ECOTOURISM AND THE TRANSPORT NETWORK: A QUESTION OF SUSTAINABILITY

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ABSTRACT

This paper identifies policies and structures which contribute to improve the sustainability of a transport network that serves an ecotourism destination. It looks into the sustainability of the modes available to the public and the level of public transport services, which are deemed important indicators. The experiences and current practices of the Swiss National Park (SNP) in Switzerland and Iguaçu National Park (PNI) in Brazil are analysed as case studies to evaluate and compare strategies that work and why these work. Findings show that although ecotourism destinations support biologically diverse areas, the car remains the major mode to the national parks even with reliable public transport services. This unsustainable travel behaviour can be reversed by changing the balance of transport incentives and disincentives and encouraging mode shift to more sustainable modes.

Keywords: ecotourism, sustainable development, sustainable transport, transport network, national parks

UNDERSTANDING ECOTOURISM AND THE ROLE OF TRANSPORT

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.

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. It is 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.

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.

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 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

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 1) 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.

Table 1 – Levels of emissions by mode – grams/passenger-km of travel

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

Notes:
1. 1 gram of carbon emitted is equivalent to 0.2727 gram of CO2.
2. 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 2 – Expected growth in worldwide vehicle ownership and traffic (in thousands)

	1995		2020	
	Cars	Vehicles	Cars	Vehicles
OECD North America	170,460	231,557	247,328	335,056
Europe	160,215	203,429	244,720	300,054
Pacific	52,654	101,188	82,193	14,251
TOTAL OECD	383,329	536,174	574,241	782,361
Rest of the World	111,255	240,357	282,349	580,288
Globe Totals	494,584	776,531	857,590	1,362,649
Vehicle-kilometres – (billions)	7,792	12,341	13,569	21,953

Notes:
1. All vehicles include cars, light trucks, motorcycles and heavy trucks.
2. OECD North America – US and Canada
3. OECD Europe – Austria, Belgium, Denmark, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, The Netherlands, Norway, Portugal, Spain, Sweden, Switzerland, Turkey, UK, Finland
4. OECD Pacific – Japan, Australia, New Zealand
5. 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.

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 expected growth in car ownership (see Table 2) 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 Holding, 1996, Coleman, 1997, Capineri and Spinelli, 2002, and Lumsdon et al, 2006) advocate 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 3 which compares the levels of occupancy and emissions between cars and buses in urban areas).

Table 3 – Emissions levels for cars and buses in urban areas

Vehicle Type (Occupancy)	NO_x	PM_{10}	CO	VOC
Exhaust emissions (g/km)				
Car (1 person)	0.31	---	3.37	0.23
Bus (empty)	14.46	0.74	18.90	0.57
Exhaust emissions (g/passenger-km)				
Car (4 persons)	0.08	---	0.84	0.06
Bus (40 passengers)	0.36	0.02	0.47	0.01
Exhaust emissions (g/passenger-km)				
Car (1.67 persons)	0.19	---	2.02	0.14
Bus (12 passengers	1.21	0.06	1.58	0.05

Notes:
1. Car is a post 1/1/93 petrol vehicle with a catalytic converter.
2. 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, Høyer, 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 small number 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).

COUNTRY PERSPECTIVES

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'. Examples which demonstrate the characteristics of an optimum relationship will help in identifying the policies and structures which influence sustainability.

This section compares the experiences and practices between the Swiss National Park, Graubünden, Switzerland as an example from a developed country, and Iguaçu National Park, Foz do Iguaçu, Paraná, Brazil from a developing country to identify strategies that work and to look at areas that still needs improvement. The analysis considers national park management, local and federal government policies that define sustainability in transport and tourism.

Managing a Popular Destination: Iguaçu National Park, Foz do Iguaçu, Paraná

The unique and strategic location of Foz do Iguaçu, 637 km from Curitiba, borders Paraguay to the west and Argentina to the south. The popularity of the Iguaçu Falls attracts an average of 750,000 visitors every year to the Iguaçu National Park (IBAMA, 2005). Between 2000–2005, Foz do Iguaçu hosted an annual average of 820,000 visitors, with tourists outnumbering locals on average by 3.5 to 1 (SETU, 2006).

Foz do Iguaçu has an area of 617.70 km^2 and a population of about 301,409 in 2005 (SMTU, 2006). For a city registering only 80,000 vehicles, the city provides services for 120,000 according to Mantovani during the interview on 20 June 2005, which is proof of the level of investment the federal government has placed on the city's transport infrastructure. The city is well linked by good roads and bridges, which encourage interstate, inter-municipal, and international road travel.

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. 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.

