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**Waiting for 2005's World Skiing Championship:
an Experimental Assessment of Tourism Sustainability in Sondrio Province**

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Abstract

The goal of the work is to underline the role that an adequate sustainability assessment can play in territorial decision making processes on tourism development. A methodology and a first experimental application of tourism sustainability indicators has been proposed, taking into consideration environmental and territorial costs and benefits arising from tourism activities. The experimental area is Sondrio Province, in the area called Valtellina, in Lombardy Region, where in the year 2005 the Alpine Skiing World Championship will take place.

An analysis on a selection of indicators, based on available data, has been proposed to describe the sustainability performance of the existing tourism models, particularly concerning alpine skiing.

We have finally compared these results with the potential additional impacts, but also benefits, coming from both present public and private local action and future audience of 2005's World Championship.

The Sondrio Province analysis demonstrates that local level decision making on tourism should be based, like many others economic fields, on a specialised set of indicators, periodically and permanently evaluated. If, at a first sight, this approach could represent a cost, private and social costs of wrong or not enough informed decisions are certainly higher, as physical interventions on a territory remain in time.

1. Introduction

The tourism sector is more and more regarded as a central element of territorial development in many countries.

According to the sustainable development approach, interactions between tourism and the environment must be analysed from two points of view. On the one hand tourism can be regarded as a sum of economic activities playing an important role in the production of income and wealth in a territory. On the other hand, tourists and tourism structures and activities can produce important pressures and negative externalities on the environment and the ecosystems, mainly regarding natural resources consumption (water, energy, land), environmental quality reduction (air pollution, traffic and people density in natural or environmentally fragile areas) and a seasonal increase in the demand for public services (water supply, waste management, public transport).

Thinking at tourism as a user of natural capital resources for wealth creation (Holden, 2000), the consequences of the whole of the interactions between tourism itself and territory are complex. Also concerns regarding the environmental quality as an intrinsic value must be carefully evaluated (Daly, 1996), together with the capability of tourism to act as a territorial environmental quality defence facing other more pollutant economic activities (see the trade-off between the presence of tourism activities and the use of land for other economic sectors, like mining or heavy manufacturing industry). At present, the whole of the cross effects are very difficult to calculate but a lot of experiences at the world level show a reduction in the expected total territorial economic benefits (especially because of the environmental quality depletion effect – Southgate and Sharpley 2002.). This because of the rising of the collective costs related to the depletion of the quality of the environment and to the need for seasonal reorganisation of public services and territorial management. Moreover, the quality and the variety of the environment and the landscapes can be considered basic inputs of tourism. As a result, from a long term perspective, the poorest quality of the environment and of the landscape can produce a reduction in tourism activities and, consequently, in revenues. These means that the durability of tourism itself is strictly linked to the durability (or better, improvement) of the environmental quality.

Facing such a trade-off, it seems important to try to get over positions which underline the only “ethic and moral” or “conservative-environmentalist” points of view. An effective intervention on a territory should therefore take into consideration the

whole of the resources but also of the needs in such area: environmental as well as social and economic. This requires research instruments adequate to give an answer to a main problem. If the development of tourism can be viewed as a major economic and welfare source in many regions, on which objective set, intervention dimension and knowledge and evaluation tools the interventions to reduce tourism environmental impacts should be based?

The answer leans first on international and national level action, essential in terms of diffusion and sharing of the goal of the tourism sustainability itself and to obtain a possible common action framework. But the capability to diffuse a new analysis approach, able to create good quality information and knowledge appears also crucial. From this point of view, the local action level seems particularly critical. Actually the real key point in choosing and starting along the path of sustainable development appears territorial subjects behaviour at the local level, where the choice for sustainable development of tourism becomes concrete. Different destinations (territories) offer different tourism models, together with different pressures and impacts but also possible changing paths. And this is the level at which different subjects and interests really confront and dispute. If the aim of an intervention on tourism sector is both the reaching of a better sustainability degree for traditional tourism models and the development of new more environmentally sound tourism models, only local subjects' capabilities, strengths, resources and real desire for change can make the difference.

In the paper an experimental assessment of tourism sustainability in Valtellina, the territory of Sondrio Province (Italy, Lombardy Region, alpine territory) is proposed, where local public bodies and private subjects are preparing for the Alpine Skiing World Championship, to be held in winter 2005.

Waiting for the skiing championship, private and public subjects are now specially working on downhill skiing trails, winter sports facilities, road infrastructures (the connections in the valley depend on two main roads only) and the event's marketing. But, at least at present, it seems that environmental concerns and potential additional pressures on the territory are poorly examined into the decision making processes.

The aim of the paper is then to underline potential additional environmental and territorial pressures coming from the skiing championships, using only existing data, the same available to local subjects. The experimental activity is still on development and the results herewith presented must anyway be considered as the starting step of a long research path.

