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DIPLOMARBEIT

Indicators for sustainable development of rural municipalities – Case studies: Gagnef and Vansbro (Dalarna, Sweden)

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Zusammenfassung

Diese Arbeit trägt zu der Diskussion über Nachhaltigkeitsindikatoren für die oft vernachlässigte lokale Ebene von ländlichen Kommunen bei. Indikatoren leisten einen großen Beitrag zum Verständnis und zur breitenwirksamen Vermittelbarkeit von Nachhaltigkeit und fördern somit die Kenntnisse von Öffentlichkeit und Entscheidungsträgern zu diesem Thema.

In der vorliegenden Diplomarbeit wurde ein Satz von 20 Indikatoren entwickelt, die nachhaltige Entwicklung in ländlichen Kommunen messen. Die Indikatoren basieren auf einem Indikatorensatz, der für zwei Gemeinden auf der Insel Lewis an der Westküste von Schottland entwickelt wurde. Dieser vorhandene Satz wurde auf die zwei schwedischen Kommunen, Gagnef und Vansbro in der Provinz Dalarna, angewendet, mit dem Ziel einen generell anwendbaren Satz für ländliche Kommunen zu entwickeln.

Aus der zu Grunde liegenden Definition von Nachhaltigkeit wurden vier Dimensionen (Umwelt, Wirtschaft, Gesellschaft und soziale Gerechtigkeit) abgeleitet. Sie bilden den Rahmen für diese Arbeit und werden durch jeweils fünf Indikatoren abgebildet. Als Datenquellen für die Indikatoren wurden offizielle Statistiken genutzt. Interviews lieferten zusätzliche qualitative und quantitative Informationen.

Die Ergebnisse der Indikatoren implizieren eine moderate, und dennoch überdurchschnittliche, nachhaltige Entwicklung der beiden benachbarten Fallstudien. Unterschiede zwischen den beiden Kommunen konnten von den ausgewählten Indikatoren abgebildet werden, diese eignen sich daher für die Anwendung auf der lokalen Ebene. Die hier präsentierten Indikatoren spiegeln den aktuellen Zustand der beiden Fallstudien wider. Aussagen über die zukünftige Entwicklung von Gagnef und Vansbro könnten möglicherweise durch fortlaufende Beobachtungen über einen längeren Zeitraum hinweg getroffen werden.

Es werden Empfehlungen für die Weiterentwicklung des Indikatorensatzes, im Hinblick auf Datenquellen und die Wahl der Indikatoren, gegeben. Zukünftige Arbeiten könnten also entweder wieder Gagnef und Vansbro untersuchen, oder in anderen europäischen Regionen durchgeführt werden, um die Übertragbarkeit der Indikatoren zu testen.

Abstract

This study contributes to the discussion of sustainability indicators for the often neglected local level of rural municipalities. Indicators facilitate to a great extent the understanding and communication of sustainability and thus enhance the public's and decision makers' comprehension of the topic.

A set of 20 indicators to measure sustainable development in rural municipalities was developed in this study. They are based on a set of indicators developed for two communities on the Isle of Lewis on the West Coast of Scotland. This existing set was applied to the two Swedish municipalities Gagnef and Vansbro in Dalarna county with the aim to create a generally applicable set of indicators for rural areas.

Four strands (Environment, Economy, Society and Social Equity) were derived from the underlying definition of sustainability. They built the framework for this study and are each represented by five indicators. Official statistics served as primary data source for the indicators. Interviews provided additional qualitative and quantitative information.

The results of the indicators imply a moderate, yet above average, sustainable development of the two adjacent case study municipalities. The chosen indicators are suitable for this small level, because differences between the two case study municipalities could be detected with their help. The indicators presented here reflect the status quo of the two case studies. It might be possible to ascertain future development of Gagnef and Vansbro through continuous monitoring over a long period of time.

Recommendations for the further development of the indicator set are given, with regard to data sources and the choice of indicators. Future studies could thus either return to Gagnef and Vansbro, or could be conducted in other European regions to test the transferability of the indicators.

