because the issue of lack of
parking space never came up. Moreover, even though the provision of parking spaces coupled with the internal transport mode has decreased the number of private vehicles inside the park, the special concession to vehicles of local tourism agencies undermines the aim of IBAMA in eliminating private vehicles inside the park.

**Public transport services**

The level of delivery of public transport services has a strong influence on mode choice. Statistics show that although the public transport services to both national parks are commendable, the mode of choice by park visitors remains the private vehicle.

The integrated public transport network in Graubünden faces tough competition with the private vehicle. The RhB (2006) laments the fact that 75% of guests to the region drive. The canton owes its public transport network to the development of tourism in the mid-19th century, when the post coaches and the rail ensured linkage to most destinations. However, the infrastructure for the private vehicle has since surpassed the level of service of both RhB and PostBus. The hourly frequency of services to the Swiss National Park is obviously not good enough: only 13.5% took public transport in the 1993 survey, even though the system is well integrated with the rest of the region/country.

Unlike Graubünden, where public transport services are well entrenched in the system, Foz do Iguaçu is still struggling to improve its services. What is commendable is that FozTrans knows the importance of having a good network and is working towards improving its services. The 22-minute service interval to the Iguaçu National Park underlines the park’s importance, yet the illegibility of the transport network is working against it. In the meantime, tourism agencies with their more organised services have thrived and filled the gap in passenger service.

There is also the need to take into account the efficiency of the whole country or state network with respect to the destination. This is evidenced in the experience in Foz do Iguaçu whose municipal linkage is a disappointment and inconsistent with the good degree of public transport service at the international, interstate and inter-municipal level. In the case of the Graubünden, the public transport network slows down once it reaches the region. The RhB is limited by its infrastructure while PostBus services need to be contracted by the canton which is based on demand due to the dispersed villages, population and geography of place.
Slowing down for sustainability

Whitelegg (1997) proposes slowing down time and encouraging low technology solutions such as walking and cycling. Working with the notion that people on vacation are not in a hurry, slowing down is not such a bad idea. In Switzerland, the ARE took inspiration from the success of the Cycling Association’s ‘Cycling Switzerland’ (Veloland Schweiz) which took off in 1998, by undertaking the Swiss Mobile project that will be launched in 2008. Swiss Mobile promotes all human powered modes and a country network is already in place. The importance of these forms of transport is acknowledged with the creation of a department focusing solely on human powered mobility under Tiefbauamt (Building and Inspection) of the Building, Traffic and Forest Department (BVFD) in Graubünden.

Public transport in Graubünden is slow and therefore suitable for tourist travel. The RhB reports that 80% of its revenue comes from tourists. The PostBus and the RhB are both aggressive in their promotion of the tourist routes, relying on the segment of the population who have more time to enjoy the attractions and who would not mind the extra time onboard the train or PostBus. This number would only be 48.6% of the visitors to the region if it is assumed that all domestic tourists (51.4%) drove, but would only amount to 23% of the total visitors if all the Germans (25.6%) took their cars. This percentage is not too far off the 75% estimate of RhB of visitors to the region who drive.

There are not enough automobile disincentives in Switzerland to sway the locals, who make up more than 50% of tourists to Graubünden, to utilise the more sustainable option open to them. The integrated transport network of rail and PostBus in Graubünden links its attractions – after all tourism shaped the region’s transport network. Yet, the high incidence of car-driving visitors undermines the sustainability of the network by decreasing patronage. Although all the trains in Graubünden are electrified and have minimal emissions, the increase in number of cars on the road can hamper the country’s goal of achieving a reduction in its CO₂ emissions as set out in the Kyoto Protocol.

MANAGING THE TRANSPORT NETWORK FOR AN ECOTOURISM DESTINATION

Because the transport network is not for the exclusive use of the national park, the provision and level of public transport services have an impact on how people utilise the
network. This study argues that if tourism is integrated with transport policies then a more sustainable transport network serves the ecotourism destination. It also assumes that both developed and developing countries are capable of providing sustainable transport options.

The distinct structures of transport governance in Graubünden as a canton and Foz do Iguaçu as one of the municipalities in the State of Paraná are quite difficult to compare. Nevertheless, the structures that enable the local governments to provide the transport services to the ecotourism destinations correlate with the practices, with some unexpected realities. The study also hypothesises that the involvement of non-government organisations and people’s initiatives in the policy-making process make a difference. The issue regarding the management of the transport network for an ecotourism destination takes into consideration the developed/developing country dichotomy as well as the different government levels that operate for each national park.

**Governance structure**

Apel and Pharoah (1995) showed in their case studies the influence of federal policies on the state and local levels even when these have strong political autonomies. This is reflective of Switzerland where even with the strong autonomy of the cantons, the federal government plays a vital role in the provision of transport infrastructure and services for the whole country. In Graubünden, the local government manages the public transport services by contracting the services of RhB and the PostBus. With the SBB providing inter-regional services, it dictates the timetable for the RhB and the PostBus. This set-up reflects how even with local governments in charge of the planning and provision of transport services, the federal government dictates the minimum requirements and the level of subsidy a canton will receive. This federal control can be traced to 1872 when additional transport powers especially timetabling and ticket prices were awarded to the Federal Council.

This system of managing public transport is quite efficient as can be evidenced anywhere in Switzerland. One only has to look at the map for the Swiss Pass to be impressed by the interconnectivity of intermodal services. This integrated network is not just at the national level but is replicated at the cantonal and even the municipality level where the

---

45 The ultimate transport ticket for visitors to Switzerland, it allows passage to all modes all over the country with discounts to some mountain trains and cable cars. The ticket may be valid for a fixed number of days e.g. 4, 8, 15 days or 1 month. For more details, see http://www.swisstravelsystem.ch/Tickets.16.0.html?&L=2 accessed 19 June 2007.
timetable of the gondolas are factored in the local timetables. Because transport as a public service is innate in the Swiss system, the federal and local governments ensure that even the remotest mountain village has service. In Graubünden, the canton purchases services to mountain villages with annual population of less than a hundred.

In Brazil, the federal government is likewise in charge of the provision of the national road infrastructure and subsidises the construction of state roads. Because the bus is the main mode of public transport in Brazil, the creation of the National Agency for Land Transport (ANTT) by the Ministry of Transport in 2001 acknowledged the importance of having a solid bus network. The outcome is nothing like the integrated system of the Swiss, mainly because there are so many players (bus operators) at the various levels. The federal government is in charge of the interstate and international passenger transport, the state governments manage inter-municipality travel while the municipalities take care of urban transport. In all levels, private bus companies bid to provide the services while the governments regulate the system.

In the case of Foz do Iguaçu, it was only with the creation of FozTrans that the public transport services improved. However, its bid to install the integrated system meant it had to rely heavily on the support of the state government. This top-down administrative influence is a regression of the municipalisation process in the 80s, which aimed to increase the power and autonomy of the municipal government. Nevertheless, FozTrans has identified the areas that need improvement and has plans of seeing these through.