2. Valtellina as an alpine territory

The Local APT (Agenzia Provinciale per il Turismo - Tourism Province Agency) introduction to Valtellina says “suspended between Lombardy and Central Europe, Valtellina occupies an entirely mountainous territory in the Alps, from the Trivio di Fuentes at 188 metres, at the top end of Lake of Como, and the peak of the Bernina at 4000 metres, offering a variety of landscapes and almost unlimited possibilities for mountain activities. Its particular, rather irregular geographical layout and its great extent in both length and height offer a spectacular variety of countryside (APT Valtellina internet website)”. Moreover, the natural landscape is enriched by historical human elements: “the long history of the Valtellina communities matured in this geographical setting, a history of stubborn clinging to the land, which still bears the signs of centuries of human toil, especially in the vineyard and the Alpine pastures, but also the signs of political strife and profound religious beliefs, which left their mark in the churches, palaces and monuments (APT, internet website)”.

The valley environment can therefore “produce” different tourism activities: from winter and summer sports to mountain living and cultural and historical routes. The resulting tourism model shows high seasonal imbalances, with a concentration of tourism arrivals and nights spent (total tourists stay days) in winter and summer periods. The principal tourism models can therefore be recognised in the following: winter mountain sports (alpine and nordic skiing, skate and mountaineering), summer mountain activities (trekking, mountaineering, summer skiing over 3.000 mt.), historical and cultural heritage, rural tourism (farm tourism in particular).

Such a model, as well as consequent territorial and natural environment impact paths, are common to all the alpine territories. The problems tourism can produce on mountain areas are well described in European Environment Agency’s documents (see in particular EEA, 1999) and in CIPRA’s *Tourism Protocol*, one of the 1991’s Alps Convention spin-offs (CIPRA, 1998). In these documents the relationship between tourism and alpine environment is analysed from a systemic point of view. Tourism generates economic, demographic and social change. From a positive point of view this change can be perceived as development. From a more critical point of view it must also be recognised as a major pressure and impact system, interacting with the delicate

mountain environmental equilibrium. The exploitation of natural capital for tourism should then be object of a more careful territorial governance, planning and regulation activities. And this specially when, at the local level, tourism development is regarded as a mechanism to reduce the abandonment of mountain territory, a phenomenon that can have negative effects itself on the environment because of the lack for soil management.

Interactions among tourism, economy and the environment are central to the present debate, but still the discussion concentrates on the lack of adequate studies on these dynamics. In 2000, the annual CIPRA congress's theme has been "Tourism and the Alps: economic quality-environmental quality" (CIPRA, 2001). Some economists have been called to present studies on the capability of tourism activities in creating wealth in the alpine territory. But still this resulted to be a real challenge. The speakers were called to speak of the effectiveness of economic cycles induced by tourism development, the capability of tourism in producing real positive territorial dynamics and the most efficient investments in tourism from a socio-economic point of view. But the evidence was the lack of *ad hoc* regional studies on alpine territory.

The experimental assessment herewith presented cannot really contribute to fill the lack, but tries to build up an example of a possible study path for the potential territorial effects of an event like the skiing championship.

This assessment follows other analysis already made in the area (Pesaro 2001 and 2002) and has been elaborated using existing data-sets (from official statistical sources and from a couple of interesting studies developed in the second half of 1990s - Quadrio Curzio, 1998, and Lucchini and Pileri, 1998), aiming to demonstrate that it is already possible to take into consideration some sustainability matters of tourism in local decision making processes even if without an *ad hoc* selection of indicators and data collection (anyway strongly desirable in the future).

3. Tourists in Valtellina territory: accommodations demand and offer

Accommodation demand and offer are the first indicator to identify the dimension of tourism sector and activities.

The Valtellina's present model of accommodation demand and offer (not considering tourists in rent or property private houses) can be considered as the final result of a

changing process started in middle 1960s (Quadrio Curzio, 1998), a period when, in Italy, tourism begins to diffuse and becomes a mass phenomenon. From that period and till the end of the 1980s the presence of tourists and, consequently, the economic importance of tourism sector has continuously increased. As shown in table 1, the first slow-down in annual increase degree of arrivals and nights spent by tourists is very recent, the beginning of the 1990s.

Tab. 1 – Tourism total flows in Sondrio Province 1970 - 1999 (thousands)

	Total arrivals	% difference	Total nights	% difference
1970	108		657	
1975	136	26,1	949	44,5
1980	218	60,5	1.370	44,4
1985	270	23,8	1.447	5,6
1990	382	41,6	1.858	28,4
1995	401	4,9	1.903	2,4
1999	414	3,4	1.875	-1,4

Elaboration after APT Sondrio

The absolute major increase can be observed between 1975 and 1980, with a +60,5% in arrivals and + 44,4% in nights spent by tourists. A second increase period starts in 1985. This is an important element in this analysis, as Alta Valtellina hosted for the first time the world skiing championship in that year. The tourism arrival and presence dynamics could therefore be an evidence of the efficacy of international sport events on tourism demand.