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Glossary

Arbetsförmedlingen – Swedish Public Employment Service

Banverket – Swedish National Rail Administration

Boverket – National Board of Building, Planning and Housing

Brottsförebyggande rådet (Brå) – Swedish National Council for Crime Prevention

Dalarnas forskningsråd – Dalarna Research Institute

Delegationen för Hållbara städer – Delegation for Sustainable Cities

fäbodar – summer pastures

Försäkringskassan – Swedish Social Insurance Agency

hållbarhetsrådet – Council for Sustainable Development

Högskolan Dalarna – Dalarna University

Institutet för Tillväxtpolitiska Studier (ITPS) – Swedish Institute for Growth Policy Studies

Kommunfullmäktige – Municipal Council

Landstinget Dalarna – Dalarna County Council

Länsstyrelsen – County Administrative Boards

Miljödepartementet – Ministry of the Environment

Miljövårdsberedningen – Environmental Advisory Council

Nationalkommittén för Agenda 21 och Habitat - National Committee on Agenda 21 and Habitat

Naturekonomi Huset – Sustainable Enterprise Solutions (SES)

naturgrus – natural gravel

Naturvårdsverket – Swedish Environmental Protection Agency (SEPA)

Offentlighetsprincipen – Principle of Public Access to Official Records'

Ohälsotal – Sick-leave rate

Regeringens kommission för hållbar utveckling – Commission on Sustainable Development (Sweden)

Regeringskansliet – Government Offices of Sweden

Regionalt Uppföljnings System (RUS) – Regional Follow-up System

Registerbaserad arbetsmarknadsstatistik (RAMS) – Swedish Labour Statistics based on Administrative Sources

Riksdag – Swedish Parliament

Rådet för främjande av kommunala analyser – Swedish Council for Local Government Analysis

Samhällsbyggnadsdepartementet – Ministry of Sustainable Development (Sweden)

Socialstyrelsen – National Board of Health and Welfare

Skogsstyrelsen – Swedish Forest Agency

Statens folkhälsoinstitut – Swedish National Institute of Public Health

Sveriges Kommuner och Landsting (SKL) – Swedish Association of Local Authorities and Regions (SALAR)

Sveriges officiella statistik – Official Statistics of Sweden

Standard för Svenska Näringsgrensindelning SNI 2002 – Swedish Standard Industrial Classification

Statistika centralbyrån – Statistics Sweden

Studieförbunden – Swedish Arts Council

Tillväxtprogram – Regional Program for Growth

Valmyndigheten – Swedish Election Authority

Vägverket – National Road Administration

Verket för näringslivsutveckling (NUTEK) – Swedish Agency for Economic and Regional Growth

Återvinningsstation – recycling station

Återvinningscentral – recycling centre

1 Introduction

The United Nations Conference on Environment and Development 1992 in Rio de Janeiro motivated many different institutions to devise indicators for sustainable development on international, national and regional levels. However, the vast amount of already existing indicators often neglect the local level of a municipality or community. Studies on sustainable development at this level are rare. The *Dùthchas-Project* (DÙTHCHAS 2001) and the *Community Capacity Index Project* (FLORA 2004) are two scarce exceptions. The road map on sustainable development for the 21st century, Agenda 21, requests in chapter 28 all local authorities to develop local sustainability concepts (UNITED NATIONS 1992). The well known slogan 'think global, act local', summarises this intention accurately. Indicators, which measure sustainability, are well-established and approved instruments of environment and sustainability policies (NLÖ 2004). So, the 'think global' part of the slogan is widely covered, but the 'act local' aspect lacks attention. Indicators for the local level could help to fill these gaps. This study contributes to the discussion of sustainability indicators for the often neglected local level of rural municipalities. The local level is the level where politics come closest to voters and citizens. It is thus the level where many policies, especially sustainability related ones, are implemented (MINEUR 2007). Thus, the local level as unit of analysis is highly interesting for research on sustainability indicators.