In retrospect. The comparison of the similar transport management structures shows how the Swiss have successfully integrated all modes into one coherent system. The Brazilians, to their credit, are working towards providing an integrated transport network but the complexity of the system hampers the efficient implementation. The big cities of São Paulo, Rio de Janeiro and Belo Horizonte have had limited success and different issues to take into consideration. The Brazilian network mostly deals with buses. The success of Curitiba in integrating its network and installing its bus rapid transit system has long since inspired other developing countries but whose success has not been replicated within Brazil. The transport system in Foz do Iguaçu is evidence of where the adaptation of the Curitiban system went wrong.
The case studies recognise the significance of having federal legislation encouraging the improvement of the sustainability of its transport network. The Swiss are keen on achieving the requirements for the Kyoto Protocol. Their various programs aim to increase public transport ridership, provide cleaner transport technology options, encourage human powered mobility modes and transfer freight transit from road to rail. Brazil, on the other hand, learned the hard way from the oil crisis of the 70s. To stop the country’s dependence on oil, the government developed its alcohol program and subsidised fuel prices to ensure the cost of alcohol is always 40% cheaper than gasoline (IEA, 2004). Unfortunately, this has had the effect of encouraging car travel.

**Provision of Transport Services**

The outcomes are different although both case studies employ the concept of integrated transport as a planning strategy.

In Switzerland, it is the canton’s duty to ensure that all communities under its jurisdiction have links to the transport network. However due to the financial capability of canton Graubünden, its large area and the dispersed villages across the mountains, the frequency of services is demand-led and can be low especially to villages with populations less than a hundred. In spite of this, a region 46 can increase the frequency of services to its area by purchasing more services from the PostBus. Unlike the regions in Foz do Iguacu, the regions of Graubünden have as much autonomy as the canton in the provision of its public transport services.

FozTrans as an autarky is still struggling to provide the necessary transport services in the municipality. The limited financial capacity of the municipality meant it had to rely on the aid of the state government in implementing its plans of installing an integrated system. The poor implementation of the integrated system that worked so well in Curitiba is mainly due to the method of service compensation. The retention of FozTrans of a market-led system in a demand-led transport network is recipe for inefficient services. The disparate land uses and population density mean rural/agricultural areas with low populations get lower frequency services.

---
46 Graubünden is divided into ten timetable regions consisting of neighbouring municipalities. The state government chooses a president to head each region and hold office for four years. 1994, BR 872.150. Ausführungsbestimmungen zum Gesetz über den Öffentlichen Verkehr im Kanton Graubünden - RAB z GöV [Determinants for the execution of the Public Traffic Law in canton Graubünden].
The difference between low service frequency in Graubünden and Foz do Iguaçu is that in Foz do Iguaçu the car ownership ratio of 1:4 means there is a high dependence of the majority of the population on public transport. Services may run every 40 minutes but it lasts until 12 midnight, unlike in Graubünden where it can mean a minimum of three scheduled trips per day. The GDP per capita of Paraná and Graubünden explains the disparity. In 2003, Paraná had a GDP per capita of R$9,891 (A$5,505), while Graubünden had CHF45,600 (A$47,880). Graubünden’s car ownership ratio of 1:2 does not deter the RhB or the PostBus from providing regular services even with only three trips per day.

The difference in service delivery, where both systems are demand-led, is in the manner of service compensation. In Graubünden, both federal and cantonal regulations govern service compensation, with the timetables prepared by the canton and subject to approval by the various regions before the purchase of services from the RhB and PostBus. Unlike the participatory decision-making in Graubünden, by contrast, FozTrans single-handedly plans the timetables and routes before bidding the services out to private bus operators. The system, where the successful companies in securing the services pay FozTrans a fixed monthly tax, encourages a market-led network that compromises the integrity of the terms of services. This has manifested in the extension of services to lucrative areas already receiving services and the sudden suspension of services to areas with low patronage.

Although there are public transport services to both national parks, these cannot compete with the private vehicle. The hourly trip through the OfenPass by the PostBus is not sufficient and the limited parking proved unsuccessful in encouraging visitors to use public transport. The reasons for the unsustainable practice were discussed in the earlier section.

In the case of Iguaçu National Park, although FozTrans has good intentions in providing better transport services in the municipality, the strong lobby of the tourism agencies have had an impact on the choice of modes of its visitors. Not only is the level of services of tourism agencies better, it is uncomplicated. In comparison, the public transport services operate in a highly illegible network. Its illegibility is due to non-existent maps and schedules at bus stops, a very forgettable timetable even though it has a 22-minute frequency, and lack of signage. Therefore, for developing countries with
established tourism cities, it is imperative to have a legible transport network that allows for easy transfers from one line to another, be it international or inter-state travel.

**Towards a sustainable relationship, of carrots and sticks**
The provision of good public transport services to ecotourism destinations is important in encouraging the public to utilise modes other than the car. Various studies (Page, 1994, Vuchic, 1999, Mees, 2000, Orbasli and Shaw, 2004) support the concept of providing a transport environment where the public can travel to various destinations without resorting to using the car. Organisations have acknowledged this possibility and have tried to influence travel behaviour. Alpine Pearls work with the concept of ‘Soft Mobility’, encouraging the use of public transport, walking and cycling to/at the destinations. Another is Germany’s Fahrtziel Natur project promoting the use of public transport in visiting national parks. The success of the Alpine Initiative in influencing the shift of freight from road to rail is a reminder that a mode shift is possible.

Policies regarding the incentives and disincentives for public transport and the private vehicle need re-evaluation to improve the sustainability of a network. It is vital to decrease the environmental impacts of transport and the pervasive use of the car. What is worrying is that even ecotourism destinations serviced by public transport as illustrated by the case studies have to deal with the dominance of the car.

In Switzerland, the increased mobility and the dependence on the car for leisure trips remain a challenge. Nevertheless, the country is committed to reducing its emissions as well as improving its public transport system to be able to compete with the car. Fagagnini (1996) and Frey (2003) both believe that external costs of private travel should be internalised to provide public transport the advantage it needs. The success of the Alpine Initiative is a reminder of the strength of a collective. The public transport advocacy of the organisations as well as the promotions of the PostBus and the RhB of the various destinations is an indication of their level of awareness. These campaigns, with special packages for groups and families, are important in encouraging a shift from car to public transport for leisure travel.

In Foz do Iguaçu, the challenge to FozTrans remains the improvement of its public transport services. Aside from changing its method of service compensation that gives the concessionaires the upper hand, there should also be a system of evaluating services and the imposition of penalties for poor performance. Mantovani, during the interview
on 20 June 2005, acknowledges the inadequate management of transport services in the city is due to the lack of technical personnel in the agency and deficiencies in transport data collection.

The fuel subsidies have had an impact on travel choices where the cheap cost of alcohol as fuel encourage domestic tourists, especially from neighbouring states, to drive to Foz do Iguaçu rather than take the bus. Comparing the amount of petrol utilised to get to the national park with the cost of a return trip on the bus, the cost is indeed competitive. With the increase in families travelling together, the savings in using the car is higher even with the parking fee factored in.