Transport Network: Of Buses and the Curitiban Model

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 kilometres (ANTT, undated). The years under Kubitschek (1956-1961) were those of building intensively. The national transport network especially the highway sector 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 during this time 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 municipalisation process in Paraná, begun in 1981, aimed to strengthen the capability of the various municipalities in providing the basic services to its constituents so as to discourage migration to large cities (Lowry, 2002). The transport sector also underwent changes to facilitate and improve its services. Mantovani (2005) acknowledged that during the years when the state managed public transport services while the municipalities maintained the infrastructure, services were uncoordinated.

Public transport services in Foz do Iguaçu composed of buses, taxis and moto-taxis, became more organized after the creation of the Institute of Transport and Transit of Foz do Iguaçu or FozTrans in 1998. With both transport and transit under the control of one agency, this enabled the coordination of city planning with transport as stipulated in Law 2.116 (1997).

In addressing bus services, FozTrans operated a system similar to Örn's (2005) model on controlled competition where a 'Public Transport Authority' bids routes and services to private enterprises. Winning bus operators were assigned zones to stop competition among along the routes.

In 2000, with financial backing from the state government, FozTrans installed an integrated transport system patterned after Curitiba. The new system meant constructing dedicated busways in the city, the construction of the Urban Transport Terminal (TTU) as the major transport terminal, and installing Curitiba's tube stations along the main routes.

Because the system failed to implement the more salient parts that made Curitiba successful, the set-up did not last long. The major reason for the failure of the system is the method of service compensation that FozTrans employed. FozTrans collected a fixed monthly tax from the bus operators rather than pooled fare revenue and compensated services per kilometre travelled as it is done in Curitiba. This operating system is no different from the market-led system prior to the integration – the only major differences are the fixed tax collected and the allowance of passengers to free transfers at integrated stations.

As with any system run by market forces, the free transfers were not popular with operators as this deprived them of additional revenue. Except for the TTU which is the major transport terminal, all the other tube stations have ceased to operate as transfer stations. As observed on June 2005, the dedicated busways were utilised by all motorists.

The poor system of service compensation also meant difficulties for FozTrans 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 (Mantovani, 2005). Providing such services without the fare increase would mean lower income for bus operators because the increase in distance would not be compensated. The only way for bus operators to agree to such a proposal would be 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.

A Tourist City's Legibility and the role of Tourism Agencies

A tourist city's transport system should facilitate tourist mobility. The experience with Foz do Iguaçu with its various attractions spread out in an area of 617.70 km^2, its transport network is not very clear. Even Mantovani (2005) admits that their network lacks good maps, routes and timetables at bus stops.

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[1]) 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 **4**, only the 30-minute interval on Sunday is regular and easy to remember.

Table 4 – Morning and Evening Timetable of the Parque Nacional-TTU bus route

Hr	Monday to Saturday		Sunday	
	Parque Nacional	TTU	Parque Nacional	TTU
5	42	25 42	30	15 45
6	04 26 48 PQ	04 PQ 26 PQ 48 PQ	00 30	15 PQ 45
7	10 PQ 32 PQ	10 PQ 32 PQ 54	00 PQ 30	15 45
8	16 PQ 38	16 PQ 38	00 30	15 PQ 45
9	00 PQ 22 44	00 22 44	00 PQ 30	15 45
10	06 28 50	06 28 50	00 30	15 45
11	12 34 56	12 34 56 PQ	00 30	15 45
12	18 40 PQ	18 PQ 40	00 30	15 45
After 6 p.m.				
18	10 PQ 32 54 PQ	10 PQ 32 PQ 54	00 30	15 45
19	16 PQ 45	38 PQ	00 30	30
20	22 PQ	22 RG/PQ	15	15 RG/PQ
21	06 PQ 50 PQ	06 PQ 50 VC/PQ	00 PQ 45 PQ	00 RG/PQ 45 RG/PQ
22	34 PQ	30 RG/PQ	30 PQ	30 RG/PQ
23	08 PQ	18 AR/PQ/VC/RG	10 PQ	15 PQ
24	00 PQ 40 PQ	00 VC/RG/PQ	00 PQ 40 PQ	00 RG/PQ

Notes: PQ – Trip begins/ends inside the national park at the School Park; the park opens at 9 a.m.
RG – Remanso Grande
VC – Vila Carimã
AR – Arroio Dourado
Source: FozTrans, 2005

The unreliability of services especially to tourist attraction routes with very few visitors can lead to cuts in services with no warning or replacement given. From personal experience, the trip to the Mark of the Three Frontiers 6 km outside of the city centre started out fine with the Porto Meira Ponte bus arriving on time, getting back to the city centre was another matter altogether. Two hours after arrival, there was still no bus entering the area given that the destination has a 40-minute service interval. The locals finally took pity and organised for

[1] Madrugadão is from the Portuguese word "madrugador" meaning early bird. Mantovani, P. B. 2005. FozTrans Traffic Engineer, Foz do Iguaçu. Interview: 20 June 2005.