After 1990 the process changes round and a constant reduction of tourism activity can be found (even if with some fluctuation in the short period). Figures, on the other hand, show different situation for Italian and foreign tourists (see table 2).

Table 2 – Tourism flows in Sondrio Province 1970-1999 – Italians and foreigners (thousands)

	Arrivals Italians	% difference	Nights spent by Italians	% difference	Arrivals Foreigners	% difference	Nights spent by Foreigners	% difference
1970	85		527		23		130	
1975	101	53.9	699	32.7	34	51.8	250	92.7
1980	147	45.2	856	22.4	71	105.6	515	106.1
1985	212	44.0	1096	28.1	58	-18.3	351	-31.8
1990	323	52.6	1575	43.7	59	1.4	283	-19.4
1995	318	-1.6	1480	-6.0	82	40.5	422	49.0
1999	315	-1.0	1379	-6.9	99	20.1	496	17.6

Elaboration after APT Sondrio

The main cause of such a dynamics can be found in the increase of international tourism destinations, chosen by Italian tourists but also by foreigners. Nights spent by Italians show a 6% decrease between 1990 and 1995 and a 6.9 decrease between 1995 and 1999. In the same periods, nights spent by foreigners increase by 49% and 17.6%.

The first real decline signals appear more recently, in the middle of the 1990s. And these dynamics still continue, as shown in table 3.

Tab.3 - Recent tourism demand – number of accommodation facilities and nights spent by tourists

	1999	2000	% difference
Hotel (nr.)	409	405	-1.0
- Italians (nights)	1419595	1377365	-3.0
- Foreigners (nights)	503106	450046	-10.5
- Total (nights)	1922701	1827411	-5.0
- Nights / bed availability nr. * 365	0.28	0.26	-7.1
Other tourism accommodations¹ (nr.)	211	222	5.2
- Italians (nights)	179586	177253	-1.3
- Foreigners (nights)	98181	90137	-8.2
- Total (nights)	277767	267390	-3.7
- Nights / bed availability nr. * 365	0.09	0.09	0.0
Total accommodations (nr.)	620	627	1.1
- Italians (nights)	1599181	1554618	-2.8
- Foreigners (nights)	601287	540183	-10.2
- Total (nights)	2200468	2094801	-4.8
Total nights / population	12.40	11.80	-4.8

Elaboration after Istituto Tagliacarne, website

From a systemic point of view, the most alarming element is the decrease of the number of nights spent by tourists, as this means that tourists arrives and depart very frequently (week-end journeys in particular). This means high degrees of environmental quality and territorial resources consume (production of traffic and other territorial pressures) but does not assure constant income effects.

Moreover, the decrease of tourism produces diseconomies. These are related to the low exploitation degree of the built and infrastructural capital and, from a larger point of view, to the low productivity of the natural capital (land and environmental quality use) already consumed. What is done on a territory remains in the long period, even if dynamics direction changes. In a contest of natural capital scarcity and following a sustainability point of view, planning and governance of physical interventions on the territory result therefore crucial for the achievement of a solid and long lasting development based on tourism. And this is even more important when considering that in Sondrio Province tourism height, calculated as the ratio between total tourism precences and population, results lower than other Italian Alps destination: 12.4 to be compared to the 28.4 in Aosta Province or the 50.6 in Bolzano Province (Istituto Tagliacarne, website).

Still, considering land use and natural quality depletion, the presence of residential tourism can play an important role. The impact of this tourism model on the territory and structures results higher than the model based on other accommodation forms (Quadro Curzio, 1998). It not only causes a higher increase in the demand for local public services but produces important transformations in urbanisation and land use models.

This is a very difficult indicator to collect. The only data source approximating the indicator is the REC (Registro degli Esercizi Commerciali – Commercial Activities Register), where a part of the arrivals and nights spent by tourists in rented private houses are registered. Still an important part of residential tourism cannot be recorded, as the portion of house owners is quite impossible to detect. Many of these houses belong to native people, who moved to bigger towns and come back for week-ends and holidays. But the most of them have been built to be sold as holiday homes to people living not too far away from the valley. This have caused an excess of construction and a high degree of permanent transformation of soils and landscape quality, because of the intense exploitation of both environmental and territorial resources.

Tab. 4 – Tourism flows in rented private houses in Sondrio Province's REC 1991-2001 (thousands)

	1991	1993	1995	1997	1999	2001
Arrivals	17	18	20	19	23	24
Nights	150	165	186	168	202	205
% differences		1991-1993	1993-1995	1995-1997	1997-1999	1999-2001
Arrivals		6.7	11.9	-5.1	23.9	4.3
Nights		10.3	12.6	-9.7	20.5	1.3

Elaboration after Annuario statistico regionale Lombardia, internet website

As shown in table 4, starting from the early 1990s the trends are a bit different from the other accommodation forms. From 1995 the dynamics are quite the same, while near the end of the 1990s a new increase has been recorded.

