



45TH CONGRESS OF THE
EUROPEAN REGIONAL SCIENCE ASSOCIATION (ERSA)

Amsterdam 23rd – 27th August, 2005

New Ways through the alps - Impact of a big Construction Site on a Small Mountain Village

Simone STRAUF; Manfred WALSER,
Institute for Public Services and Tourism at the University of St. Gallen (IDT-HSG),
Dufourstr. 40a
CH – 9000 St. Gall, Switzerland
Simone.strauf@unisg.ch
Manfred.walser@unisg.ch

Key-words

Sustainable regional development, criteria and indicators, economic impact, spatial incidence analysis

Table of Contents

1	Introduction	2
2	Project Goals and Content.....	4
2.1	Perspective of sustainable development.....	5
2.2	Anticipated effects of the construction site	6
2.3	Criteria and Indicators	9
3	Preliminary Assessment of the Construction Project.....	13
3.1	Preliminary assessment of environmental goals.....	13
3.2	Preliminary assessment of economic goals	13
3.3	Preliminary assessment of social goals	15
4	Study on the Economic Impact of the Construction Site on the Upper Surselva Region.....	17
4.1	The method of spatial incidence analysis.....	17
4.2	The primary payment incidence	19
4.3	The secondary payment incidence.....	19
4.4	The total construction site-related revenues	21
4.5	The intangible effects	21
4.5.1	Image effects	21
4.5.2	Structural, networking and competency effects	22
5	Conclusion	24

1 Introduction

Transport policy is a matter of particular importance for Switzerland with its location in the heart of Europe. Swiss corridors through the Alps are used particularly frequently for transport between Italy and Germany. It was for this reason that Switzerland carried out an ambitious construction project called NEAT (Neue Alpen Transversale) to improve the European train connections especially for freight transports. One part of the project is the new Gotthard base tunnel, the longest railway tunnel in the world and the most impressive element of the new transalpine railway line through the Alps. In view of the difficult accessibility and extreme climatic conditions, ensuring the fast and reliable transit of more than 300 trains per day through the two 57 km long single-track galleries represents a considerable technical challenge. The Gotthard base line directly links the northern and southern sides of the Alps and the project of building a new line should achieve the following goals:

- Massive increase in goods capacity (twice as much as today)
- Much shorter North-South transit time for passengers and freight
- Reduced traction power requirements, per weight unit of transported goods, as a result of the elimination of steep slopes.

The construction project began in 1996 and is scheduled for completion in 2013. Due to the length of the tunnel and the unique geological features, the tunnel will be approached from five points. The shortest but most technically-challenging construction section is 800 meters deep in the mountain below the small town of Sedrun. Sedrun is in the Graubünden canton in the eastern part of Switzerland and has approximately 1500 residents. For the region, this is a “traditional” mountain region in a peripheral location. Sedrun is well-known as a vacation destination, particularly during the winter season. Although Sedrun has attained a strong position in tourism over the last few years, it has not gone unaffected by the impact of structural transformation in the tourism industry. The numbers of overnight stays have continuously fallen over the last ten years. Vacation rentals in particular have recorded heavy losses. The population has remained relatively constant over the last few years and has hardly been affected by people leaving the region.

Within the framework of the construction project of the new Gotthard base tunnel, the overall conditions in the community have been undergoing change over the last 15 years or so starting with when Sedrun was selected as the location for the intermediate access portal and the multi-function station complex. The construction site with its several thousand employees, the logistical challenges it poses and the massive changes to the natural environment required

has created an unusual situation for the town. This timeframe for the project can also, however, be seen as advantageous. It can be used to redefine the direction of development and prepare for future growth.

2 Project Goals and Content

The construction project is being monitored from an academic standpoint by the Swiss Institute for Public Services and Tourism (Institut für öffentliche Dienstleistungen und Tourismus) at the University of St. Gallen throughout the entire construction period. The goal of the research project is to conduct *basic research* about the organization of this type of major construction site. The study examines how this type of construction project can be carried out in line with both social and environmental needs as defined by the concept of sustainable development and how lasting economic benefits can be achieved for the communities and the region. In addition, a type of *early warning system* is to be set up that makes it possible to identify radical change processes at an early stage so as to be able to react to them. The visual implementation of these results forms the second part of the project. There are two components necessary to fulfill these goals:

- A *communications concept* for the entire time period
- A manageable number of *criteria* which can be observed over time on the basis of how they change

Evaluating a construction project from the standpoint of sustainability demands a lot of the evaluation standard. Two factors make the search for criteria particularly difficult:

- The construction project is not the subject of the analysis, i.e. neither of the tunnel itself nor the preliminary plans are under discussion. The academic study focuses on the ongoing *construction process*. Even though the different criteria that now exist for measuring sustainability are incredibly diverse, they can usually only be applied to projects or products and cannot be used in their current state to evaluate an ongoing (construction) process.
- The projected construction period of thirteen years means that the criteria and indicators used must demonstrate a high degree of flexibility. For a *timeframe* of this kind, it is not possible to predict all of the conceivable developments that might occur during construction. Consequently, the set of criteria must be able to accommodate additions and modifications in line with the construction process itself. This makes it necessary to have as broad a data pool as possible at the beginning of the project as data that has to be collected at a later time can only be evaluated with great difficulty or not at all over the lifespan of the construction site.