The indicators presented here are based on a set of indicators developed by ZENNER (2007) for two communities on the Isle of Lewis on the West Coast of Scotland. This existing set was applied to two municipalities in Sweden to test their transferability to other rural regions, with the aim to create a generally applicable set. Indicators which could be implemented in different regions could facilitate the comparability of regions. This aspect gains importance on a European level, since European regions are engaged in an increasing 'competition of regions' (MOSE 2005). The advancing Europeanization influences the state-to-regions-relationship. The Europe-of-regions thesis encourages regions to increase self-government. This has already led to a more comparative style of thinking in Sweden (OLSSON & ÅSTRÖM 2004), underlining the need for a comparison tool, for example, on the base of sustainability indicators.

Sustainability is defined here, in accordance with ZENNER (2007), as **lasting well-being of a community in terms of social life, social equity as well as local economy within a healthy natural environment, and without damaging any goods or services**. Four strands were derived from this definition: Environment,

Economy, Society and Social Equity. They build the framework of this study and are each represented by five indicators.

As mentioned before, ZENNER's thesis (2007) builds the base of this thesis, which can be considered follow-up research. This origin influenced the methodology chosen for this thesis. The goal was to achieve comparability between both theses. The method of research using case studies was maintained, yet some methods of data acquisition were altered. Instead of a survey, official statistics were used as primary data source. Interviews as an additional source of information were maintained, but in contrast to ZENNER's work, municipalities were chosen as unit of analysis. The latter helped to avoid problems of defining the case study borders, which ZENNER encountered with the choice of communities as unit of analysis (ibid, p. 13). Another reason for this choice was the availability of statistics on the level of municipalities.

Chapter 2 first outlines the status of sustainable development discussion in Sweden. It gives an overview of efforts taken so far and introduces indicator sets developed for the national level in Sweden. The second part of the chapter focuses on the county of Dalarna and outlines the state of sustainability discussion in the county. The methods used are described and explained in chapter 3. This also includes the question whether a case study is the appropriate method for analysing sustainable development and indicators for measuring it. Chapter 4 introduces the case study municipalities and the county of Dalarna. Subsequently, the indicators are described and their results are presented. An overview of all indicators and their results in table form and in a graph, completes the chapter. Chapter 5 first discusses basic aspects, which influenced the methods applied. This is followed by the indicators' discussion. The conclusion (chapter 6) finally summarizes the results and lessons learned.

2 Sustainability discussion – situation in Sweden

The chapter first outlines the status of sustainable development discussion in Sweden. It offers an overview, which is not intended to be exhaustive, of efforts taken so far and introduces indicator sets developed for the national level. The second part of the chapter focuses on the county of Dalarna and outlines the state of sustainability discussion in the county.

2.1 National level

Sweden is a precursor in implementing sustainable development, a position which is also accompanied by a leading role in developing indicators as measurements of sustainability. The numerous indicator systems at different governance levels are thus a predictable finding (MINEUR 2007). The Swedish effort for sustainable development started with a pioneering role in environmental protection. For example, the first European national park, Sarek National park, was founded in 1909 in northern Sweden. The country also hosted the first UN *Conference on the Environment* in Stockholm in 1972 (MIDDELKOOP *et al.* 2004).

A more holistic view on sustainable development was introduced into the government's actions with preparations for the UN *Conference on Environment and Development* in Rio in 1992. A few months after the conference, the Government requested all municipalities to develop a local Agenda 21 (LA 21) (HÜLSMANN & PASTOR 1999). By the end of 1998 more than half of municipalities of Sweden (56%) had formally adopted LA 21 plans. The majority had also already discussed them in their municipal councils. Sweden was thus a leading country in Europe concerning the implementation of LA 21. One reason for this success was the high level of national support in form of campaigns and finance. The government's investment programme for local initiatives towards ecological sustainability was launched in 1997 and supported municipalities to take actions towards their LA 21 objectives. This approach can be referred to as a top-down strategy from the national government, which contradicts the original bottom-up strategy of LA 21 (ECKERBERG 2002). In order to coordinate work on Agenda 21 and sustainable development, the Government appointed a National Committee on Agenda 21 and Habitat in 2000 (MIDDELKOOP *et al.* 2004). After only two years of existence, the Committee ceased its work with the end of 2002. A final report was presented to the Government in April 2003 (NATIONALKOMMITTÉN FÖR AGENDA 21 OCH HABITAT 2007). This development on the national level reflects the situation among the municipalities of Sweden. The original commitment faded away and many municipalities started to

cut back staff and resources for LA 21 (ECKERBERG 2002). Apparently, the 'buzz-word' *Agenda 21* had lost its attraction and politicians turned towards the presumably new topic of *sustainable development*.