Marketing and promotions are also influential in determining mode choice. In Switzerland, transport details are essential in the promotion of destinations such as the Swiss National Park. While in Brazil, popular destinations like the Iguaçu National Park are merely tourist destinations. Information sheets do not include directions or the modes available to the public to get to these attractions. With no transport details and faced with the illegibility of the transport network, the chances of visitors utilising the buses that ply the national park decreases.

In retrospect. It is apparent that the incentives and disincentives for the various modes dictate the mode choice of visitors to the national parks despite its high level of integration with the municipality. The factors that encourage the utilisation of the car despite public transport services to the national parks include:

- The level of service of the infrastructure supportive of the car is quite high while the public transport service does not offer a good level of flexibility as in the Swiss case. In the case of Foz do Iguaçu, the network is illegible in spite of the relatively good frequency of bus services to the national park. In either case, the car becomes the more viable option.
- The perception of the national park as just one of the destinations within the region makes the visit an ordinary one, making the car the mode of choice. Opting for a more sustainable mode especially to environmentally critical areas entails a highly conscious decision.
- The provisions of parking areas at the national parks are free and limited (SNP) or fees are collected but there is a high capacity (PNI). In either case, the disincentives
for car use are not critical. The best combination would be to limit parking spaces as well as charge high fees.

- In both case studies, even with the good integration of the national park with the municipality, the level of service of the public transport is not competitive enough for the private vehicle.

Moreover, what still needs to be done to curb the unsustainable practice?

- Improve environmental awareness of the public by increasing the campaign regarding leisure travel by public transport, the success of the Alpine Initiative remains the inspiration in Switzerland. In Foz do Iguaçu, its public transport network needs to be more legible. The admission by Mantovani of FozTrans of the city’s lack of maps, timetables and signage as well as poor services in other areas is important because it means the agency knows what needs improvement.

- In general, transport researchers are supportive of the concept of the internalisation of external costs by car users so that private vehicle travel reflects the true costs. It also seems to be the only car disincentive that when coupled with the provision of good public transport services, can actually compete with the car.
7. CONCLUSIONS

Improving the sustainability of a transport network that serves an ecotourism destination is possible. The examples from Switzerland and Brazil have shown that their innate differences do not prevent them from employing similar policies and structures. The provision of good public transport services is considered vital in decreasing the amount of impacts of travel to the destination. Unsustainable travel behaviour can be reversed by changing the balance of transport incentives and disincentives and encouraging mode shift to more sustainable modes.

A region’s transport network and level of public transport services are critical to the sustainability of its relationship with an ecotourism destination. The legibility of the network is significant in increasing the utility of the service. Providing good public transport services means that the public has an option to shift modes and change unsustainable travel behaviour. Although only 13.5% of visitors to the Swiss National Park took public transport, this is a better percentage compared to Tropical North Queensland where intrastate tourists at 60% would (presumably) drive to the various national parks while the rest would hire a car to get around. In the case of Foz do Iguaçu, which is still developing its public transport services, the recognition of FozTrans of its shortcomings is an affirmation of the importance of providing good public transport services.

The choices open to the public are crucial because these have an impact on their eventual mode choice. The prevalent use of private vehicles to areas of natural protection is due to the imbalance in transport policies between public transport incentives and car disincentives in the region. The seamless network of highways, bridges and tunnels has further facilitated the use of the private vehicle and the trend away from the rail and buses. Although the public transport services in Graubünden are inflexible due to the limited infrastructure of the RhB and the contract-based services of the PostBus, these do not deter them from promoting the region’s attractions with their services in mind. The marketing departments of both public transport providers are aggressive and the fact that tourism in the region basically grew around the transport development ensures that all attractions are linked by their services. The strong participation of the public transport
service providers in promoting tourist destinations is a strong incentive for the utilisation of public transport modes and improving sustainability.

Non-government organisations and interest groups are aware of the environmental implications of the current unsustainable practices and work towards educating the public regarding the sustainability of their mode choices. The study shows that the participation of organisations and groups in decision-making ensures that a more sustainable system is put in place. The successful lobby of the Alpine Initiative for the shift of freight from road to rail is an inspiration to the advocacy of Fahrziel Natur and Alpine Pearls in encouraging the utilisation of the integrated public transport network for travel to natural areas. The involvement of the organisations, academics and communities in the development of the 1999 Management Plan for Iguazu National Park, facilitated the realisation of the plans with the help of the private sector. The perceived success of this public-private partnership in national park management and operations provides a good model especially for national parks in developing countries where revenue from ecotourism destinations is important for its survival.

Local political and institutional factors influence the sustainability of transport outcomes. The autonomy of even the villages in the Swiss cantons meant the approval and continued provision of parking areas in Val Trupchun near the Swiss National Park even though no parking charges are collected. The influx of tourists to the area can be translated to an increase in revenue for these villages. This autonomy was also observed in year 2000 when the people of Zernez rejected the proposal for the expansion of the national park. In a landmark event in 1994, the power of the collective through a people’s initiative successfully influenced the regulations that led to the shift of freight from road to rail. In the case of Foz do Iguacu, the municipalisation process created and strengthened an important service agency (FozTrans) thereby providing better public transport services. The inclusion and involvement of the private sector in the planning process enabled the advancement of the goal of Iguazu National Park in improving sustainability with the promotion of ecologically friendly modes of transport. It is mainly due to the strong lobby of tourism agencies coupled with the poor legibility of the transport network that the aim of the Iguazu National Park to decrease the number of vehicles inside the park has been undermined.

National parks that operate with the strong sustainability concept do not lose their popularity or economic viability. Because the state of the environment is more important
than the number of visitors, the Swiss National Park and the Iguaçu National Park have shown that regulating both human and vehicle access ensure the protection and preservation of its natural areas. The success of the Swiss National Park in restricting visitors to keep to the marked trails has enabled the public to view and appreciate wildlife in their natural setting. The decision of IBAMA to limit private vehicle access by providing an internal public transport has not only successfully decreased the number of vehicles inside the park but the environmental impacts as well. The presence of local tourist agencies inside the park remains a challenge to IBAMA who wants to eliminate private vehicles inside the park. This problem has persisted mainly due to the inadequate services of FozTrans, which is trying its best to improve the system. The concessionaires for their part have continued to decrease the environmental impacts of the transport modes used for ecotourism activities.

The study stresses the importance of providing a well-integrated network especially to ecotourism destinations such as national parks. It has been shown that for travel to natural areas, the mode utilised to get to the destination is an important component in its sustainability. The simple logic that operates the projects of the Alpine Pearls and Fahrtziel Natur, stringing several destinations in the alpine region along public transport routes is an indication that it can easily be done. The infrastructure is in place and the services are provided. Where financial capability is seen as a barrier to implementation, Foz do Iguacu in Brazil has shown its determination to provide a more sustainable system to complement the efforts in improving sustainability in the Iguacu National Park. Therefore, providing a sustainable transport network that serves an ecotourism destination is possible and need not involve a lot of investment.