To be able to identify the appropriate criteria and indicators, it is necessary to define the line of attack that the academic research will take:

1. What principles does a 'sustainable construction process' have to uphold? – the *perspective of sustainable development*
2. What areas are expected to be most affected by the construction site? – the *perspective of the construction process*
3. How should the criteria and indicators be organized so that they are meaningful when used? – the *perspective of the research instruments*

These three questions make up the theoretical framework for choosing the set of indicators.

2.1 *Perspective of sustainable development*

According to the final report of the UN commission for Environment and Development (Brundtland Report, German: Hauff, Volker, editors, 1987; see Interdepartmental Committee Rio 1995, p. 22), the concept of sustainable development is defined as:

A development is sustainable when it meets the needs of the present without compromising the ability of future generations to meet their own needs.

When applied to the construction project, this means (see Minsch 1993) that the Sedrun intermediate access portal must be carried out in such a way that it:

- Conserves and preserves natural resources
- Strengthens the societal and social cohesion in the town and region
- Encourages the material well-being of all those involved
- Does not solve problems at the expense of other regions or social groups

The 'sustainable' construction process is simultaneously socially compatible, environmentally responsible and economically efficient. It is oriented around preserving and increasing the number of opportunities that future generations will have in Upper Surselva as a living space, an economic market, a recreational area and natural environment. This process takes into consideration the needs of all participants including the local population and those who have come to the region to work and it takes into account the impact on other regions.

2.2 *Anticipated effects of the construction site*

Before the criteria and indicators can be identified, the following questions have to be answered: in which areas are what kind of effects expected and within what timeframe? The following overview is an attempt to provide a rough idea of the anticipated effects as represented at the beginning of the construction project.

Environmental aspects

The environmental effects of the Zwischenangriffs Sedrun are mainly expected in the following areas (see Elsasser 1999):

- Transport including reusability and recyclability of new facilities
- Biotope protection and areas to compensate for destroyed biotopes
- Natural scenery and land use with the Val da Claus rockfill being the main focus
- Consumption of raw materials and energy that includes in equal measure the reusability of the infrastructure (accommodations) as well as dumping and reuse of the excavated materials
- Noise and harmful emissions in the day to day operation of the construction site and at critical points (Tgaglias refuse dump, ventilation galleries for accidents)
- Water supply in terms of mountain water and gallery wastewater
- There are also secondary effects caused by the increase in population

As a result of the logistics necessary for the construction site, not all of the adverse effects can be prevented. The focus of attention has to be not just on preventing damage but also on minimizing the effects of damage. Proactive and reactive environmental protection must complement one another.

Performing systematic environmental monitoring in the key environmental realms helps to record the ecological situation surrounding the major construction site. Due to the effects on regional planning, interfaces must be created to the canton's strategic planning and to local planning. Environmental monitoring and compensatory measures for unavoidable strains are part of the environmental impact assessment audit. It is here that the responsibilities and the process are specified in detail. Monitoring is the responsibility of the public sector. Based on the plans and the environmental audit already published, this major construction site is considered a model project.

Economic aspects

In the economic realm, the question of the infrastructure needed for this major construction site plays an important role. The existing infrastructure will be used more heavily at certain points and new infrastructure facilities will be added. Creating this infrastructure efficiently is an economic challenge and creates a new market for some companies in the town. The region has also experienced the direct benefits of regional experts being included in planning.

The question of whether the additional infrastructure needed can be reused or reversed must also be considered from the standpoint of sustainability. In connection with the construction site, an improved transport system for the region is currently under discussion. This system can be seen as compensation for the additional strains. The cost of living could change dramatically as a result of the construction site. In the supply of goods and services, it is unclear to which extent the increase in the total economic activities will lead to an increase in prices and the cost of living and how this will affect the local population. This increase must be seen alongside increased revenue for local companies, meaning that there will most likely be winners and losers.

In the area of tourism, which is by far the most important economic pillar for the valley, it is difficult to project how the construction site will affect the numbers of visitors. The potential strain caused by construction site operation must be weighed against the appeal of the information center as an additional attraction. Improved capacity utilization of visitor accommodations during the low season is juxtaposed against a competition for occupancy during the high season which will also affect the revenues in the leisure industry.

In addition to the economic influences which can be directly quantified, there are also intangible effects, i.e. the consequential and secondary effects of projects that cannot be accurately estimated. They range from image questions and infrastructure effects through to the effects of projects on the structure of the population and the real estate market. This pertains to, for example, the exchange of plots of land and land acquisition prior to construction, halting agricultural land use, using landfills or excavating construction raw materials in the region. Intangible effects also include, however, the impact on qualifications, the corporate landscape and cooperation between different forces and interests (networking and competency effects, see Bieger, Frey 1999).

Social aspects

The identity of the inhabitants of the Upper Surselva region is characterized by their peripheral location and their affiliation with the Romansch-speaking minority. This is

juxtaposed against a regional economy which is overwhelmingly based on tourism, attracting a high number of visitors from outside the region.

In the social realm, one of the main challenges is the shared living space between the village population and the vacationing visitors with a large group of foreign workers. One factor that makes this situation even more difficult is that many of the new arrivals come from different sociocultural environments. The issue of integration and how to deal with “outsiders” is a key topic for creating a sustainable construction site. This affects social life as well as the working conditions at the site, the quality of accommodations and recreational opportunities.