In 2000 the Swedish Ministry of the Environment charged Statistics Sweden with the development of indicators for sustainable development. This first national set was published in 2001 and contained 30 indicators. They were divided into four groups: *Efficiency*, *Contribution and Equality*, *Adaptability,* and *Values and Resources for coming Generations*. Besides measuring sustainable development in Sweden, they also contributed to the discussion and work on the first Swedish *National Sustainable Development Strategy* (NSDS) (STATISTICS SWEDEN 2001), which was published in June 2002 (RAMETSTEINER *et al.* 2007). The strategy was based on already existing policies and other instruments regarding sustainable development. The implementation of objectives and measures of the strategy was up to each responsible organisational group. The absence of a systematic implementation strategy characterized this approach, which otherwise was very integral.

The development of the strategy, as well as the indicators, were intended to be closely linked to the work of the EU (MIDDELKOOP *et al.* 2004). The first revision of the NSDS of Sweden was published in 2004 (GOVCOM 2003). Instead of a review in the classical sense, it was rather “an update with further prioritizing of objectives” (RAMETSTEINER *et al.* 2007, p. 127). The review was influenced by the commitments of the 2002 UN *World Summit on Sustainable Development* in Johannesburg. Aspects concerning consumption and production patterns were stressed in the review. As announced in 2004, the second review was issued two years later (GOVCOM 2005).

The 2006 version of the strategy also included the elaboration of indicators for sustainable development. The revised set contains 86 indicators and includes 12 headline indicators. The indicators are structured in six topics: *Health*, *Sustainable Consumption and Production Patterns*, *Economic Development*, *Social Cohesion*, *Environment and Climate,* and *Global Development* (RAMETSTEINER *et al.* 2007). These indicators are designated tools for the follow-up of the measures announced in the strategy. Due to the lasting cooperation with Statistics Sweden, figures for some indicators are easily accessible over the Internet. Some figures are even broken down by age and gender, as well as by region, in order to “permit separate reporting of different categories” (GOVCOM 2005, p. 69). The indicators and measures announced in the strategy will be monitored and reviewed on a regular basis. Improved statistics, methods of measurement or analytical insights will influence the

further development, as well as progress on the EU's *Strategy for Sustainable Development* (GOVCOM 2005). The next revision of the NSDS and its indicators is planned for 2010 (RAMETSTEINER *et al.* 2007).

Again, the Swedish government created institutions which should facilitate the implementation of the strategy. The Council for Sustainable Development existed under the National Board of Building, Planning and Housing from 2005 until 2007. It was replaced by the Commission on Sustainable Development (ESDN 2008), which is affiliated to the Ministry of the Environment. Its function is to provide advice and sound analyses of issues related to sustainable development. The Commission is supposed to support further development of the NSDS of Sweden, but also to contribute to the EU's strategy for sustainable development. The last aspect is especially important, because the EU's strategy will be subject to a comprehensive follow-up in 2009, which coincides with the Swedish Presidency of the EU during the second half of that year. Other international co-operations on sustainable development, like the UN Commission on Sustainable Development (UNCSD) and the OECD, may be supported by the Commission. Its members come from various sectors and range from, e.g., the Swedish Prime Minister Fredrik Reinfeldt to CEOs of Volvo and Vattenfall to the rector of the Swedish University of Agricultural Sciences. This mixture of politicians, businessmen and members of the research community is supposed to extend the issues and the group of actors working on sustainable development. During the first year of its existence climate change issues were the main topic (GOVERNMENT OFFICES OF SWEDEN 2007).

Sub-national activities for sustainable development encompass, amongst others, the Delegation for Sustainable Cities, which was launched by the government in September 2008. The task of the Delegation is to promote

> "*the work for long-term well functioning and attractive city environments where high quality life goes hand in hand with a better environment, economic growth, social cohesion and a reduced climate impact*" (SOU 2008).