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 the last kilometre to the Mark of the Three Frontiers.

A tourist city with unpredictable public transport services and illegible network further increases the attractiveness of hiring tourist agencies to get around. From Table 5, tourists gave the agencies an average of 88.83% good rating compared to the 70.5% that public transport received from 1996 to 2003. 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.

Table 5 – Tourists' Satisfaction Rating of Specific Services

Services evaluated	Year (% indicating good level of service)							
	1996	1997e	1998	1999	2000	2001	2002e	2003
Agency Services	87.2	88.0	89.8	88.7	87.8	89.1	89.6	90.4
Taxi Services	72.0	73.3	73.0	76.0	82.1	75.4	80.9	79.0
Public Transport	70.1	72.0	74.3	71.8	72.0	68.7	68.1	70.5

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

Foz do Iguaçu as an established tourist destination has a strong culture of tourism. Since the creation of the Municipal Council of Tourism – COMTUR in 1960, various tourism organisations has had a strong representation in the local government (SMTU, 2006). Because of the strong lobby of the local transport providers, they are granted certain privileges which international agencies, mainly from Argentina, are deprived of. The local agencies' ability to bring their vehicles inside the Iguaçu National Park, even after the installation of its internal public transport system in 2000, is an advantage for them while it is a constant aggravation for the Brazilian Institute for the Environment and Renewable Natural Resources (Instituto Brasileiro do Meio Ambiente e dos Recursos Naturais Renovaveis, IBAMA).

Iguaçu National Park

Iguaçu National Park is the most significant amongst Paraná's natural parks, 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. 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, pers. comm. 14 June).

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 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.

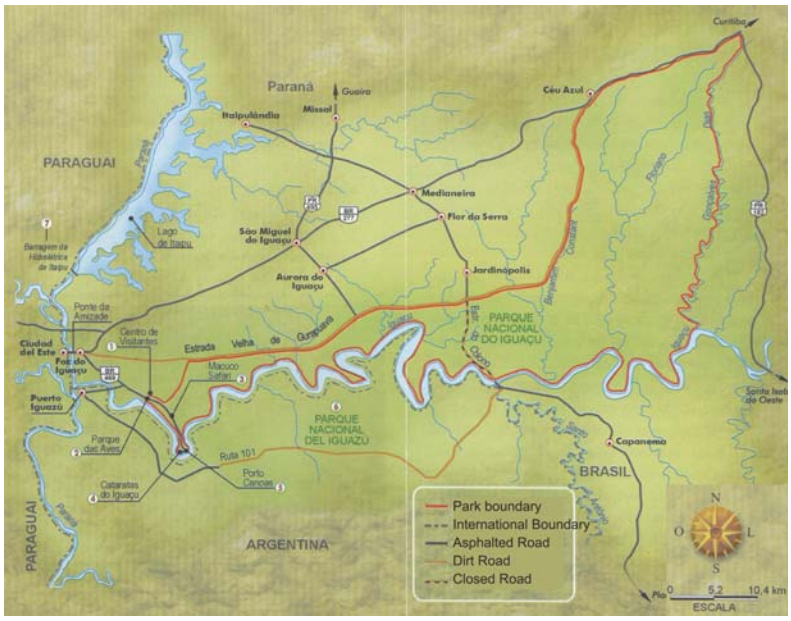

Figure 1 – Iguaçu National Park showing its boundaries
Source: Horizonte Geografico, Guia Philips Parque Nacionais with IBAMA, MMA

It is due to the attraction of the waterfalls that the Iguaçu National Park had to come up with a system of control and visitor management. With over 2,000 visitors daily, the previous system where everyone had access threatened the integrity of the national park as an important conservation unit. The 1999 Management Plan of IBAMA saw the installation of an internal public transport mode inside the park in partnership with Cataratas SA as the major concessionaire. This has greatly reduced the number of private vehicles entering the national park by 70% as shared by Benvenutti in an interview on 24 June 2005 and by data gathered by IBAMA in 2002 and 2003 as shown in Figure 2. Parking spaces for 170 buses, 20 vans and 676 small vehicles are provided at the Visitors' Centre 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.[2]

The seeming success of this private-public partnership between IBAMA and the various concessionaires is very significant for a popular national park in a developing country. The advantage is two-fold. One, the involvement of the private sector in the management of the park leaves IBAMA to monitor the implementation of the ecotourism activities identified in the 1999 Management Plan as well as attend to the protection of the remaining 97% of the national park. Two, it can implement its plans with minimal cash outlay, given that majority of national parks in Brazil are struggling in their upkeep.