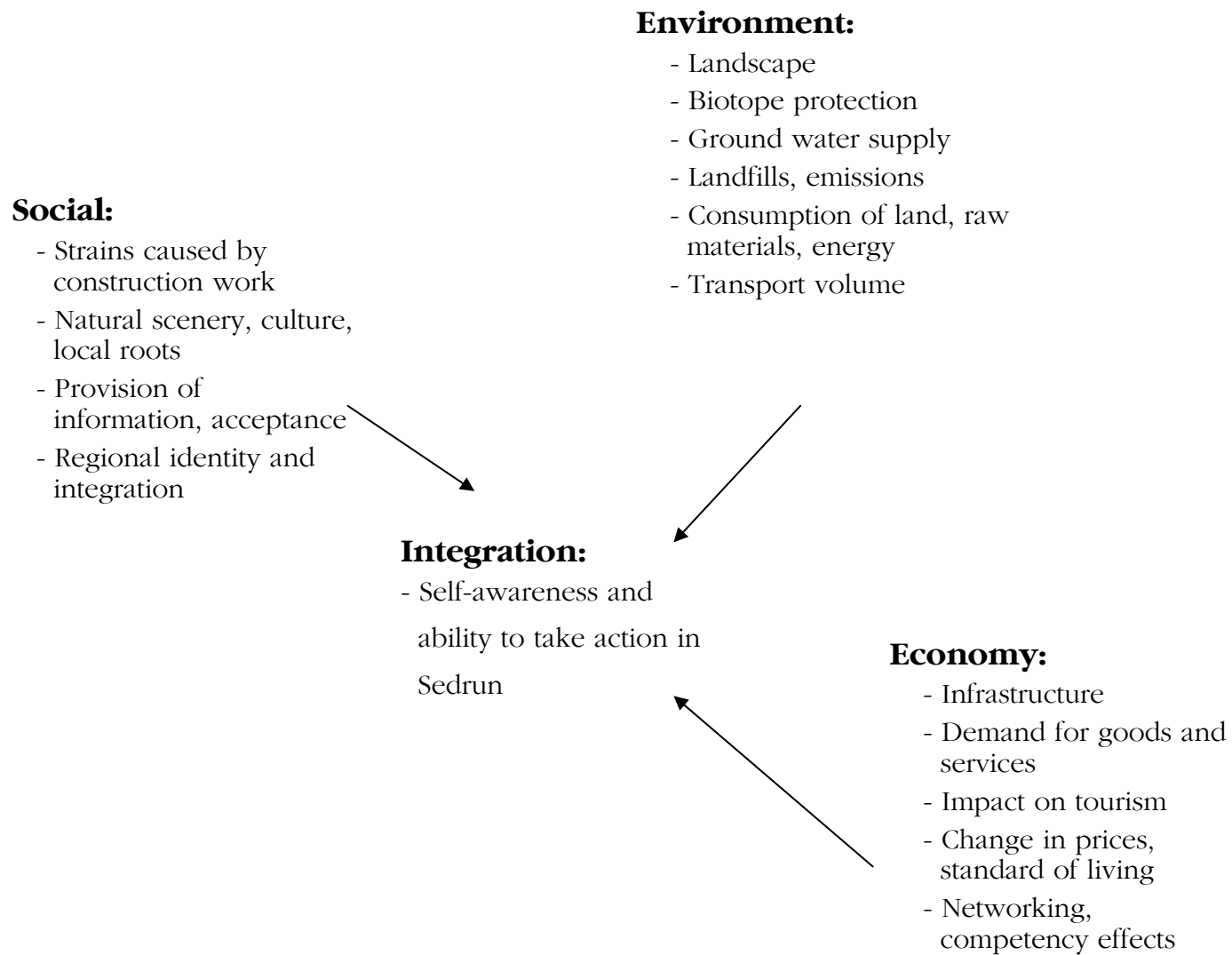
A subjectively experienced threat to local identity can be reinforced if parts of the local landscape are reorganized across large areas and exposed to the new strains caused by noise, traffic, etc. From the very beginning, steps were taken to cushion the effects of strain, including the making construction site visually appealing, installing windows to absorb sound and setting up a hotline for complaints.

One key aspect in the social realm is that projects be transparent for the local population and the residents are included in ongoing planning at an early stage (see Müller 1999).

Communication and involvement are also central requirements for sustainable development. The communication strategy of AlpTransit Gotthard AG and the public sector efforts play an important role. Projects which strengthen identity and create a positive awareness for the overall NEAT project are helpful in cushioning the effects of strains.