So far, the Delegation's existence is limited until 2011. It was created in the course of a reorganisation as a part of the Environmental Advisory Council. The latter was launched in 1968 and has since then been the Government's advisory body on environmental issues. The Council itself is affiliated to the Ministry of the Environment (ibid). So, despite the Swedish Government's attempt to include different ministries on the work on sustainable development, the Ministry of the Environment is, again, the responsible authority.

Another environmental authority contributing to work on sustainable development, is the Swedish Environmental Protection Agency (SEPA). It has the overarching responsibility for achieving the *Environmental Quality Objectives*, which are

> "*one of Sweden's innovative and successful components of its sustainable development initiatives*" (MIDDELKOOP *et al.* 2004, p. 10).

The objectives' aim is to solve all major environmental problems until 2020. It is thus "a promise to future generations of clean air, healthy living environments and rich contact with nature" (SEPA 2008, p. 1). The Swedish Parliament adopted 15 environmental objectives in 1999. A 16th objective on biodiversity was added in 2005. Besides the overall responsibility, the SEPA also coordinates the work of all agencies involved with the objectives. Six other authorities act as lead agencies for different environmental objectives. These are, for example, the National Board of Health and Welfare (*Human Health*) or the Swedish Forest Agency (*Sustainable Forest*). The County Administrative Boards are local agencies to promote progress towards achieving the objectives on that level (SEPA 2008). They contribute to regional solutions for sub-goals defined through the objectives. These sub-goals help to specify and define the *Environmental Objectives*, which are formulated in rather general terms, like *Clean Air*, *Sustainable Forests* or *A Good Built Environment* (ARL 2001). Thus, the *Swedish National Environmental Quality Objectives* (NEQO) are directed to the national and sub-national level in order to prioritise and guide work on environmental and sustainable development (MINEUR 2007).

2.2 Indicator systems in Dalarna

The previous chapter described some indicator sets for sustainable development on the national level in Sweden. But such sets were also developed for the regional and local level, and were often adopted even before those on national level (MINEUR 2007). This chapter examines work on the NEQOs on the regional (county) level, first in general terms for all Swedish counties and then, more specific, for Dalarna. Additionally, other indicator systems and sustainability approaches, which are unique for Dalarna, are presented.

From the beginning on the development of the NEQOs had contained the aim to address the national as well as the regional level for the implementation of its objectives. Therefore, the government commissioned the county administrative boards to develop a regional follow-up system of the NEQOs. This already happened in 1998, one year before the environmental objectives were even adopted by the Swedish Parliament (CAB DALARNA 2005). In 1999 the *Regional Follow-up System* was presented by all 21 Swedish county administrations, which were in

charge of the work (MINEUR 2007). This cooperation resulted in a consistent follow-up system for the whole country and a corporate design for its presentation on the system's web-page (NATURVÅRDSVERKET 2003). In 2007, the system consisted of more than 70 indicators, with each being linked to at least one NEQO (MINEUR 2007). The project officially ended in 2004, but the indicators are still revised on a regular basis. Also the whole system is still subject to further development (CAB DALARNA 2005). This development work and the follow-up of the environmental objectives are the main tasks of county administrative boards regarding the NEQOs.

In Dalarna, these tasks are closely linked to the ongoing work on the *Environmental Objectives* of Dalarna. The latter are the national objectives adjusted to the county's circumstances. Thus, the *Environmental Objectives* of Dalarna consist of objectives of the national set, but also of objectives which are specific for the county. This can be explained by the need to clarify the aims regarding environmental issues set by the *Dala Strategy*. The follow-up indicators, used for the *Environmental Objectives* of Dalarna, thus represent the environmental dimension of sustainable development as defined by the strategy (CAB DALARNA 2007). Besides this, another task of the indicators is to illustrate the state and change of the environment in Dalarna (CAB DALARNA 2005).