**Limitations of study and recommendations for further research**

The question of sustainability in the relationship between transport networks and ecotourism destinations still needs to be developed. This study’s utilisation of documents, policies and current practices to analyse the situation has provided the background needed to explore the issue. It requires empirical evidence of the environmental impacts of transport to these destinations. For its part, Switzerland has an ongoing research project, NFP 48 Landscapes and Habitats in the Alps, which looks into the traffic system, tourist behaviour and room structure.\(^{49}\) However, due to my incomprehension of the German

\(^{49}\) This is the online translation of NFP 48 “Landschaften und Lebensräume in den Alpen” Verkehrssystem, Touristenverhalten, und Raumstruktur in alpinen Landschaften by M. Tschopp, P. Fröhlich, and K. W.
language, the findings of the report have not been included in the analysis of the Swiss case study.

There is also the fact that changes have occurred since the collection of data in June 2005 in Foz do Iguaçu, Brazil and September 2006 in Graubünden, Switzerland. The plans for a bicycle way along federal highway BR 469 to the Iguaçu National Park has been realised while the contract for the Hotel das Cataratas is up for re-evaluation. There were ongoing tourist visitor surveys in the Swiss National Park with results to be released in 2008 and the launch of the Swiss Mobile in 2008 means an increase in human powered mobility. It would be interesting to find out the impacts of these events to the management of the park and mobility in the region.

Given the complicated relationship between transport networks and ecotourism destinations, this study acknowledges that there are more factors involved in ensuring sustainability other than the provision of appropriate transport services. The relationship extends to the social, cultural and economic aspects of the place, which this study may have hinted at but has not discussed in detail mainly due to the study’s focus on the transport aspect.

This study has underlined the importance of the sustainability of transport choices especially to ecotourism destinations. The challenge now is to have the public relate to the research findings in this area. Behavioural studies that further relate the impact of mode choices to areas of protection are important in educating the public and in influencing their choices.

Axhausen of the Institute for Transport Planning and Systems (IVT) and the Swiss Federal Institute of Technology Zurich (ETH Zurich). The Preliminary Report was done in August 2005.
BIBLIOGRAPHY


Alpine-Pearls 2006, 'Alpine Pearls - holidays with soft mobility in the most beautiful areas of the Alps' report by Alpine Pearls, TVB Werfenweng, Werfenweng.


ARE 2003, 'The spatial impact of transport infrastructures: Learning from the past (Project Summary)' report by Federal Office for Spatial Development (ARE), Federal Department of Environment, Transport, Energy and Communications (DETEC), Bern.

ARE and SFSO 2000, 'Mobilität in der Schweiz' report by Swiss Federal Office for Spatial Development (ARE) and Swiss Federal Statistical Office (SFSO), Bern.


Graubünden 2006e, 'Porträt Kanton Graubünden' report by Canton Graubünden Administration, Chur.


IBAMA 2000, 'Plano de Manejo, Parque Nacional do Iguaçu' report by Instituto Brasileiro do Meio Ambiente e dos Recursos Naturais Renovaveis (IBAMA), Brasilia-DF.


IBDF and FBCN 1982, 'Plano de Uso Publico, Parque Nacional do Iguaçu' report by Instituto Brasileiro de Desenvolvimento Florestal (IBDF) and Fundação Brasileira para Conservação da Natureza (FBCN), Brasilia.


LITRA 2003a, 'Infrastruktur-Investitionen' report by LITRA Informationsdienst für den öffentlichen Verkehr, Bern.


LITRA 2006, 'Infrastruktur-Investitionen' report by LITRA Informationsdienst für den öffentlichen Verkehr, Bern.


PCE 2002, 'Showing the way: Curitiba: Citizen City' report by Parliamentary Commissioner for the Environment (PCE), Wellington.


SBB 2002, 'SBB – Full Speed Ahead! The Enterprise' report by the Swiss Federal Railways (SBB AG), Bern.


SFSO 2006a, Graubünden Regional Portrait: Key Data, Swiss Federal Statistics Office (SFSO).


Secretaria Municipal de Turismo 2005, 'Estatisticas (Sintese)' report by Secretaria Municipal de Turismo de Foz do Iguacu (SMTU), Foz do Iguacu.


Stirnimann, P. 2006. Technical Services Manager, Human Powered Mobility, Chur.


STT 2005, 'Engadin Scuol' report by Scuol Tourism Team (STT), Scuol.

STV 2006, 'Swiss Tourism in Figures' report by Schweizer Tourismus-Verband (STV), Berne.


Werder, H. 2006, 'Verkehrsunbraukraft als Schlusselaktor der wirtschaftlichen Entwickluung (Traffic infrastructure as a key factor of economic development)' report by DETEC General Secretary in a session report to LITRA on 22 March 2006, Bern.


## APPENDIX A  DESTINATION AREAS BY TYPE

<table>
<thead>
<tr>
<th>TYPE</th>
<th>DESTINATIONS</th>
<th>POINTS TO CONSIDER</th>
</tr>
</thead>
</table>
| 1. Island | - Valle de Mai Nature Reserve, Seychelles  
- Ambergris Caye, Belize  
- Vancouver Island, Canada  
- St Lucia Heritage Tourism Project, St Lucia  
- Cayo Levisa, Cuba  
- Pemba, Zanzibar  
- Mafia Island Marine Park, Tanzania  
- Yakushima (Yaku-Island), Japan  
- El Nido Marine Reserve, Palawan, Philippines  
- Fraser Island, Australia  
- Kangaroo Island, South Australia | - human population  
- biodiversity  
- level of development  
- level of infrastructure  
- modes from mainland  
- modes utilized within/around the island  
- needs of the community  
- classification: developing vs developed country  
- means of livelihood  
- management plan of resources (documents and exercises done to come up with the current plan)  
- island promoted primarily as an ecotourism destination |
| 2. Mountain | - Annapurna Sanctuary, Nepal  
- Bhutan | - human population  
- energy consumption  
- state of trails  
- visitor management  
- access |
| 3. Forest | - Cordillera Carabaya, Peru | - level of infrastructure  
- biodiversity level  
- trails  
- visitor management |
| 4. National Parks | - Morne Trois Pitons National Park, Dominica  
- Volcanoes National Park (PNV), Rwanda  
- Nyungwe National Park (PNN), Rwanda  
- Gunung Leuser National Park, Indonesia  
- Iguacu National Park  
- Last Mountain Lake National Wildlife Area, Saskatchewan, Canada  
- Blue Mountains National Park, NSW, Australia  
- Swiss National Park | - infrastructure (outside and inside the park)  
- access  
- management style  
- biodiversity level |
| 5. Private Reserve | - Monteverde Cloud Forest Reserve, Costa Rica  
- Rara Avis, Costa Rica | - management style  
- infrastructure  
- access  
- biodiversity level |
| 6. Biodiversity Conservation Area | - Sierra del Rosario Biosphere Reserve, Cuba  
- Tamanana-Caribbean Biological Corridor, Costa Rica  
- Maya Biosphere Reserve, Guatemala  
- Cayo District, Belize  
- Huanglong Scenic and Historic Interest Area, China  
- Kinabalu Park, Malaysia | - biodiversity level  
- management style  
- infrastructure  
- access  
- land uses of neighboring areas |
### APPENDIX B  ECOTOURISM DESTINATIONS SHORT LIST