[2] Parking fees and exchange rates utilised are from January 2005 to be consistent with all the data gathered over the mid-May to June 2005 period.

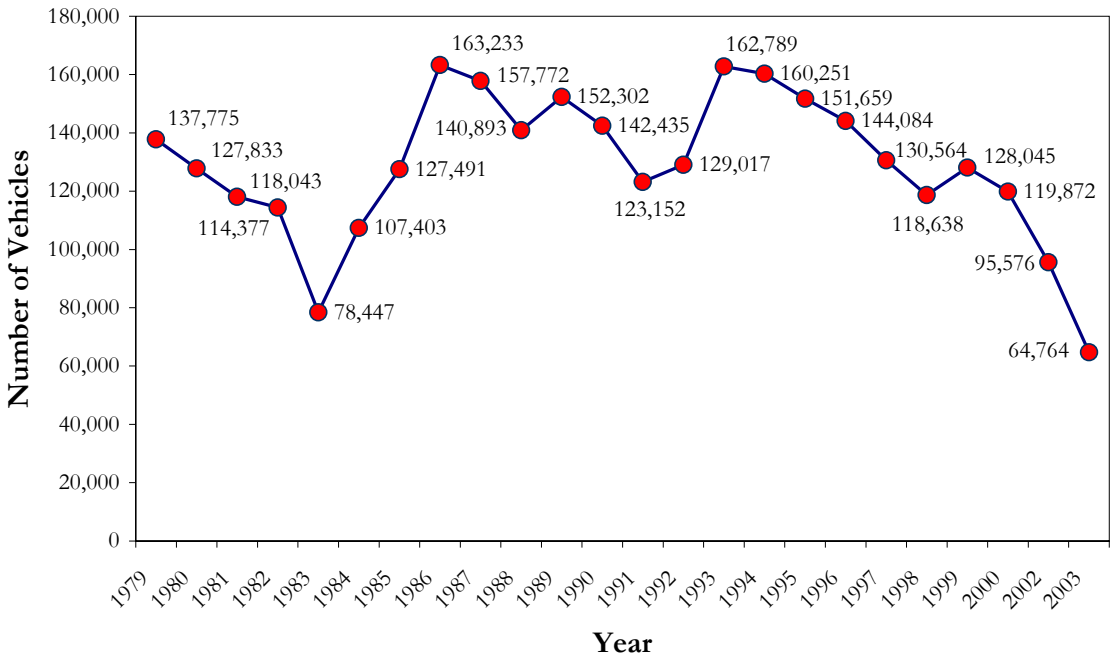

Figure 2 – Annual Number of Vehicles entering the Iguaçu National Park
Note: Internal transport system installed in 2000, there is no data for 2001.
Source: IBAMA Visitor Statistics 1979~2000, IBAMA Vehicle access count for 2002 and 2003.

The Iguaçu National Park offers both mass and ecotourism activities inside the park and visitor access is limited with the imposition of fees. The areas near the waterfalls are very popular and accessible to everyone who has paid the entrance fee of R$19.00 (A$9.30).[3] The concessionaires who offer ecotourism activities collect additional fees to the entrance fee, ranging from R$30 (A$16.70) to R$50 (A$27.80), very high fees which the average Brazilian cannot afford.

The active involvement of the concessionaires in the operation of the national park has helped increase their awareness of the importance of the environment. The director of Macuco Ecoaventura, one of the concessionaires operating both Macuco Safari and Black Well Trail, has actively improved the vehicles they use. From the interview with Muniz on 22 June 2005, she related that Macuco Safari mainly used alcohol fuelled jeeps but at present they have six electric vehicles. Black Well Trail gives the visitors the option of riding the bicycles or taking the ride on a vehicle pulled by a motorbike (Muniz, 2005).

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 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

[3] R$19 is the PNI entrance fee for foreigners in June 2005. The park charges different rates for Brazilians, those who live in the immediate municipalities, those from Mercosul-member countries, and foreigners. Exchange rate as at January 2005 with R$2.046=A$ to be consistent with the case study report details.

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.

Switzerland's almost "best practice": Swiss National Park, Graubünden

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 3). Though the canton with 7,106 km^2 has the biggest land area and occupying almost a sixth of Switzerland, only a tenth of it is arable. At present, the canton's major sources of income are tourism, hydroelectricity, and agriculture.