The aforementioned *Dala Strategy* was developed by Region Dalarna in 2006 and is a comprehensive strategy for sustainable development in Dalarna. The strategy identifies challenges the county faces and derives goals for the year 2016 from them. Its purpose was to create a controlling and guiding tool for the many different parties working on the development of Dalarna (REGION DALARNA 2006). The effort needed for achieving the goals is distributed among those different parties. The strategy describes a vision as well as objectives and principles for the future. More concrete aims are presented in development and growth programs, like the *Environmental Objectives* of Dalarna, or the *Regional Program for Growth* (REGION DALARNA 2006a). The strategy is based on those already existing programs, since it does not intend to create completely new structures. It is planned to compile follow-ups of the strategy, but documents about the *Dala Strategy* contain only vague information about the further proceedings (REGION DALARNA 2006+a).

The *Dala Strategy* summarises the overall and lasting effort in Dalarna to coordinate and concentrate the work on regional development. The efforts to achieve this aim date back to 2003 when Region Dalarna was founded (NRC DALARNA 2002). It is the Regional Development Council of Dalarna, which was established by the

Dalarna County Council and all 15 municipalities in the county. The mentioned organisations fund the Development Council, but it is also supported by the central government and, on project level, by EU grants (REGION DALARNA 2009). Even though it was intended to concentrate all regional development activities in one organisation, the Development Council focuses only on the economic development of Dalarna, without considering any environment or sustainability issues.

Prior to Region Dalarna's foundation, the idea evolved to develop a program which monitors the overall development in Dalarna. The original aim was to create an observation tool for different areas of progress in the county. Fast signals of change would show how these areas develop and would then help the people, who are involved in the development of Dalarna, to plan and decide. The necessity of such a program was stated and discussed first by the former NaturResursCentrum Dalarna (NRC[1]) in 2000 (FÄRJE 2006). A workshop was organized to identify key factors and indicators of the program, as well as the budget which would be needed for this kind of work (E 1, see table 2 under 3.3.2). Because the intention was to cover a wide variety of topics with the program, people from different organisations participated in the workshop in 2002. That included organisations like Statistics Sweden, SEPA, Helsingborg municipality, Dalarna University and Sustainable Enterprise Solutions (NRC DALARNA 2002). A steering committee from Region Dalarna and the Dalarna Research Institute guided the development work of the monitoring program (FÄRJE 2006).

In 2004, the first version of the program, named *Dalamonitorn,* was presented. The indicators were divided in three thematic groups (*Creative*, *Adaptive*, and *Attractive Dalarna*), which were adopted from the above mentioned *Regional Program for Growth*. This enabled the use of *Dalamonitorn* for the follow-up of the Growth program, even though this contradicted the original aim of *Dalamonitorn* to give early warnings of the development in Dalarna (E 1). The Growth program should have reacted to the warnings given by *Dalamonitorn*, not the other way around.

Additionally to the three thematic groups, *Dalamonitorn's* indicators were divided in six horizontal goals (*Environment*, *Equality*, *Integration*, *Internationalization*, *Leadership*, *Collaboration*). The development over time was measured and the indicators were expressed as ratio. For the visualisation of the development between two years, the colours of traffic lights were used: Green symbolised a positive result, yellow little or no change (+/- 2%), and red a negative development.

1 NRC became a part of Teknik Dalarna in Borlänge in 2004.

The main point of criticism of the first versions from 2004 and 2005 was a lack of data. For many of the over 190 indicators, only old or no data was available (MÖLLER 2005). And it also turned out that the data needed was quite unconventional and therefore too much time and money were necessary for the data collection. The revised version of 2006 took this criticism into account and the indicators were then based on official statistics, which were accessible at no or low costs (E 1). Additionally, the number of indicators was reduced to 34, which contributed to a more lucid structure. Financed partly by the Swedish Agency for Economic and Regional Growth, the 2006 version was presented on its own web-page in order to further enhance accessibility. Whenever it was possible, the data was presented separately for every municipality in Dalarna (FÄRJE 2006). The traffic light system was maintained, as well as the three thematic groups and the horizontal goal *Equality*. Another horizontal goal about *Social Sustainability* was added.

Another drawback of the changes was the classification of *fast* and *slow* data. This referred to how promptly data could be made available. *Fast* data was available quickly and *slow* data only after about two years. Thus, the program considered data from different years which contradicted the aim to detect changes year-on-year. Therefore, the program monitored the actual situation in Dalarna rather than the development over time as it was originally intended (personal conversation P. Möller, May 2008). This classification can also be seen as a relict of the original idea of a fast reacting monitoring system.