Recent data confirm the present slow-down in tourism demand. This could explain the importance that local administration and other territorial subjects give to the championships, even if the real results of such an event, following a sustainable development point of view, must be compared to other territorial results. In fact, as the numbers around 1985 demonstrate, the intervention on the territory does not assure stable income and, on the contrary, can correspond to a permanent natural capital depletion.

To complete the analysis it is important to observe that tourism flows show high differences in different local Mountain Communities (sub-province territorial mountain areas which aggregate a number of municipalities). The skiing championship involves only Alta Valtellina (Bormio and Santa Caterina Valfurva), even if its influences will interest the whole Valtellina area. The Alta Valtellina Mountain Community already shows a particularly high concentration of tourists and accommodates the 60% of total arrivals and the 70% of total nights spent by tourists in Sondrio Province (Regione Lombardia, website). This seems related to the demand for winter sports, as the area offers a lot of winter sports facilities due to the geographical position and natural characteristics but also to the 1985 championship. The most of the new tourism flows will then arrive where tourism is still strong and, at least at present, there is no evidence for a wider territorial intervention and involvement.

The process of reduction of tourists recorded in the 1990s also seems to depend on the lack of natural snowfall that has characterised the whole of the Alps arch in the last decade (CIPRA, 2001). If skiing maintains a central role in the Valtellina tourism model, skiing championship and related investments seems to be a good occasion for the revival of the area. Central government has assigned about 103 millions euros for the event itself (ski-runs and facilities, accommodations, telecommunication system, other structures needed for the event) and 130 millions euros for infrastructural system. But this contribute to the rise of the unbalance between Alta Valtellina and the other valley destinations.

Tab. 5 – Hotel accommodation offer in Sondrio Province 1970-1999

	Hotels	% difference	Beds	% difference	Beds/hotels
1970	494		14.052		28
1975	543	9.9	16.417	16.8	30
1980	518	-4.6	16.904	3.0	33
1985	387	-25.3	16.565	-2.0	43
1990	400	3.4	17.680	6.7	44
1995	404	1.0	18.401	4.1	46
1999	406	0.5	19.132	4.0	47

Elaboration after Local APT, website

Results of this polarisation effect can be both positive and negative. On the one hand, this means a higher marketing power for promoting events in Alta Valtellina, a more traditional and well recognisable location. On the other hand, this causes a higher and concentrated pressure from people and vehicles in a limited territorial area and season.

From the accommodation offer point of view, the dynamics seems in line with tourism demand flows. In 1985, just before the first world skiing championship, the system reaches the lower point. From that period the principal dynamics is the recovery of efficiency of accommodation: the number of structures changes a little, but the beds-hotel ratio shows a stable increase, together with the average dimension of hotels.

Tab 6 - Tourism accommodation offer*

	1999	2000	% difference
Hotels (nr.)	409	405	-1.0
- Beds Nr.	19.061	19343	1.5
Other accommodation facilities (nr.)	211	222	5.2
- Beds Nr.	8.232	8609	4.6
Total accommodation facilities (nr.)	620	627	1.1
- Beds Nr.	27.293	27952	2.4
% other facilities / Total	34.03	35.4	4.0

* Not rented or property houses

Elaboration after Istituto Tagliacarne, website

The previous tables show highly aggregated data. Actually, high differences arise if looking at individual Mountain Communities. As shown in table 8, the number of hotels generally reduces in the 1980-1999 period except for Alta Valtellina, where the increase is about 16%, while the increase of beds is even larger: 37%.

These indicators show a concentration and polarisation dynamics interesting Alta Valtellina, starting from 1985. This dynamics can be also found observing the real estate local market. Prices remain high because of the high environmental quality and because skiing is possible all over the year (in summer over 3000 meters in Stelvio area – Il Sole 24 Ore, website).

Tab 7– Accommodation offer in Sondrio Province per Mountain Community - % differences

Mountain Communities	Hotel number					Beds number				
	1980/85	1985/90	1990/95	1995/99	1980/99	1980/85	1985/90	1990/95	1995/99	1980/99
Valchiavenna	-27.3	-2.5	-7.7	5.6	-30.9	-9.9	4.3	0.8	16.6	10.5
di Morbegno	-56.8	5.7	2.7	-2.6	-54.3	-28.0	11.2	1.8	-0.4	-18.9
di Sondrio	-36.2	-3.3	-8.6	-3.8	-45.7	-16.0	-4.8	-7.9	3.8	-23.5
di Tirano	-31.0	-1.7	-6.8	-3.6	-39.1	-10.8	4.6	-7.1	3.0	-10.8
Alta Valtellina	-1.5	7.8	6.8	2.3	15.9	10.7	9.8	9.6	2.9	37.1
Province	-24.4	3.4	0.8	0.5	-20.9	-2.1	6.7	4.0	4.0	12.9

Elaboration after Local APT Sondrio, website

The density of structures and activities in Alta Valtellina induces a polarisation effect and 2005 skiing championship is contributing to these dynamics because of the new investments flows interesting the area. The density of tourism structures is already high but still interventions for the strengthening and renewal of accommodation system,

sport facilities (skiing slopes for instance) and other tourism services are required. According to a long period point of view this could represent a constraint to the real and stable development of tourism, a welfare strategic element for the whole Province territory.