<table>
<thead>
<tr>
<th>Destination</th>
<th>Comments</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Maya Biosphere Reserve, Peten, Guatemala [Central America’s last remaining rainforest and wetland] [became a reserve in 1990] [1.6~2.1 million hectares] [Mayan ruin sites, bird watching]</td>
<td>- threat: slash and burn agriculture, oil exploration, population growth, weak local and national government policy - transportation going to Flores, Peten from Guatemala City, Cancun, and Belize may be by airplane and bus - cater for the hitchhiking backpacker and the tour bus hiker - civil war wracked the country until 1996 - Conservation International (CI), a non-profit organization, created ProPeten in 1991 and helped in the creation of the Caminos Mayas or new Mayan Trails - “These trails are a series of community-led and managed trails covering different ecosystems and villages in the Maya Biosphere Reserve. Trips on the trails are offered to tourists in and around the city of Flores. Zotz-Tikal, the Scarlet Macaw Trail, and El Mirador are three of the excursions offered through the tropical forest of the Maya Biosphere Reserve.”</td>
<td>- most of the plans cater to limit on-site impacts only with the introduction of the trails - involvement of an NPO in the management of the site - lack of infrastructure due to the political history of the place - national park</td>
</tr>
<tr>
<td>2. Sakau Rainforest Lodge, Malaysia [set amidst of Kinabatangan Wildlife Sanctuary, along the Kinabatangan River]</td>
<td>- built up area limited to 929sqm of a 2.83ha property - recruits local people as boatmen, general workers, gardeners, and kitchen hands - sensitive architecture and environmentally sensitive utilities e.g. solar lighting complemented with a generator - all boats used to ferry passengers are built by local fishermen - utilize boats fitted with 15hp engines charged by solar charged batteries</td>
<td>- the lodge is a recipient of a number of ecotourism awards - only access is via the river and the extensive use of boats for tours - privately owned</td>
</tr>
<tr>
<td>3. Ulu-Temburong National Park, Brunei [range of habitats: lowland forest and jungle rainforest to montane forest at an elev of 2000m] [wildlife]</td>
<td>- Access is via traditional longboat along river corridors, or jungle hiking tracks, no roads into the park - mountainous terrain, provision of raised walkways and canopy walk, suspension bridges over rivers and streams - location is 15mins from international airport</td>
<td>- the naturally difficult terrain discourages the creation of trails hence the elevated walkways, the river is the main transport corridor - national park</td>
</tr>
<tr>
<td>4. Green Villages in Austria [environmentally compatible tourism reflecting the character of Austrian villages]</td>
<td>- criteria for architecture and character of the place - motorways are at least 3km away with max limit on through roads of 3-4000 vehicles per day; no noise emissions from industrial zones - good access to public transport; alternative transport options e.g. cycle tracks - guest to inhabitant ratio: 1:1</td>
<td>- more on culture and agriculture tourism - well developed criteria for the overall planning of the villages - managed by the communities</td>
</tr>
<tr>
<td>Destination</td>
<td>Comments [Access, Transport Planning, Impacts]</td>
<td>Remarks</td>
</tr>
<tr>
<td>-------------</td>
<td>---------------------------------------------</td>
<td>---------</td>
</tr>
</tbody>
</table>
| 5. Rara Avis Rainforest Lodge and Reserve, Costa Rica | - architecture ecologically sensitive to the site; no electricity  
- main activity: guided hikes along narrow forest trails to enjoy the wildlife (trails are muddy)  
- involves the community of Las Horquetas in the operations and management  
- roads are difficult so a tractor departs from Las Horquetas every 930am and leaves Rara Avis at 230pm. Travel time is 3hrs for a 15km voyage.  
- Horses and Jeep transportation can be arranged but requires a 3km walk from El Plastico to Rara Avis’ Waterfall Lodge (1 hour by tractor cart or 1.5 hours walk through jungle trails) | - the condition of the roads have turned away potential visitors not willing to “rough” it, allowing for the “right sort” of people to appreciate Rara Avis  
- private venture |
| 6. Last Mountain Lake National Wildlife Area, Saskatchewan, Canada | - “hands-off management” style of protecting wildlife and grasslands  
- public access: nature trails, vehicle traffic limited to designated roads, daylight tours allowed only  
- limited agricultural activity in selected areas of the park: areas where lure crops (for the nesting birds) are grown are off-limits to the public from August to September of the year | |
### APPENDIX C  EARLY COMPARISONS OF THE SWISS AND BRAZIL CASE STUDY AREAS

**Swiss National Park, Graubünden, Switzerland**

<table>
<thead>
<tr>
<th>Description</th>
<th>Programs</th>
<th>Management</th>
<th>Access and Mobility</th>
<th>Tourism</th>
</tr>
</thead>
<tbody>
<tr>
<td>the only national park in Switzerland</td>
<td>need to increase the area as it is felt that “a wider area is needed to fully protect the flora and fauna” (walkingworld.com)</td>
<td>Camping, lighting fires, picnics and parking are all strictly prohibited beyond designated areas</td>
<td>Zurich: main international airport; train links to major cities</td>
<td>Swiss tourism accounts for 5.4% of its GDP, most of it centred on winter tourism. The increase in global warming led to the decrease in the number of ski slopes and the government plans to strengthen summer tourism by “extending the natural reserves and by enlarging the potential for hiking, rafting and cycling” (Eisinger and Schneider 2003)</td>
</tr>
<tr>
<td>located in the Engadine valley in the eastern canton of Graubünden</td>
<td>Swiss Federal Council came up with a document entitled Sustainable Development Strategy 2002; Area 6 Environment and Natural Resources underlines the importance of nature and the countryside in the promotion of gentle tourism and protection of biodiversity; Area 8 Mobility aims to increase the volume generated by public transport and non-motorized transport traffic with special attention to agglomerations and leisure traffic</td>
<td>Walkers are prohibited to leave the marked paths (there are 20 colour-coded routes)</td>
<td>Train links with France, Italy, Austria, Germany, The Netherlands, and Belgium</td>
<td></td>
</tr>
<tr>
<td>its creation was inspired by the foundation of the Yellowstone National Park in America in 1872</td>
<td>Conscious effort to reduce the country’s CO₂ emissions by rebuilding its forests, promoting clean-fuel vehicles, strengthening the public transport system by coordinating bus and rail times, increasing rail and road services and improving infrastructure</td>
<td>Park is closed from November til May due to the risk of avalanches</td>
<td>High quality public transport: vehicles and punctuality of timetable</td>
<td></td>
</tr>
<tr>
<td>the Park was formally established in 1914, and has grown by a process of gradual accretion to its current size</td>
<td>There are many trails in the Park which serve agro-industrial centers, links regions and promotes ecological tourism</td>
<td>The Rhätische Bahn (Rharian Railways) serve Graubünden as it lacks expressways</td>
<td>The national park is accessible through the OfenPass which passes through the park. There are 6 PostBus stops and 10 parking areas with limited number of spaces.</td>
<td></td>
</tr>
<tr>
<td>a strict natural reserve</td>
<td>The creation of the Private Natural Heritage Reserve (RPPN); under Parana state law, environment protection means more revenue-sharing money for City Hall</td>
<td>The state’s major source of income would be tourism, hydroelectricity, and agriculture</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Parque Nacional do Iguaçu, Paraná, Brazil**