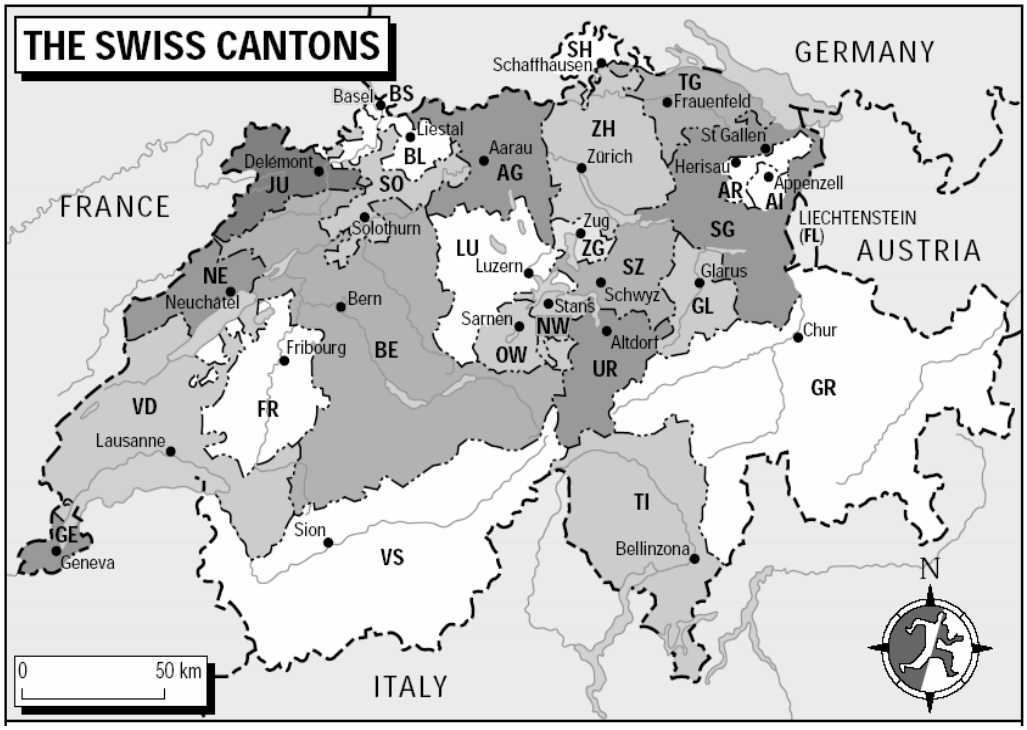

Figure 3 – The Swiss Cantons locating canton Graubünden (GR)
Source: Map from http://switzerland.isyours.com/images/rg.maps.cantons.pdf accessed on 6 Sep 2007.

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 4**Error! Reference source not found.**: (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).

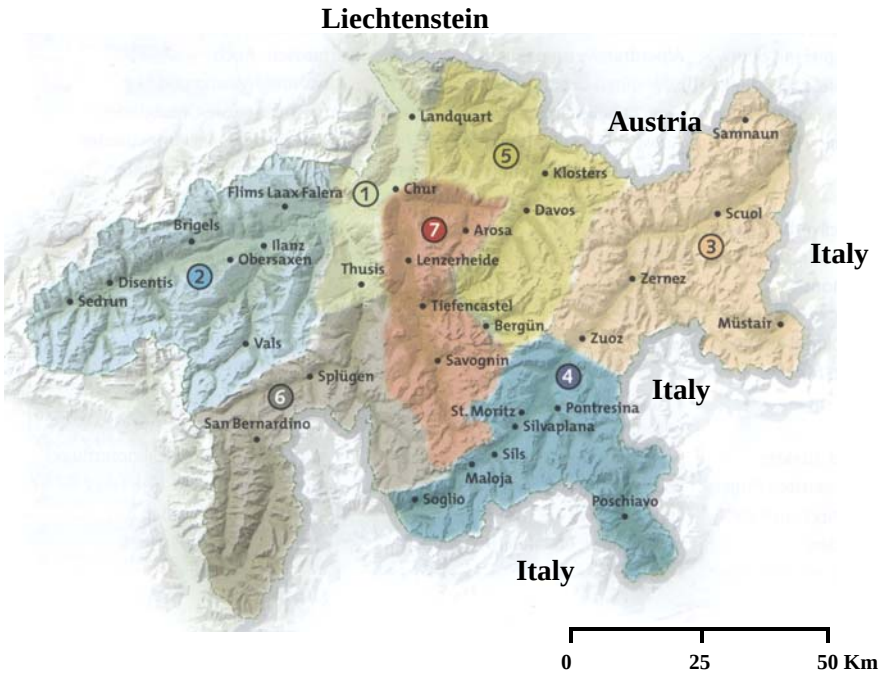

Figure 4 – Holiday regions in Graubunden
Source: Graubunden, 2006d

As an important holiday region, Graubünden is dependent on the tourism sector which generates 30% of its GDP (Graubünden, 2004). It 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 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 by Lozza (1996), it mirrors the region's visitor profile, the Swiss at 61% and the Germans composing 20%. 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 (2006, pers. comm., 4 Sep).