A comparison of the three aspects of sustainability and the expected impact of the construction site on the region produces the picture below:

Figure 1: The impact of the construction site on the aspects of sustainability



2.3 Criteria and Indicators

Criteria and indicators are used to measure to what extent a specific goal was achieved. They are always associated with the development process whose progress (or neutral: whose change) they measure. Indicators therefore gain in importance if they are documented over a longer period of time. The degree of change over time is initially value-free information. It is only the extent to which the change actually measured is compared against the desired change that an assessment of the development is possible. The number of criteria selected for this project had to be limited. First, it is not the responsibility of the monitoring researchers to ensure that the binding planning requirements were fulfilled. It is also not possible to perform

primary data collection (field research). Instead, existing material and data from various sources are processed and correlated. Changes become visible based on a synopsis of the sources and local meetings and discussions with important players representing various perspectives and interests. These changes are not immediately obvious to the construction site management as they change only slightly over time and have a general character. The following criteria were selected:

Criteria used for environmental goals

Strive for lasting, environmentally-compatible development of natural scenery and residential areas	<i>The goal is to preserve or improve the quality of the landscape. No additional land will be sealed. Residential areas retain their self-contained character. After completion of the construction project, land use in the region displays more natural areas with a high biotope potential than before the project. Resources can be used in the region and for the region.</i>
Carry out environmentally-compatible construction projects	<i>The goal is a high level of environmental management of the construction site and the construction projects. The environmental management of the construction site is exemplary, the workers are aware of the ecological correlations and problems. Common ecological quality standards are not just upheld but, in some cases, exceeded. Over the course of the entire construction project there is not a single accident where hazardous substances escape into the natural environment. The infrastructure can be used again or recycled without a problem.</i>
Preserve and improve the natural environment	<i>The goal is to preserve and improve flora and fauna as well as biotope potential. There are more rare breeds in the region after the construction project than before. The compensatory measures are carried out and increase the biotope potential in the region. They do not conflict with the needs of the local population. Streams, floodplains, moors and dry areas all exist and have a high level of biological diversity.</i>
Preserve or improve the water supply	<i>The goal is to use mountain water sparingly and to maintain or improve the surface water with respect to quantity and quality. The construction project does not have a major impact on non-recoverable losses and declines in quality. The discharged gallery wastewater has a high water quality level. The following indicators are checked.</i>
Minimize the use of energy	<i>The goal is to minimize the use of energy for the construction site and transport. The construction project and the associated infrastructure function with a well-thought out energy-saving plan. The number of truck journeys required for the construction site is disregarded. The transport companies observe the requirements.</i>

Criteria used for economic goals

Improve supply structures	<i>The goal is a supply and price level that is economically and socially compatible. The supply for daily needs is more diverse but not more expensive. The price level does not rise more than</i>
---------------------------	--

Use of the construction site as a tourism factor	<p><i>personal income.</i></p> <p><i>The goal is high demand in the tourism industry as the most important economic factor for the region and the community. The construction site does not disturb the visitors. Above all, it brings additional guests during low season. Supply grows, staying within a healthy range. There are no conflicts between different types of tourism. No extra capacity is created for accommodations that would be at risk of non-occupancy after the construction project is complete.</i></p>
Improve economic structure	<p><i>The goal is to improve the economic situation of the local and regional manual labor and service companies. The construction project brings additional income and creates jobs. The companies are aware of the construction site-driven requirements for the years ahead and invest carefully and strategically. New companies with new core competencies are able to establish themselves.</i></p>
Increase and safeguard the ability of the community to act economically	<p><i>The goal is to consolidate and improve the public budget at various political levels. As a result of the construction project, AlpTransit, the town and the canton invest in a lasting and environmentally-compatible infrastructure and the income associated with this infrastructure which can continue to be used after the construction site is complete</i></p>
Criteria used for social goals	
Create a positive mood among the local and valley population	<p><i>The goal is to reduce grounds for complaints to a minimum. Inhabitants and visitors of Tujetsch are exposed to as few additional inconveniences as possible caused by the construction site. They are kept informed, identify with 'their' construction site and workers and are proud of them. The number of inhabitants remains stable and young people have long-term opportunities.</i></p>
Integrate the construction workers	<p><i>The goal is to integrate the construction workers as well as possible into the day-to-day life of the community. Over the course of time, the construction workers establish a connection to cultural life in the village. They feel comfortable based on their social and societal position and working conditions.</i></p>
Reduce disturbances created by the construction site (noise, dust, etc.)	<p><i>The goal is that all of those involved with and affected by the construction site have a subjectively positive impression. This has to do with disturbances such as noise, dust, etc, that are caused by construction and traffic. The construction project causes only few disturbances. They are compensated for generously.</i></p>
Shape the relationship between municipal policy and residents	<p><i>The goal is active involvement of citizens in political life as well as a good information policy. The population of Tujetsch participates actively in political life. Everyone feels that their concerns are taken seriously and are well-informed about the construction project. There is the greatest possible amount of transparency in all relevant information between the AlpTransit Gotthard AG and the decision-makers in the town, region and canton.</i></p>

To measure whether the environmental, economic and social goals were reached, several indicators were assigned to the criteria above. The following are examples of some of the indicators used:

Integrative indicator:

The “self-image” of Sedrun over the years	<ul style="list-style-type: none"> ➔ Sedrun in the media ➔ Population structure and migration
---	---

Environmental indicators:

Natural scenery and residential areas	➔ Changes in land use
Environmental management of the construction site	➔ Accidents/failures in construction site operation with environmental impact
Changes in natural environment	➔ Development of specific biotopes
Minimize energy consumption	➔ Energy consumption of the construction site, construction site-driven increase in traffic

Economic indicators:

Supply structures and price level	➔ Price and supply of groceries
Construction site as a tourism factor	➔ Construction site-driven overnight stays
Manual labor and service companies	➔ Creation of jobs by company type
Public budget	➔ Public sector investment

Social indicators:

Mood among the local and valley population	➔ Calls made to the complaint hotline
Integration of construction workers	➔ Participation of construction workers in cultural events and recreational activities
Disturbances caused by the construction site (noise, dust, etc.)	➔ Number of truck journeys below Sedrun
Relationship between the township and the population	➔ Participation of local inhabitants in informational events

The indicators used are gathered on an annual basis so that development can be continuously recorded. 8 years have passed since the construction site started and the progress of the construction project can be evaluated in a preliminary assessment. The stated environmental, economic and social goals with the criteria and indicators they are based on are the standard used for evaluation.