<table>
<thead>
<tr>
<th>Description</th>
<th>Programs</th>
<th>Management</th>
<th>Access and Mobility</th>
<th>Tourism</th>
</tr>
</thead>
<tbody>
<tr>
<td>UNESCO World Heritage site</td>
<td>Brazil public policies on the environment are “generally advanced” though “implementation and enforcement of the environmental laws have been far from ideal” (US Library of Congress)</td>
<td>Environmental awareness made Iguaçu develop ecologically sound tourism</td>
<td>Parana has excellent railways and highways; there are 15,300km of roads and 3,370km of rail track which serve agro-industrial centers, links regions and promotes ecological tourism</td>
<td>Travel and tourism used to be viewed as “elitist and an unnecessary luxury” (US Library of Congress). After the Rio Earth Summit in 1992, ecotourism has been the priority.</td>
</tr>
<tr>
<td>Curitiba, capital city of Parana, is promoted as the Ecological Capital of Brazil</td>
<td>The creation of the Private Natural Heritage Reserve (RPPN); under Parana state law, environment protection means more revenue-sharing money for City Hall</td>
<td>Area is managed by the Instituto Brasileiro de Desenvolvimento Florestal (IBAMA)</td>
<td>Iguazu Falls have 275 falls that can be accessed by trails, small boats, a bridge connects Argentina with Brazil, helicopter rides are also offered</td>
<td>Tourism contributes an estimated 8% to the country’s GDP (LatAm: 5%, World: 10.2%)</td>
</tr>
<tr>
<td>Foz do Iguaçu is the capital of tourism and energy of the state of Parana</td>
<td>1972, specialized environmental agencies organized at federal level and established reserves and national parks; 1981, National Environment Policy defined, creation of a National System for the Environment with the National Environmental Council at its apex; 1992, thirty-four national parks and fifty-six biological reserves established</td>
<td>Park has seven zones: Intangible (80%), central and eastern part of the park), Primitive (4%), Extensive Use (3%), Intensive Use, Recreation, Special Use, Cultural-Historic zones</td>
<td>BR 469, a federal highway, links the national park with Foz do Iguaçu.</td>
<td>Tourism and hydroelectricity are the main industries of Foz do Iguaçu.</td>
</tr>
<tr>
<td>Very popular park famous for its waterfalls</td>
<td>Installed an internal public transport system inside the park in 2000 to decrease the number of private vehicles allowed access into the park.</td>
<td>Parana has excellent railways and highways; there are 15,300km of roads and 3,370km of rail track which serve agro-industrial centers, links regions and promotes ecological tourism</td>
<td>Parana has excellent railways and highways; there are 15,300km of roads and 3,370km of rail track which serve agro-industrial centers, links regions and promotes ecological tourism</td>
<td>Parana has excellent railways and highways; there are 15,300km of roads and 3,370km of rail track which serve agro-industrial centers, links regions and promotes ecological tourism</td>
</tr>
<tr>
<td>There are various ecotourism activities offered.</td>
<td>In 2000, a new system was installed. Cataratas SÀ as the major concessionaire constructed the Visors’ Centre with parking provisions for buses and cars. Fees are collected along with entrance fees.</td>
<td>In a survey done in 2000, 44% of distance travelled per day was for Leisure. A Leisure Technical Programme of Action (LPTA) was created by the Federal Office on Spatial Development to support leisure projects</td>
<td>In a survey done in 2000, 44% of distance travelled per day was for Leisure. A Leisure Technical Programme of Action (LPTA) was created by the Federal Office on Spatial Development to support leisure projects</td>
<td></td>
</tr>
<tr>
<td>In 2000, a new system was installed. Cataratas SÀ as the major concessionaire constructed the Visors’ Centre with parking provisions for buses and cars. Fees are collected along with entrance fees.</td>
<td>In 2000, a new system was installed. Cataratas SÀ as the major concessionaire constructed the Visors’ Centre with parking provisions for buses and cars. Fees are collected along with entrance fees.</td>
<td>In 2000, a new system was installed. Cataratas SÀ as the major concessionaire constructed the Visors’ Centre with parking provisions for buses and cars. Fees are collected along with entrance fees.</td>
<td>In a survey done in 2000, 44% of distance travelled per day was for Leisure. A Leisure Technical Programme of Action (LPTA) was created by the Federal Office on Spatial Development to support leisure projects</td>
<td>In a survey done in 2000, 44% of distance travelled per day was for Leisure. A Leisure Technical Programme of Action (LPTA) was created by the Federal Office on Spatial Development to support leisure projects</td>
</tr>
</tbody>
</table>
**APPENDIX D  LIST OF INTERVIEWEES**