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 (see Figure 5). The Rhaetian railway (RhB) 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).

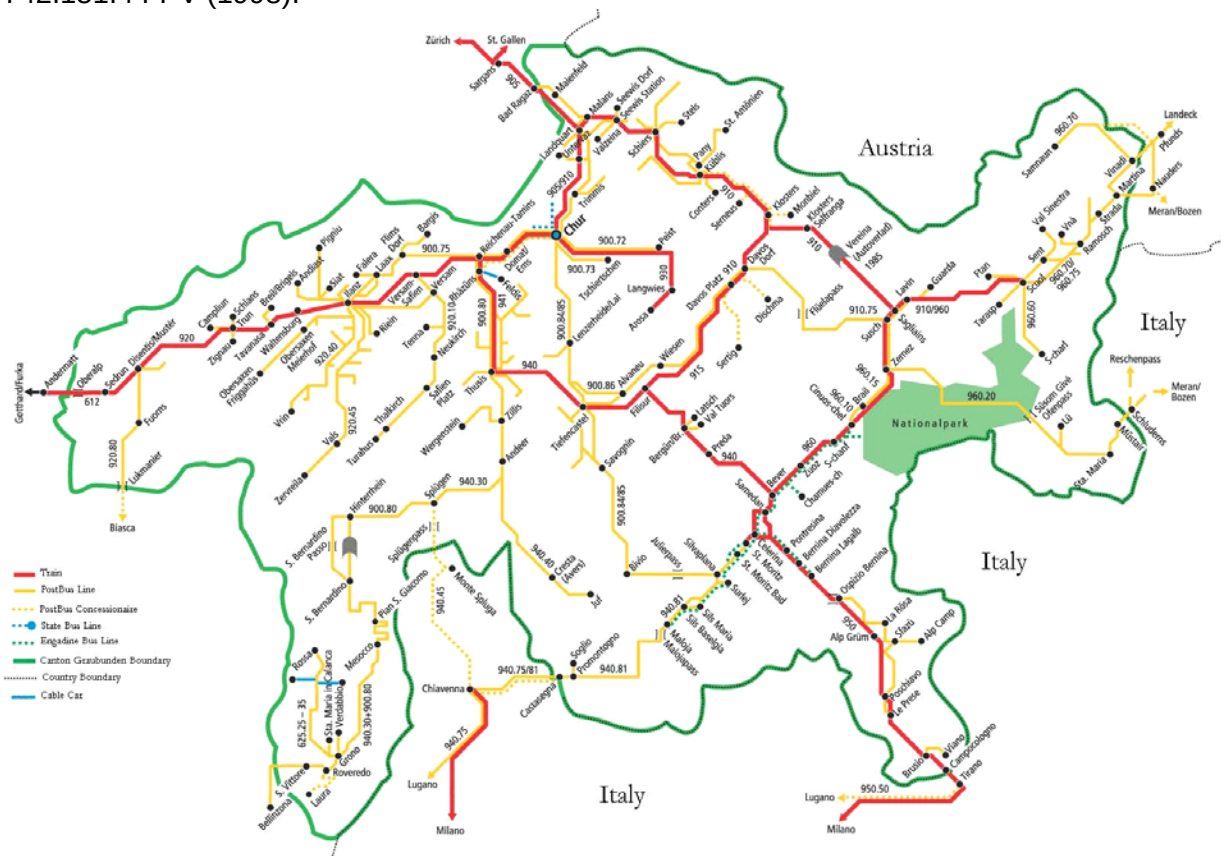

Figure 5 – Canton Graubünden transport network
Source: Graubünden 2006

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).

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). Prior to changes in the federal transport 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).

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 7,106km^2 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 Transport Network and the Private Vehicle

Graubünden, owing its present-day transport network to the early years of tourism, has an integrated network of rail and buses linking all the villages and local attractions. Yet, even with such a good network, the continued constructions of bridges, tunnels and roads have given the private vehicle the advantage over public transport. The RhB has resigned itself to playing supporting role to the car, where it acknowledges that 75% of visitors to Graubünden drive (RhB, 2006b).

The construction of the Sunnibergbrücke bridge in the Prättigau[4] valley is meant to redirect 78% of future traffic from Klosters (Fasani, 2005). This decreases travel time and distances between villages, sometimes shaving 30 minutes to an hour of the time it takes for RhB or PostBus (see Table 6). This disadvantage has resulted in the decreased utility of the public transport network and its dependence on the tourist season.