3 Preliminary Assessment of the Construction Project

3.1 Preliminary assessment of environmental goals

The assessment of the construction site with respect to the environmental goals is essentially oriented around the following points:

- Land use
- Scope and quality of environmental compensatory projects
- Energy consumption
- Quality of water supply

The construction site, with its land use, the changes in the natural environment and scenery as well as its impact on flora and fauna, represents a large-scale intervention.

Carrying out the environmental compensatory projects posed challenges during planning stages as well as in implementation. The compensatory projects are largely completed, were implemented as planned and can overwhelmingly be positively assessed. Some projects, however, are still in trial phases. Projects will continue to be necessary in the years ahead as well to ensure that this land is managed in an environmentally-compatible way.

An attempt was made to optimize workflows, the environmental quality management functions and regular checks are performed particularly in the area of water. However, discharges that exceeded limits were regularly tolerated particularly in the beginning as long as they did not affect the supply of drinking water.

The volume of road transport increased considerably since the construction site was set up. However, not all values were recorded (construction site equipment).

The amount of energy the construction site uses is extremely high compared to planned values. On the other hand, water consumption is much lower than projected.

3.2 Preliminary assessment of economic goals

The economic goals during the construction phase essentially concern the following:

- Tourism
- Company development
- Job market
- Municipal finances

The indicators considered are supposed to provide insight into how the areas above changed during the construction phase.

In the area of tourism, many were afraid that there would be a drop in the numbers of overnight stays because the construction site would adversely affect the image of the region and that construction site workers would live in vacation rentals, driving away potential visitors. Tourism development over the last few years has shown that the image of the region has changed positively as a result of the construction site and that new guests have come to the region to visit the information center. Even though the number of overnight stays has dropped drastically, a direct connection to the construction site cannot be established. The opinion that visitors and construction site workers compete for vacation home rentals is still very prevalent. In our opinion, however, this argument only applies to the high season when all of the beds in the region are booked. Furthermore, it is up to those renting to decide who will occupy their rentals.

With the construction of the information center, the tours being offered, the open house at the construction site and other activities, several instruments have been created to market the construction site. These offerings have been met with great interest. They appear to be customized to visitor needs and demand seems certain for the next few years. They can be used to attract additional visitors to the region that stimulate revenue and potentially act as multipliers.

It is not just the tourism industry in the region that benefits from the construction site, companies in the region do as well. At least EUR 45.3 million stemming from contracts awarded to commercial companies and payments to the municipality has flowed into the region since the beginning of construction. The vast majority of these resources flow into the local and regional construction companies, with hotels and restaurants profiting as well.

A direct connection between the development of the job market in the region and the construction site cannot be established. Overall, the number of companies and the number of employees in the region has dropped over the last few years. However, some individual companies in the construction industry were able to record major increases in revenues which, in turn, also resulted in new people being hired.

The construction site has had a direct influence as well on the municipal finances of Tujetsch. The town is receiving additional income from “inconvenience payments” from AlpTransit Gotthard AG and the large number of foreign workers has increased tax revenues. Since the start of construction, the township has had additional earnings of EUR 2.05 million.

3.3 Preliminary assessment of social goals

With respect to the social impact of the NEAT constructions site on Sedrun, a range of indicators can be used to assess development such as:

- Integration of construction site workers into village life
- Level of acceptance local inhabitants have for the construction site
- Disturbances caused by the construction site for the local inhabitants

Overall, the construction site seems to have been successfully integrated into the community in a socially compatible way.

The inhabitants of Sedrun experience the NEAT construction site as part of their daily lives. The majority of the inhabitants feels sufficiently informed about the construction site. And, the municipal representatives describe contact with the construction site management as cooperative and uncomplicated. The local population accepts the construction site as a matter of course and it is hardly perceived as being disruptive.

When the construction site was set up, the hotline for complaints was used more frequently but in the last few years, it is hardly used at all. Only a few people still feel bothered by the construction site, on the contrary, a large percentage has benefited either directly or indirectly. The majority of local inhabitants and the construction site workers rate the relationship between them as positive. The locals for the most part describe the construction site workers as friendly and polite, the construction site crew has frequent contact with the local inhabitants and rate it positively. Some workers have surprisingly little contact to the locals which could possibly be attributed to their working rhythm and their accommodation in temporary annexes as well as to language barriers. The absence of construction workers is particularly noticeable on the rental apartment market because some prefer the temporary annexes.

The integration of the workers into community social life continues to be difficult. The shift work of the miners, the peripheral location of the temporary annexes and the frequent trips home by the workers hardly make it possible for them to participate in the cultural and social life of the community. The participation in cultural events or involvement in clubs is also quite low. But from the perspective of the workers, this is seen only in part as a problem: the difficulty of being separated from family and friends outweighs the desire for entertainment and recreational activities.