**Brazil Interviewees – 26 May ~ 24 June 2005**

<table>
<thead>
<tr>
<th>Name/Agency</th>
<th>Contact Details</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>IBAMA - Brasilia</strong></td>
<td></td>
</tr>
<tr>
<td>Moacir ARRUDA</td>
<td></td>
</tr>
<tr>
<td>Maria Luisa NOGUEIRA PAES</td>
<td></td>
</tr>
<tr>
<td>Ph: +55 61 316 1173</td>
<td></td>
</tr>
<tr>
<td>Email: <a href="mailto:marruda@sede.ibama.gov.br">marruda@sede.ibama.gov.br</a></td>
<td></td>
</tr>
<tr>
<td>Ph: +55 61 316 1754/1261</td>
<td></td>
</tr>
<tr>
<td><strong>IBAMA – Curitiba</strong></td>
<td></td>
</tr>
<tr>
<td>Guadalupe VIVEKANANDA</td>
<td></td>
</tr>
<tr>
<td>Luiz Francisco FARACO (translator)</td>
<td></td>
</tr>
<tr>
<td>Email: <a href="mailto:guadalupe.vivekananda@ibama.gov.br">guadalupe.vivekananda@ibama.gov.br</a></td>
<td></td>
</tr>
<tr>
<td>Ph: +55 41 3363 2525/ 3354 0608</td>
<td></td>
</tr>
<tr>
<td><strong>SINDETUR – Curitiba</strong></td>
<td></td>
</tr>
<tr>
<td>Paulo GRUBER [President]</td>
<td></td>
</tr>
<tr>
<td>Luiz GRUBER (translator)</td>
<td></td>
</tr>
<tr>
<td>Email: <a href="mailto:paulogruber@onda.com.br">paulogruber@onda.com.br</a></td>
<td></td>
</tr>
<tr>
<td>Email: <a href="mailto:luizf@parametroseguros.com.br">luizf@parametroseguros.com.br</a></td>
<td></td>
</tr>
<tr>
<td><strong>IAP – Curitiba</strong></td>
<td></td>
</tr>
<tr>
<td>Maria Angela DALCOMUNE</td>
<td></td>
</tr>
<tr>
<td>Email: <a href="mailto:mariad@pr.gov.br">mariad@pr.gov.br</a></td>
<td></td>
</tr>
<tr>
<td>Ph: +55 41 3213 3453</td>
<td></td>
</tr>
<tr>
<td><strong>Fundação o Boticário de Proteção à Natureza</strong></td>
<td></td>
</tr>
<tr>
<td>Leide TAKAHASHI</td>
<td></td>
</tr>
<tr>
<td>Gustavo GATTI</td>
<td></td>
</tr>
<tr>
<td>Email: <a href="mailto:leide@fundacaoboticario.org.br">leide@fundacaoboticario.org.br</a></td>
<td></td>
</tr>
<tr>
<td>Ph: +55 41 3340 2641</td>
<td></td>
</tr>
<tr>
<td>Fax: +55 41 3340 2635</td>
<td></td>
</tr>
<tr>
<td>Email: <a href="mailto:gustavo@fundacaoboticario.org.br">gustavo@fundacaoboticario.org.br</a></td>
<td></td>
</tr>
<tr>
<td><strong>Eco Parana</strong></td>
<td></td>
</tr>
<tr>
<td>Michelle POITTEVIN [Architect and Planner]</td>
<td></td>
</tr>
<tr>
<td>Email: <a href="mailto:michelle@ecoparana.pr.gov.br">michelle@ecoparana.pr.gov.br</a></td>
<td></td>
</tr>
<tr>
<td>Ph: +55 41 3322 1196</td>
<td></td>
</tr>
<tr>
<td><strong>SETU - Secretaria de Estado do Turismo</strong></td>
<td></td>
</tr>
<tr>
<td>Gilce Zelinda BATTISTUZ [Head of Statistics]</td>
<td></td>
</tr>
<tr>
<td>Patricia ALBANEZ [Statistics]</td>
<td></td>
</tr>
<tr>
<td>Leticia Hartmann OLANDESI [Marketing &amp; Promotions]</td>
<td></td>
</tr>
<tr>
<td>Email: <a href="mailto:planejamentoturistico@setu.pr.gov.br">planejamentoturistico@setu.pr.gov.br</a></td>
<td></td>
</tr>
<tr>
<td>Ph: +55 41 3313 3508</td>
<td></td>
</tr>
<tr>
<td>Email: <a href="mailto:estatistica@setu.pr.gov.br">estatistica@setu.pr.gov.br</a></td>
<td></td>
</tr>
<tr>
<td>Ph: +55 41 3313 3547</td>
<td></td>
</tr>
<tr>
<td>Email: <a href="mailto:olandesi@terra.com.br">olandesi@terra.com.br</a></td>
<td></td>
</tr>
<tr>
<td>Ph: +55 41 3313 3520</td>
<td></td>
</tr>
<tr>
<td><strong>IBAMA – Foz do Iguaçu</strong></td>
<td></td>
</tr>
<tr>
<td>Jorge Luiz PEGORARO [Park Chief]</td>
<td></td>
</tr>
<tr>
<td>Raquel C. MÜLLER [Ecotourism Specialist]</td>
<td></td>
</tr>
<tr>
<td>Marcos DAMAS [Monitoring]</td>
<td></td>
</tr>
<tr>
<td>Email: <a href="mailto:jorge.pegoraro@ibama.gov.br">jorge.pegoraro@ibama.gov.br</a></td>
<td></td>
</tr>
<tr>
<td>Ph: +55 45 3521 8365</td>
<td></td>
</tr>
<tr>
<td>Email: <a href="mailto:raquel.muller@ibama.gov.br">raquel.muller@ibama.gov.br</a></td>
<td></td>
</tr>
<tr>
<td>Ph: +55 45 3521 8368</td>
<td></td>
</tr>
<tr>
<td>Email: <a href="mailto:marcos.damas@ibama.gov.br">marcos.damas@ibama.gov.br</a></td>
<td></td>
</tr>
<tr>
<td><strong>Iguassu Convention &amp; Visitors Bureau (ICVB)</strong></td>
<td></td>
</tr>
<tr>
<td>Mauricio do Amaral LUPION [Executive Director]</td>
<td></td>
</tr>
<tr>
<td>Rodrigo S. MARQUES [Marketing Coordinator]</td>
<td></td>
</tr>
<tr>
<td>Fabricio da Costa VINCI [Events Officer]</td>
<td></td>
</tr>
<tr>
<td>Email: <a href="mailto:icvb.diretoria@foznet.com.br">icvb.diretoria@foznet.com.br</a></td>
<td></td>
</tr>
<tr>
<td>Email: <a href="mailto:icvb.marketing@foznet.com.br">icvb.marketing@foznet.com.br</a></td>
<td></td>
</tr>
<tr>
<td>Email: <a href="mailto:icvb.eventos@foznet.com.br">icvb.eventos@foznet.com.br</a></td>
<td></td>
</tr>
<tr>
<td>Ph: +55 45 3523 0233</td>
<td></td>
</tr>
<tr>
<td><strong>Secretaria Municipal de Turismo</strong></td>
<td></td>
</tr>
<tr>
<td>Lourenço KURTEN</td>
<td></td>
</tr>
<tr>
<td>Leandro VANDRE</td>
<td></td>
</tr>
<tr>
<td>France CHOU</td>
<td></td>
</tr>
<tr>
<td>Email: <a href="mailto:kurten@fozdoiguacu.pr.gov.br">kurten@fozdoiguacu.pr.gov.br</a></td>
<td></td>
</tr>
<tr>
<td>Email: <a href="mailto:leandrovandre@yahoo.com.br">leandrovandre@yahoo.com.br</a></td>
<td></td>
</tr>
<tr>
<td>Email: <a href="mailto:bitluv@yahoo.com">bitluv@yahoo.com</a></td>
<td></td>
</tr>
<tr>
<td>Ph: +55 45 3521 1462</td>
<td></td>
</tr>
<tr>
<td>Info hotline: 0800 45 1516</td>
<td></td>
</tr>
<tr>
<td>Name/Agency</td>
<td>Contact Details</td>
</tr>
<tr>
<td>-------------</td>
<td>----------------</td>
</tr>
</tbody>
</table>
| **FozTrans – Instituto de Transporte e Transito de Foz do Iguaçu**  
 Priscila B. MANTOVANI [Traffic Engineer]  
 www.fozdoiguacu.pr.gov.br | Email: pmantovani@fozdoiguacu.pr.gov.br  
 Ph: +55 45 3572 4662 |
| **Interoeste Turismo [Travel Agency]**  
 Licerio SANTOS  
 www.interoeste.com.br | Email: licerio@interoeste.com.br  
 Ph: +55 45 3523-0099 |
| **COMTUR -- Conselho Municipal de Turismo ABAV – Brazilian Association of Travel Agencies – Regional Direction**  
 Cassinotur [Travel Agency]  
 Felipe GONZALEZ [President]  
 www.cassinotur.com.br | Email: cassinotur@foznet.com.br  
 Ph: +55 45 3572 4434 |
| **Canion Iguaçu**  
 Marcelo SKAF [Director]  
 www.campodedesafios.com.br | Email: marcelo@campodedesafios.com.br  
 Mobile: +55 45 9103 7986  
 Ph: +55 45 3529 9268 |
| **Macuco Safari**  
 Ana Claudia MUNIZ [Biologist] | Email: biologia@macucosafari.com.br  
 Ph: +55 45 3574 4244 |
| **Cataratas S.A.**  
 Wadis BENVENUTTI [President] | Email: cataratas@cataratasdoiguacu.com.br  
 Ph: +55 (45) 521-4400 |
<table>
<thead>
<tr>
<th>Agency / Contact Person</th>
<th>Contact Details</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>ProNatura</strong></td>
<td></td>
</tr>
</tbody>
</table>
| Urs TESTER (Abteilungsleiter Biotope und Arten) | Ph: 061 317 91 91  
Fax 061 317 92 66  
Email: urs.tester@pronatura.ch |
| **Amt für Wirtschaft und Tourismus Graubünden** |               |
| [Economic Development and Tourism Office]  
Michael CAFLISCH (Regional Policy Office)  
Marco MAISSEN (Statistics) | Ph: +41 (0) 81 257 23 42  
Fax: +41 (0) 81 257 2192  
Email: michael.caflisch@awt.gr.ch  
Email: marco.maissen@awt.gr.ch |
| **Swiss National Park** |               |
| Flurin FILLI (Research Manager)  
Hans LOZZA (Communications Manager) | Ph: +41 (0) 81 856 13 78  
Fax: +41 (0) 81 856 17 40  
Email: filli@nationalpark.ch  
Email: lozza@nationalpark.ch |
| **PostBus**              |               |
| Philipp BUEHLER (Head of Marketing & Communications) | Ph: +41 (0) 81 256 31 63  
Fax: +41 (0) 81 256 32 56  
Email: philipp.buehler@postauto.ch |
| **Rhätische Bahn (RhB)** |               |
| André BRUGGER (Marketing Manager) | Ph: +41 (0) 81 288 65 76  
Fax: +41 (0) 81 288 61 43  
Email: a.brugger@rhb.ch |
| **Tiefbauamt Graubünden** |               |
| Peter STIRNIMANN (Chef Technischer Dienst/Langsamverkehr) | Ph: +41 (0) 81 257 37 11  
Fax: +41 (0) 81 257 21 57  
Email: peter.stirnimann@tba.gr.ch |
## APPENDIX E  COMPARISON OF CASE STUDY AREAS