A final element is the economic dimension of tourism in Sondrio Province. As table 8 shows, tourism and commerce really have a central role in the Valley economic system. And this effect results even stronger if considering the construction sector, whose development is strictly linked to tourism, due to the dimensions of residential tourism model (see next paragraph). Trends also show a recession in both the sectors of tourism and commerce and of constructions. The reduction of the value added in the two sector between 1996 and 1999 can be comparable, a dynamics which confirms the links.

Tab. 8 - Sondrio Province production system – value added

	1996	1999	Δ96-99 %
Total value added (millions euro)	2,472.78	3,312.4	33.95
% Agriculture	2.7	2.3	-14.81
% Manufacturing industry	23.6	20.9	-11.44
% Construction	10.5	6.8	-35.24
% Commerce and tourism	23.6	18.7	-20.76
% Transport and communication	5.6	7.5	33.93
% Banking and insurance	5.3	7.5	41.51
% Services to consumers	13.4	15.1	12.69
% Other non commercial services	15.4	21.1	37.01

Elaboration after Istituto Tagliacarne, website

4. Prevalent tourism model: analysis of some pressure indicators and potential effects of the skiing championship

The environmental impact path of tourism model in Valtellina seems particularly related to 3 main elements:

1. the large component of residential tourism;
2. the density of tourism activities offer in Alta Valtellina;
3. the change in the prevailing tourism activities of the last ten years.

The dimensions and nature of consequences of such elements on the territory and the natural environment are very often difficult to investigate.

Regarding the first point, the density of residential tourists means a certain stability in tourism presence in the long period. Residential tourists appear more stable and less linked to seasonal fluctuations and trends show an increase in the purchase of the holiday house. Many experts see in these dynamics the reason for the development of construction industry and the increase of its contribution to the economic growth, together with the enlargement of the offer of commercial and tourism activities and services. The increase of this tourism model, on the other hand, is one of the main causes of urban sprawl and non governed diffusion of residential areas all over the usable territory, scarce in mountain areas. Environmental effects, in this case, are due to the consume and the change in the uses of land and to the necessary extension of infrastructures for public and environmental services (electricity, fresh water supply and sewage networks, waste management, mobility and access facilities).

The Valtellina valley is quite narrow. The inclination of slopes increase rapidly from the rivers Adda riverbed and, because of this, human activities, except for agriculture and tourism, are concentrated in the valley floor. Using the Province digital cartography the usable surface has been calculated in about the 1% of the territory (Lucchini and Pileri, 1999), an amount which considers also the Adda river overflow strips, where a lot of buildings and infrastructures were built in the past and some are still previewed in some local plans (the 38 national road's renewal project, for instance, envisages some stretches adjacent the riverbed). This is particularly clear when analysing the different land use typologies in Sondrio Province and in the Adda river basin. As table 8 shows, urbanised areas are very concentrated. They reach the 1.1% of the Province total surface and arrive to 3.6% when referring to the Adda river basin, the 27.7% of the Province total surface. If, on the one hand, the direct exploitation of soils seems limited, on the other hand, pressures caused by such a settlement model are very high, specially considering that the most of the building activities is in the valley floor, that is in the river basin, where the environment and ecosystems are more fragile.

Tab. 9 – Land use typologies in Valtellina - 2001

	Urbanised		Agricultural		Wood		Uncultivated		Total surface	
	Km ²	%	Km ²	%	Km ²	%	Km ²	%	Km ²	%
Adda riverbasin	31.9	3.6%	178.31	20.1%	383.5	43.3%	291.55	32.9%	885.26	100
Province	35.18	1.1%	368.40	11.5%	2093.05	65.5%	698.11	21.9%	3194.74	100

Elaboration based on Province digital cartography

Tab. 10 – Urbanised area in Adda river basin within different distances from the centre line of Adda river basin per Mountain Community (thousands square meters)

	100 m		300m		500 m		Total Urbanised	
Morbegno	1898	9.4%	4444	22.1%	6451	32.1%	20092	4.1%
Sondrio	2191	10.5%	4991	23.9%	8546	41.0%	20845	2.7%
Tirano	2373	18.0%	4887	37.0%	7555	57.2%	13207	2.9%
Alta Valtellina	1623	16.3%	2638	26.5%	4126	41.4%	9970	1.1%

Elaboration based on P.T.C.P. 1997

The analysis on urbanised area in the Adda river basin per Mountain Community and distance from the river basin central line offers an even more precise framework of the land use model in the area (see table 10). It is easy to imagine the consequences on landscape and the naturalistic quality of the river environment.