4 Study on the Economic Impact of the Construction Site on the Upper Surselva Region

The following study is one focus of our longstanding research project and deals with the issue of the economic impact of the NEAT construction site in Sedrun on the Upper Surselva region. In this study, the question of the direct monetary effects on the Upper Surselva region was of particular interest. The focal point was the effects of contracts awarded by the developer – AlpTransit Gotthard AG – as well as the effects triggered by the presence of the workers and the additional visitors.

The analysis of the economic effects of the NEAT construction site in Sedrun concentrated on the following questions:

- 1. What are the economic effects that stem directly from operation of the construction site and the associated presence of the workers and the additional visitors to the Upper Surselva region?**
- 2. What are the indirect economic effects that are the result of the operation of the construction site?**
- 3. What other effects – particularly over the long run – are expected for the region as a result of the construction project?**

4.1 The method of spatial incidence analysis

Spatial incidence analysis was the method used to analyze the economic effects of the NEAT construction site on the Upper Surselva region. This is a method for recording the spillover effects of a national budget or other (quasi) public projects. Here, all effects are considered incidences not just the monetary ones. Hence, it is a type of cost-benefit analysis that is particularly suited to examining the spatial effects of infrastructure facilities or the operation of these types of facilities.

The spatial incidence analysis is uncommon because it does not require any previous methodological knowledge, is relatively easy to carry out and the results it produces are comparatively transparent and easy to understand. Strictly speaking, it is only a classification system to organize accounting and statistical information into a problem-related and spatial structure. Despite certain methodological and theoretical deficits, the spatial incidence

analysis is still suitable as a methodological foundation for recording the economic effects of the NEAT construction site in Sedrun. The theoretical specifications had to be adapted, however, to the specific givens. The NEAT construction site in Sedrun is a one-time event but it spans a 17-year period. The effects associated with it refer in part to individual years during construction while some of them extend beyond it. To create a comparative framework, the time period between the start of construction in 1996 and the end of 2003 was selected.

This analysis attempts to systematically record the various incidences that occurred during this time period from the construction of the NEAT in Sedrun. The primary and secondary incidences can be quantified as part of this process. These are the “**tangible effects**” that represent the actual payment streams. A distinction is made between three different aspects here:

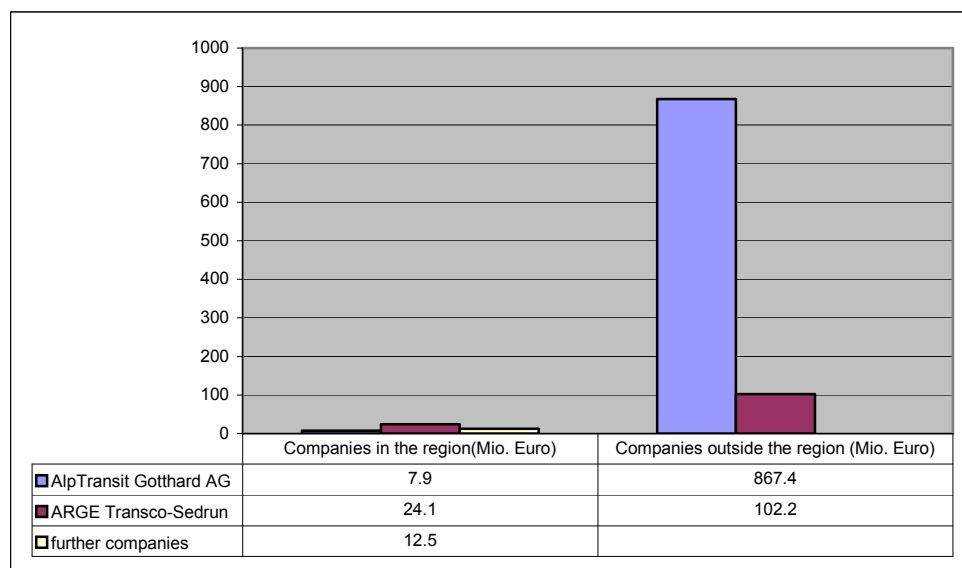
- The **primary payment incidence** includes all payment streams that are directly connected to the NEAT construction site. Here, an attempt is made to analyze the greatest possible percentage of the real financial streams with respect to their origins and goals. And, a spatial profit and loss statement is created for the Upper Surselva region.
- The **secondary payment incidences** include all payment streams that originate from the various participants and players in connection with the NEAT construction site. Using model calculations and the results of other studies, the financial streams triggered here are also spatially analyzed and a profit and loss statement created for the Upper Surselva region.
- The **total construction site-related revenues** include all revenues that arise directly from the construction site and the participants as well as the revenues that are the result of (tourism) induced advance payments and investments as well as the income effects in the people who work in the affected companies (i.e. the multiplier effects). Here, only those revenues are considered, however, that were initiated from outside of the Upper Surselva region.

In incidence analyses, it is usual that, in addition to the tangible effects, goods and benefits incidences are also recorded. These intangible effects can usually only be represented qualitatively. We differentiate in this case between image and brand effects, structural effects, competency effects and networking effects.

4.2 The primary payment incidence

To calculate the direct economic effects, those payment streams are considered that are directly connected to the AlpTransit Gotthard AG as the developer. Here, a demand-side approach was chosen. The accounting data of the AlpTransit Gotthard AG is the focal point. The income side is ignored because the AlpTransit Gotthard AG receives all of its funds from the federal government. The contracts awarded by ARGE Transco-Sedrun were also included in the calculations as well as other selected companies as the most important contractors for the AlpTransit Gotthard AG.