<table>
<thead>
<tr>
<th>Aspects</th>
<th>Foz do Iguaçu, Brazil</th>
<th>Graubünden, Switzerland</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Total Area</strong></td>
<td>Total: 617,700 hectares</td>
<td>Total: 710,520 hectares</td>
</tr>
<tr>
<td></td>
<td>Urban: 165,500 hectares</td>
<td>Unproductive area: 296,162 hectares</td>
</tr>
<tr>
<td></td>
<td>Rural: 164,500 hectares</td>
<td>Land &amp; Nature Reserve: 211,717 hectares</td>
</tr>
<tr>
<td></td>
<td>(SMTU, 2006)</td>
<td>(Graubünden, 2006)</td>
</tr>
<tr>
<td><strong>Transport Modes</strong></td>
<td>Buses, Taxis, Moto-taxis and Agency vehicles</td>
<td>Rail (RhB) and Bus (PostBus)</td>
</tr>
<tr>
<td><strong>Transport network covered</strong></td>
<td>Foz do Iguaçu, Paraná State</td>
<td>Canton Graubünden</td>
</tr>
<tr>
<td><strong>Transport Manager</strong></td>
<td>FozTrans</td>
<td>Canton Graubünden Building, Traffic and Forest Department (BVFD), Office of Public Transport - Rhaetian Railway (RhB) - PostBus</td>
</tr>
<tr>
<td><strong>Mode Split to Region</strong></td>
<td>Air: 32.64% (average 1996~2003)</td>
<td>Cars: 75% of guests use cars (RhB website)</td>
</tr>
<tr>
<td></td>
<td>Bus: 31.64%</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Car: 34.04%</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Others: 1.68% (SETU, 2004)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>60% leisure trips, 40% work trips</td>
</tr>
<tr>
<td></td>
<td></td>
<td>PostAuto: 9.5 million (Brugger 2006 and PostAuto 2006)</td>
</tr>
<tr>
<td><strong>Number of Visitors</strong></td>
<td>925,762 (1996~2003 average)</td>
<td>1,696,711 (2005) (Graubünden, 2006)</td>
</tr>
<tr>
<td></td>
<td>(SMTU, 2005)</td>
<td></td>
</tr>
<tr>
<td>Visitor Make-up</td>
<td>Brazilian: 65.7%</td>
<td>Swiss: 51.4%</td>
</tr>
<tr>
<td></td>
<td>Foreign: 34.3% (Argentina 12.89%)</td>
<td>European Union: 45% (Germany 25.6%)</td>
</tr>
<tr>
<td></td>
<td>(SETU, 2004)</td>
<td></td>
</tr>
</tbody>
</table>

### Details

<table>
<thead>
<tr>
<th><strong>Iguáçu National Park</strong></th>
<th><strong>Swiss National Park</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Total Area</strong></td>
<td>185,262.50 hectares</td>
</tr>
<tr>
<td><strong>Park Management</strong></td>
<td>IBAMA</td>
</tr>
<tr>
<td><strong>Transport Network</strong></td>
<td>BR 469 (federal highway)</td>
</tr>
<tr>
<td><strong>Frequency of bus services</strong></td>
<td>22-minute interval, 5.25~24.00 departing TTU</td>
</tr>
<tr>
<td><strong>Entrance fee</strong></td>
<td>R$19.00 ≈ A$9.30 (2005 rate) Additional fees for ecotourism activities</td>
</tr>
<tr>
<td><strong>Mode Split</strong></td>
<td>82.71% Car : 15.41% PT (1979-2000 average) (IBAMA, 2005)</td>
</tr>
<tr>
<td><strong>Visitor Makeup</strong></td>
<td>Brazilian: 64.57%</td>
</tr>
<tr>
<td></td>
<td>Foreign: 35.43% (Argentina 17.10%) (1981-2005 annual average) (IBAMA, 2005)</td>
</tr>
</tbody>
</table>