Residential tourism contribution to this situation appears important. The number of rented and property holiday houses in Valtellina is high and still increasing. Data from 2001 population census show that houses not occupied by residents are 48.779, more than 41% of the total 118.333 (Camera di Commercio di Sondrio, website).

The calculation of land uses per Mountain Community also reinforces the hypothesis on the polarisation of tourism activities in Alta Valtellina. As shown in table 11, the land for residential uses is the 89.7% of the total Alta Valtellina surface and the land for sport facilities is the 1.4%, the largest extent compared to all the other Mountain Communities.

Tab. 11 - Typologies of land uses in Valtellina's Mountain Communities (thousands square meters)

	Residential	Productive	Mixed uses	Park	Sport facilities	Services	Other	Total
ValChiavenna	4994	394	1258	0	21	68	53	67990
%	73.56	5.81	18.53	0.00	0.31	1.00	0.79	
Morbegno	9165	1093	0	5349	74	97	71	10505
%	87.24	10.41	0.00	0.05	0.70	0.93	0.67	
Sondrio	10588	1001	417	0	80	209	109	12402
%	85.37	8.07	3.36	0.00	0.64	1.68	0.88	
Tirano	6274	403	0	0	52	107	36	6872
%	91.30	5.87	0.00	0.00	0.75	1.56	0.52	
Alta Valtellina	6274	403	0	0	52	107	359	4742
%	89.71	2.04	0.00	0.00	1.45	3.06	3.74	
Total Sondrio Province	37295	3295	1675	5349	278	588	304	41311
%	90.28	7.98	4.05	0.01	0.67	1.42	0.73	

Elaboration based on the Lombardy Region digital cartography

Such a residential model causes an intense exploitation of both environmental and territorial resources but produces incomes only some periods in the year (week ends and holidays). Moreover the presence of tourists often requires the extension and

reorganisation of infrastructures for public and environmental services (energy and fresh water supply and sewage networks, waste management). And resources effectiveness and efficiency results even lower if we take into consideration costs coming from the management of seasonal peaks in the demand for consumes, infrastructures and public and environmental services. The global territorial economic result, on the long period, should therefore carefully take into consideration both the reduction of the natural capital necessary for tourism development and the reduction of real revenues related to the rise of territorial costs due to the presence of tourists.

From the sustainability point of view a good indicator of tourism presence and pressure can be traffic (social costs of traffic in Italy have been calculated in an average 9.4% of PIL, the 94% of which related to road transport – Molocchi and Lombard, 1997).

The most of the traffic peaks recorded in the valley seems to be one of the consequences of the tourism residential model (Quadrio Curzio, 1998). People arrivals in the valley are concentrated in week ends and winter or summer holidays. The main transport means are private vehicles which contribute to concentrate traffic on the two main roads of the valley, the national 36 and 38. The dimensions of potential tourist flows can be better imagined referring to news like “Record queues yesterday November 4th 2002, the end of the All Saints long week-end. Starting from the first afternoon hours a 25 Km queue has grown from Sondrio to the starting of national road 36 (<http://sondrio.netweek.it/index.php?visual=31455>)”

A possible indicator to detect tourism pressure from traffic is the Average Daily Traffic (ADT): average number of vehicles running along a certain road portion per day. The ADT is collected in different days of the year and allows the analysis of traffic fluctuations during different seasons and days of the week.

In environmental assessments these data are as useful as difficult to obtain. Table 12 summarises a number of data directly requested to ANAS, the Italian public body responsible for road management. They are not homogeneous and not numerous. It is anyway interesting to present them as an example.

From data reading the national road 38 seems to be a major mobility structure for residents and less influenced by tourism flows. Also former data collection show peaks on Saturdays, confirming the contribution of non working travels. This seems to depend both from tourism flows and from the development of a large number of big shopping centres (Torricelli and Tabacco, 1998).

Tab. 12 - Average Daily Traffic on national 36 and 38 roads (number of vehicle runs per day) - 1997

Road 36

Peaks recorded in on Saturdays and Sundays, quite stable in winter and summer periods

Annual average ADT	4,471
Daytime ADT	4,640
Winter ADT	4,297
Saturday January, 20 th data collection	5,738
Sunday February, 4 th data collectio	7,108
Tuesday July, 22 nd data collection	6,559
Sunday September, 14 th data collection	5,105

Road 38

High traffic all over the year, more homogeneous around the Annual Average ADT
Peaks recorded in on Saturdays and Sundays, quite stable in winter and summer periods

Daytime average annual ADT	16,766
Night average annual ADT	5,947
Spring-summer average ADT	17,997
Wednesday* June 6 th ,data collection	22,248
Saturday April, 7 th data collection	19,397
Fall-winter average ADT	15,535
Saturday October 6 th data collection	17,594
Wednesday November 21 st data collection	16,137

* High contribution by residents as June 6th is a local holiday (patron saint)

Elaboration based on ANAS data

This elements have also to be compared to the general increase in the use of private vehicles recorded in the last two decades. Unfortunately the more recent data (2001 census) are not yet available, but trends between 1981 and 1991 are clear (see table 13).