Figure 2: Primary payment incidence of the NEAT construction site in Sedrun



Source: Internal data collection, 2003

If the contracts from the companies above that have been awarded since the start of construction are included, the NEAT construction site has contributed to a total increase in revenues of at least EUR 44.5 million for companies the Upper Surselva region.

4.3 The secondary payment incidence

In addition to the payment streams directly triggered by activities of AlpTransit Gotthard AG, demand for goods and services in the Upper Surselva region and throughout Switzerland was brought about by other players. A distinction can be made for the following groups of goods and services:

- Demand for services for accommodation and lodging by the construction site workers

- Demand for restaurant services by construction site workers
- Demand for day to day goods bought by the construction site workers
- Leisure, entertainment, sports and culture consumed by the construction site workers
- Demand for transportation services for traveling to and from Sedrun by the construction site workers and the construction site visitors
- Demand for hotels and restaurant services by visitors of workers and the information center
- Demand for hotel and restaurant services by open house visitors
- Tax revenues stemming from construction site workers to the municipality of Tujetsch

To be able to analyze the secondary payment incidence, the question of to what extent the demand for goods and services is covered must be answered. Generally, it can be assumed that the majority of the expenditures above are made right in the town. This applies in particular to expenditures for accommodation, food, shopping and possibly for personal services or recreational activities. Other expenditures, in contrast, are only made in smaller amounts in the town, for example, the costs for traveling to and from Sedrun.

Based on the analysis of the various players involved in the NEAT construction site in Sedrun, a comprehensive estimate of the emerging secondary payment incidences was performed. A total of **just under EUR 14 million** was spent in the time period from 1996 – 2003 by the groups involved in the Upper Surselva region. The workers with their expenditures made the biggest contribution to the increases in revenues in the Upper Surselva region.

The following table provides an overview of the secondary payment incidence:

Table 1: Balance of secondary payments for the Upper Surselva region

Player	2003	Total amount 1996 - 2003
Construction site workers	EUR 2'990'000	<i>EUR 11'143'000</i>
Tax revenues from construction site workers	EUR 416'000	<i>EUR 1'000'000</i>
People visiting construction site workers	EUR 57'000	<i>EUR 162'000</i>
People visiting the information center	EUR 199'000	<i>EUR 1'390'000</i>
People visiting the construction site open house	EUR 5'300	<i>EUR 46'000</i>
Total	<i>EUR 3'667'300</i>	<i>EUR 13'741'000</i>

4.4 *The total construction site-related revenues*

To determine the total construction site-related revenues, the primary and secondary payment incidences are added together and multiplied by a regional multiplier.

When added, the direct construction site-related revenues amount to approx. EUR 58 million for the time period from the start of construction in 1996 to 2003. If a regional multiplier of 1.37 is used as a basis for mountainous regions, the **total calculated construction site-related revenues are at least EUR 80 million.**

4.5 *The intangible effects*

As already mentioned, it is not just the tangible effects that play an important role, the intangible effects of creating infrastructure are also significant. Because the construction period of the NEAT construction site in Sedrun spans such a long time, the effects will not be limited to the short-term. It will also leave its mark over the long-term in the Upper Surselva region. The intangible effects can be broken down into image, structural, networking and competency effects.

4.5.1 Image effects

Image is defined as the totality of the visions, attitudes and feelings that a person or group has towards an event or a facility. An image is created through different experiences at different levels: at the emotional, motivational and cognitive levels. Depending on the type of information that the person obtains and which experiences he or she has, an image emerges. Reporting in the media plays an important role here. Reality is not always consistent with the picture people have in their minds.

The NEAT construction site in Sedrun has also generated an image: a vision and feelings associated with the construction site. At early planning stages, many articles about the NEAT construction site appeared in the regional, national and international media. Since the start of construction, more articles appear every year. In addition to articles published in print media or on the Internet, reports from the region are broadcast by (international) TV crews. In general, reporting on the construction site in Sedrun is positive. The impact on the region, the amazing technical feat as well as the special knowledge of those working at the site contribute to the fact that the construction site in Sedrun is perceived as something special and unique. Still, there is bad press about the construction site in the headlines: for example, if accidents occur or the long controversy about wage payments and working conditions for the South

African miners. However, the high level of interest in the information center and the tours which were booked well in advance are evidence that the public image of the construction site is good and a visit to the construction site is by all means worth it.

4.5.2 Structural, networking and competency effects

Since the start of construction in 1996, a broad-based network has emerged around the construction site in Sedrun. Numerous effects and the resulting impact of these effects can be directly and indirectly linked to the construction site.

The structural effects arising from the NEAT construction site are quite diverse. The main one is certainly the multi-functional station complex that will exist with the completion of the construction work which plays a key role in the overall concept for the new Gotthard Tunnel. With the concept entitled “Porta Alpina”, proposals are currently under discussion as to whether and to what extent this multi-functional station complex can be used together with the existing infrastructure as an underground train station for the Upper Surselva region. Prior to the actual start of construction, advance payments were also necessary to make it possible to operate the construction site. This involved the infrastructure facilities that will remain in the region over the long term. A completely developed commercial area will also be built on the land where the construction site currently is. It can be used by the municipality of Tujetsch once construction work is complete. The construction of the spa facility in Sedrun could also be considered a structural effect. Even though it is an indirect effect, it was still made possible by the construction site. The additional income generated for the town of Tujetsch by the AlpTransit Gotthard AG created the additional funding to invest in the new spa facility. The construction of the information center is also an infrastructure facility that, at least during the construction phase, will mean extra benefits for the Upper Surselva region. The structural effects mentioned above encompass various types of facilities that, over the course of the construction project, have led to an improvement in the infrastructure in the Upper Surselva region and will continue to be advantageous for the region after the construction project has ended.