Table 6 – Travel Times of the various Modes within the Region

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

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

The completion of the Vereina tunnel in 1999 added a rail link between the Lower Engadine[5] and the Prättigau Valley. Although this meant shortened travel distance from Landquart to Scuol via rail, the nature of the rail as an overland vehicle carrier means that travel time for both car and rail is the same at 1.5 hours (highlighted in Table 6).

Switzerland's railway network has served the public since its establishment in 1844. From 1950 onwards, road infrastructure has since taken over. Though developed countries have more or less come to the realisation that increasing transport infrastructure will never solve congestion (Banister, 2002), Switzerland's national road network begun in 1959 is still in the process of completion until 2010 (Weiss, 1997, Fagagnini, 1996). The Department of the Environment, Transport, Energy and Communications (DETEC 2001, p 19) acknowledges the importance of completing the network "without delay" even dispensing with expanding existing motorways and accommodating only improvements of identified trouble areas.

Compared to the upgrading of the road network, public transport infrastructure has had few improvements through the years. The RhB, with its predominantly single-track rail network and the mountainous geography of Graubünden, has had very little room to manoeuvre and accommodate changes. There are no plans for expansion because the network is full – it cannot accommodate additional rolling stock, it can only increase the frequency of morning services for daily travellers (Brugger, 2006).

DETEC (2001) guarantees all sectors of the population and parts of the country access to mobility. This underwrites the service-led integrated transport system that exists in the whole of Switzerland. For cantons like Graubünden where the utility of rail is declining, the federal

[4] Prättigau valley covers the area of Landquart, Davos and Klosters.
[5] Engadine Valley covers the area from Samnaun through Scuol to Zernez.

government provides financial aid for the RhB to provide hourly services. Even Brugger (2006) concedes that 80% of the railway's earnings are from tourists while inhabitants of the region account for only 20% and mostly from work trips.

This reliance on tourist receipts has led to the restructuring within RhB and the creation of a Marketing department effective 1 January 2007 as shared by Brugger (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, which involved the creation of timetables by the Traffic and Infrastructure department and requesting the Marketing team to fill it with guests, did not allow Marketing to have a say on how things should be done (Brugger, 2006).

The strength of the public transport services in a leisure destination such as Graubünden given its tourism heritage is that all of the canton's attractions are accessible by public transport. The PostBus and the RhB are 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.

Swiss National Park

The Swiss National Park (SNP) located in the Engadine 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 km^2, it has grown to the present area of 172.3 km^2. 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 (Pro Natura, 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 Swiss Agency for the Environment Forests and Landscape (SAEFL). The National Park Federal Commission (NPFC)[6] as explained by Tester (2006, pers. comm., 1 Sep) sets the guiding structure of the association.

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 (SNP 2006c). It is only open during summer.

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

[6] 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).

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).

The Swiss National Park in canton Graubünden receives about 150,000 visitors every year (Lozza, 1996). Though the park is well serviced by both RhB and the PostBus, the mode of choice by over 70% of its visitors is the car (see Figure 6). 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 1993. 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 and the villages serviced by both RhB and PostBus (Lozza, 1996).

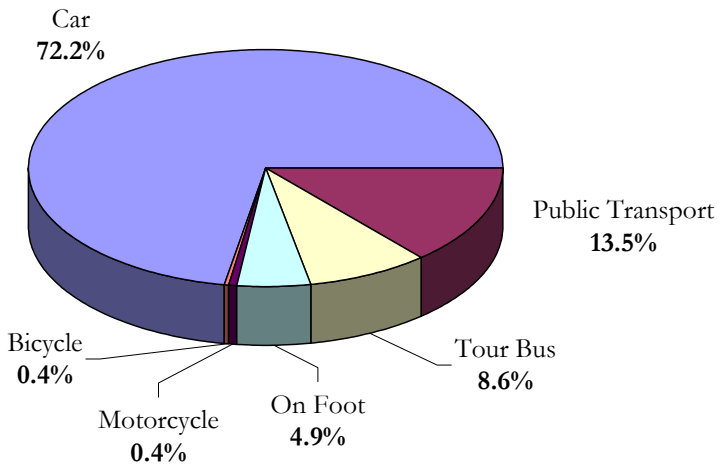

Figure 6 – Mode share observed over the whole season, June to Oct 1993
Source: Lozza, 1996

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 [parking spaces] 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.