Tab. 13 – Transport means - % use of public (PUT) and private PRT transport* per Mountain Community in Sondrio Province 1981- 991

	PUT 1981	PUT 1991	PUT % diff 81/91	PRT 1981	PRT 1991	PRT % diff 81/91
Chiavenna	9,78	7,60	-22,29	87,64	87,78	0,16
Morbegno	20,71	12,07	-41,72	74,88	81,78	9,21
Sondrio	17,73	8,06	-54,54	80,00	86,90	8,63
Tirano	24,73	11,01	-55,48	73,12	84,15	15,08
Bormio	13,45	5,31	-60,52	83,18	87,47	5,16
Province Total	18,06	9,37	-48,12	79,04	85,25	7,86
Lombardy	28,80	17,62	-38,82	67,29	78,07	16,02

*residual values are related to other transport means: bicycle, feet, etc.

After Torricelli and Tabacco, 1998

Traffic has important responsibilities on sound and air pollution. NO₂ emissions trends, for instance, show an increase (traffic is the source of the 70% of total NO₂ emissions).

The railway offer is still limited and the structure is quite old (it was completed in 1902). Starting from Sondrio there is one trail only and the average speed is around 65-70 Km/hour. It is therefor difficult to think to railway as a real alternative to private transport and, more generally, to wheel transport. The tourist flows expected for the skiing championship can represent an important additional environmental pressure also because the lack of a more environmentally sound transport system. Investments have been previewed for the renewal of the railway system (particularly by law means, like the Legge Obiettivo n° 443, December 21st 2001), but still interventions on roads system predominate. Waiting for skiing Championship, Lombardy Region has assigned 77,468,534 euros to the renewal of the national road 36 and ANAS has committed itself for 129,114,224 euros interventions on 36 and 38 roads. Moreover, even if the public budget for Valtellina's infrastructure financing (around 130 millions of euros, equivalent to ANAS interventions value) mentions railway renewal, details on interventions and budgets are not yet available.

Good indicators regarding the exploitation of public services are the monthly per-capita waste production and the indicator of tourism pressure "I optimised", constructed as the ratio between the maximum and minimum quantity of waste produced in each municipality (Lucchini and Pileri, 1998).

Tab. 14 – Urban Solid Waste monthly production and tourism pressure indicator Iopt (tons per month - 1996)

Municipalities	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	I opt
Chiavenna	167	173	182	180	206	183	218	176	213	198	185	179	1,3
Madesimo	57	58	62	35	24	28	56	111	29	21	21	54	5,1
Morbegno	241	210	214	247	249	300	230	237	264	273	231	234	1,4
Aprica	113	69	77	72	59	59	117	201	54	39	56	85	5,2
Bormio	278	195	215	240	197	182	284	350	182	184	154	212	2,3
Chiesa V. Malenco	90	62	76	89	73	73	131	174	77	57	64	82	3,1
Livigno	390	339	390	301	198	174	291	415	207	186	167	257	2,5
Teglio	92	67	80	91	98	89	137	178	97	74	78	80	2,7

xxx = maximum quantity produced in a month in the municipality

xxx = minimum quantity produced in a month in the municipality

After Lucchini and Pileri, 1998

As table 14 shows, the tourists presence can induce important monthly fluctuations. The consequence is the need for an adequate waste collection and management system, flexible enough to manage the different waste flows.

Waste production fluctuates because of the presence of a different number of people present in the area in different year periods. The indicator could therefore be used also to detect the real presence of tourists in an area (something that official statistics seem not able to obtain). The main result from the analysis of this indicator is the evidence of a tourism model characterised by a higher presence of tourists in the summer period (August in particular). And this is true also in ski districts (like Bormio, in Alta Valtellina, or Livigno), where summer data always remain higher than the winter data. Are therefore winter sports the main tourism model in the area? Perhaps the answer is yes only in Bormio case, as skiing is possible also in summer (over 3000 mt.). On the other hand, investors in the tourism sector should perhaps better consider this elements, particularly waiting for 2005 skiing championship.

Data on tourists presence over the year underline another important element. In the last ten years the prevailing tourism activities have changed and the offer, at present, appears wider and more various than in the past: specialised winter and summer mountaineering, hiking, trekking and mountain bike excursions, water sports like rafting, winter falls climbing and summer falls descent, horse-riding, paragliding and hang-gliding, educational rural activities, farm tourism, etc..