The networking and competency effects produced by the construction project are also diverse. These effects are primarily the result of the knowledge that individual companies and the municipality of Tujetsch have acquired over the construction period. As a result of the construction site, individual companies in the region have been awarded additional contracts. Some of these contracts were consistent with the core businesses of the companies but, in

some cases, they represented particular challenges. The companies in the region were often incorporated into working groups, some with international participation. Working together with partners and the fulfilling project requirements, which were highly specialized in some cases, demands a high level of cooperation among companies and generates additional knowledge among participants. The knowledge acquired in connection with working on the construction site will help these companies acquire new contracts and will also act as a reference. Many contracts awarded the AlpTransit Gotthard AG were handled by working groups. The cooperation within these working groups, some of which had international participants, also produced new skills among the participating regional companies. New contact networks have emerged that could continue to exist after the construction project is over. New cooperation partners were gained that can come together again on a needs basis for subsequent contracts. The networks within the region were also reinforced. Companies that had already worked together in the past have acquired new, common references together. The NEAT construction site was also a challenge for the community. Several thousand workers residing in the town over a period of many years affects life in the community. Over a 15-year time period, the number of residents will increase by more than 20% and, at the end of the project, it will drop to its original level. Even if many of the workers live in temporary annexes, living space must be provided for every individual, the retailers gain additional customers and people in the community also work at the construction site. For municipal employees, this means more administrative work but the restaurants and hotels as well as private renters will have regular contact with construction site workers. The restaurants and hotels benefit from the workers and the visitors to the construction site and adjust to the demand. In some cases, business holidays are the same as the construction site holidays. To what extent the quality level in the hotels and restaurants of the region will be influenced by the construction site is difficult to say. It is also difficult to say what the long-term effects will be once construction work is complete as the additional income will disappear and hardly any additional visitors will come to Sedrun.

5 Conclusion

Eight years have passed since the construction project began and the end of 2003. It was necessary to come up with a range of criteria and indicators to achieve the environmental, economic and social goals, making the project as sustainable as possible. Since the project began in 1999, two complete data collections and two partial data collections have been performed, and the question of the economic effects of the construction site has been answered. Over the course of the project, it became apparent that the indicators and criteria selected at the project start as well as the method chosen can basically be considered meaningful. However, in individual cases, a decision was made as to whether it was still necessary and useful to collect data each year for a specific indicator or not. Some indicators, for example, were already eliminated because it was determined that they would not play a role over the course of the rest of the project and were not very significant. Changes in the rental market for apartments were not included in basic data collection due to the fact that initial discussions about the impact of the construction workers focused primarily on the vacation rentals and the potential competition for tourists. This showed the problems that can occur when anticipating effects in a long-term study.

So far, the progression of the project can be rated positively. The environmental goals have largely been achieved and the compensatory projects carried out. The focus now is managing the land. Observations of the water supply have hardly yielded any problems. The construction site consumes much more energy than originally planned. As the project progresses further, it remains to be seen whether action must be taken and if so, how. One highlight with respect to the economic goals is the fact that the region has benefited considerably from the additional revenues generated by the construction site. Since the beginning of construction, additional revenues totaling approx. CHF 122 million have been generated by the contracts awarded within the scope of the construction site and by the expenditures of construction workers and visitors.

One problem that remains unsolved is the conflict between the construction workers and tourists for occupancy of vacation rentals. Consequently, the impact that the construction site has had on tourism in the region is not 100% positive even though the region has been able to attract additional visitors as a result of the information center and the appeal of the construction site.

For the community overall, the construction site has hardly had any negative effects: it benefits economically from the construction site, directly from the compensatory payments of

the developers and the tax revenues from the workers and indirectly through the expenditures in hotels, restaurants, retail stores and commercial businesses.

The primary social goals have to do with the relationship between the locals and the construction site and the employees of the construction site. Now that construction has been going on for 8 years, the construction project has been totally integrated into people's day to day lives and it is not really perceived as disruptive. Instead, many benefit from it. The relationship between the local population and the construction site workers is described as good by both sides although the workers who work in shifts have relatively little contact with residents.

The importance of the NEAT construction site for the region is also evident at the following levels: on the one hand, through the visible infrastructure that will still exist once construction is finished and, on the other hand, in the increased numbers of discussions about new projects and processes. The region of Upper Surselva has become more dynamic, more projects are being initiated, such as the spa facility, that would not have been possible without the construction site. In addition, discussions about the future of the region have been stimulated, a future which will more or less be influenced by the construction site. The population identifies strongly with the construction site. It remains to be seen whether the Upper Surselva region can maintain the momentum spurred on by the construction site and can influence its image over the long term in a positive way. What will certainly be preserved is the feeling of having accomplished a "project of the century" and creating a good basis for new projects.