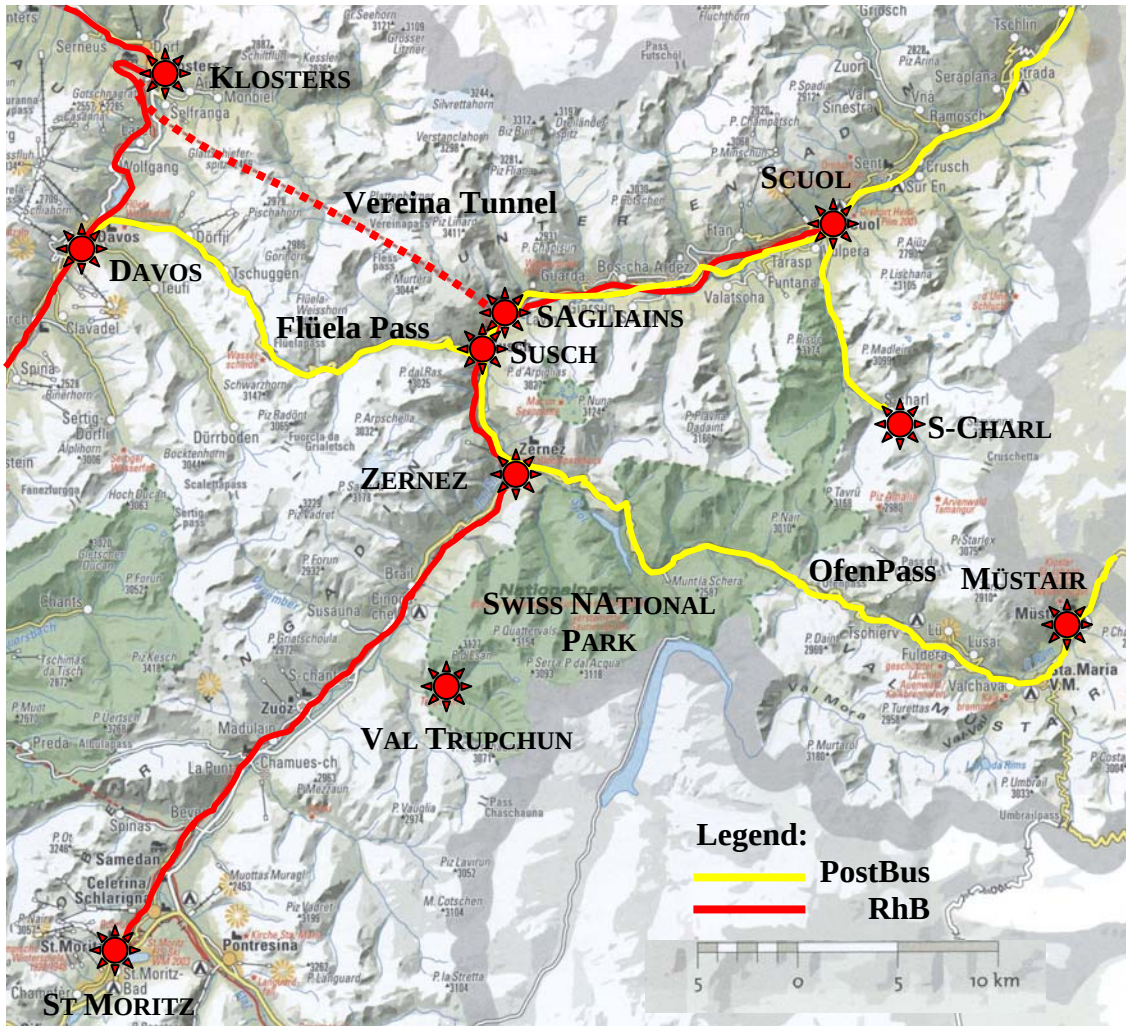

Figure 7 – The Swiss National Park and the RhB and PostBus lines
Note: The map does not reflect all RhB and PostBus lines in the region.
Source: Base map from Graubünden, 2006d, highlight of details by author.

Another reason for the number of car-driving visitors is the location of 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 (see Figure 4). With the reciprocity agreement on road transport between Switzerland and the European Union, 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 Schauffhausen, Zurich and finally Landquart. [7] The SNP is very accessible to Italy through the OfenPass and Livigno while the Scuol-Landeck route links Austria.

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

[7] 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.

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.

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.

TRAVEL, THE NATIONAL PARKS, AND THE TRANSPORT NETWORK IN PERSPECTIVE

What is driving the car? Incentives, Disincentives and the aim for Sustainability

This research 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.

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 m^2 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 comes 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.

Managing the Transport Network

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

Comparing transport management structures, the Swiss have successfully integrated all modes into one coherent system. One only has to look at the map for the Swiss Pass[8] 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 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 populations of less than a hundred.

[8] 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.

The Brazilians, to their credit, are working towards providing an integrated transport network but the complexity of the system hampers the efficient implementation. 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 encourage 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.

Towards a sustainable relationship, of carrots and sticks

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 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.

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.

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. There is the advocacy of Fahrtziel Natur in encouraging the utilisation of the integrated public transport network for travel to natural areas. The perceived success of the public-private partnership in Iguaçu 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.

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 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.

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