On the one hand, this means new jobs and opportunities for residents and can represent an important mechanism to reduce seasonal imbalances (and the associated environmental pressures caused by the concentration of people in limited periods of time). On the other hand this means more people scattered all over, as new offer contributes to the diffusion of tourism activities out off traditional tourism centres. The effect is an increase in the number and typology of environmental pressure sources in extended territorial areas. Parks and other high quality natural environments (where the most of these kind of activities take place) are particularly interested by this trends. But also the valley floor and the periurban areas suffer, due to the increase in the scarcity of usable land. And this means the need for a wider and more stable information collection on environmental pressures and impacts and for a strengthening of public control on land uses.

One of the major tourism attraction remains skiing (alpine in particular but also snowboard and nordic skiing). Are local communities aware of environmental, but also socio-economic, effects of these activities?

From the environmental point of view, skiing development needs land and energy and produces impacts on natural ecosystems, due to ski-runs, ski-lifts facilities and artificial snowmaking (Nordic skiing less than alpine skiing or snowboard).

Tab. 15 – Land use for existing and previewed (Alpine Skiing World Championship) ski-runs (thousands square meters)

	Existing ski-runs surfaces	% on the total Province	Previewed ski-runs surfaces	% on the total Province	% difference exist-prev
ValChiavenna	16438	16.3	46150	22.1	180.8
Morbegno	1805	1.8	1805	0.9	0
Sondrio	7318	7.2	11076	5.3	51.3
Tirano	12592	12.5	15229	7.3	20.9
Alta Valtellina	62800	62.2	134817	64.5	114.7
Total Province	100952	100.0	209078	100.0	107.1

Elaboration from Sondrio Province digital cartography

As shown in table 15, the existing extension of ski-runs surfaces is quite large. Still the previsions are for a sensible expansion. And this in Alta Valtellina in particular, because it hosts the championship. But the Alta Valtellina ski-runs offer is already the highest (more the 60% of the Province territory). From the environmental point of view this means an increase in the consume of soil where the pressure is already high. To renew one of the ski-runs, for instance, about 3,000 trees have been cut inside the Stelvio Park area (this because of a precise demand by FIS).

Moreover, also investments for renewal and strengthening of skiing facilities are concentrated in this area, contributing to the increase of territorial unbalances in facilities equipment and, consequently, in tourism offer and revenues.

Finally it is very important to take into consideration meteorological conditions. In Alps area snow is every year less present at low heights. If on the one hand previsions are for an increase in the number and dimension of skiing facilities, on the other hand the area needs more and more very expensive artificial snow-making facilities. And this is a very diffused dynamics, even if in presence of uncertainty on economic real results. Can ski industry revenues exceed expenses for the realisation and the running of the artificial snow-making facilities in the short and long period? Actually, when choosing a resort in future snow-deficient winters the amount of artificial snow-making and price of lift tickets seem to be the most important to skiers. Moreover, in the long period, non-snow related activities can be more important (König, 1998). And are environmental costs considered in the accounts? Artificial snow-making has a number of negative

effects, including a shorter growing season, high water and energy consumes, depletion of wood cover, and greater soil erosion (among other, artificial snow is 5 time heavier than natural snow and this demands soils management after the skiing season to permit the growing of underwood and grass).

Conclusions

The results of the analysis, developed with existing data-sets (official statistics sources and *ad hoc* data collection activities), confirm the pressures that present tourism model produces in Valtellina territory. Waiting for Alpine Skiing World Championship, one of the goals to control environmental new pressures should be the creation of a permanent measurement system. This could permit the stable monitoring on tourism pressures on the territory and the environment. Moreover, the stable and periodical assessment of some innovative indicators (for instance monthly production of waste) appears interesting to monitor the real presence of tourists in the area in different periods. It could consequently be possible to ameliorate the whole assessment of the balance between territorial private and social costs and benefits.

The results should be the availability of a better and richer knowledge on territorial and environmental dynamics as a decision making base. This also to overcome the limits of the present action of different subjects on the territory. The paper project has indeed risen because of the feeling that local action and discussions around the skiing championship (both from the point of view of economic and public bodies and from the point of view of citizens and consumers councils and environmental associations) lacks of information and knowledge on real complex dynamics between tourism and the territory in the Valtellina area. Sustainability path requires a more systemic approach to the pressures originated by the championship: all the pressures caused by present intervention activities, the future impacts of tourists' presence in the area (for a so short period of time) and the future results after the event. It is important to remember the analysis of arrivals and nights spent by tourists after the world championship of year 1985, which demonstrates how temporary the marketing effect of such an event can be (especially if not reinforced with a wider and innovative tourism offer) compared to the permanence of structures and land changes.

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