The further development of the program has stagnated since 2006. The data presented on *Dalamonitorn's* web-page has not been updated since then (REGION DALARNA 2009a), even though Region Dalarna decided in 2006 to finance *Dalamonitorn* for the next four years with up to 200,000 SEK per year (FÄRJE 2006). A review of the program was done, as scheduled, in 2008. It was decided to terminate work on the program (E 1). Some of the statistics used for *Dalamonitorn* are now presented under another category on Region Dalarna's web-page (REGION DALARNA 2009b).

3 Methods

The methods used are described and explained in this chapter. It is also discussed, whether a case study is the appropriate method for analysing sustainable development and indicators as measurement of it.

3.1 Case study method

The choice of case study municipalities will be explained after the elaboration of case study as *research* method.

3.1.1 Criticism of case study method

The use of the case study method for *research* is viewed with scepticism and sometimes considered a "label for bad research" (SCHOLZ & TIETJE 2002, p. 4). In contrast to this, the use of case studies in *teaching* is well-established and respected. First efforts in *teaching,* using case studies, date back to the beginning of the 20th century (TELLIS 1997). The method's purpose in *teaching* is to establish a framework for discussion and debate among students. Thus, to present empirical data and events in an exact manner is not the main objective of *teaching* case studies . But case studies used for *research* purposes need to present a complete and accurate rendition of their sources and evidence (YIN 2003).

This aspect concerning scientific validity of case studies in *research* is covered only to a small extent by the literature. The fact that there are no clear and generally accepted standards for research case studies can and did result in a lack of rigour of such studies. Methodical inaccuracy has been a major concern regarding the use of case studies as a method of research. Therefore, exact definitions, for example of the purpose and unit of analysis of a case study, are needed. The same is true for key terms used in a study. They should not be idiosyncratic, but rather similar to previously used terms and units. This allows comparison between different studies and highlights the importance of literature review for conducting case studies (YIN 2003).

Another frequently encountered concern about case studies is that this approach does not offer a basis for generalisation (FLYVBJERG 2006; TELLIS 1997; YIN 2003). YIN (2003) replies to this concern, that "case studies, like experiments, are generalizable to theoretical propositions" (ibid, p.10). Scientists conducting experiments act analogously by generalising their findings to theory rather than to other experiments, conducted under altered circumstances (ibid).

Furthermore, FLYVBJERG (2006) corrects this concern, or misunderstanding as he calls it, as follows:

> *"One can often generalize on the basis of a single case, and the case study may be central to scientific development via generalization as supplement or alternative to other methods. But formal generalization is overvalued as a source of scientific development, whereas "the force of example" is underestimated*."(p.228)

In order to further enhance generalisation and reliability of case study findings, multiple cases can be examined instead of a single case. The logic behind the approach of multiple cases should be replication rather than sampling logic. More direct replications can result in more robust findings and thus provide stronger support for a theory (YIN 1993). The aforementioned points indicate the various options the design of case studies offers. Such studies can, for example, also be either holistic or embedded; exploratory, descriptive or explanatory and can use quantitative or qualitative data (SCHOLZ & TIETJE 2002).

A unique strength of this method is the ability to deal with a full variety of sources of evidence, like documents, artefacts, interviews or observations (YIN 2003). Thus, a case study is an appropriate method for analysing a contemporary phenomenon within its real-life context. This is especially true for research fields dealing with sustainability, for which an understanding of the cause-and-effect relationships between natural and social systems is important (SCHOLZ & TIETJE 2002). So, the case study method is suitable for this thesis, despite the limitations this method can encompass.

3.1.2 Choice of case study municipalities

The selection of municipalities as unit of analysis has already been mentioned before. In order to make the findings comparable to ZENNER's (2007) approach, the focus on rural areas is maintained. Thus, potential case study municipalities had to be located in rural areas and, at least to a certain extent, in peripheral areas. Rural areas are characterised by a wide variety of factors. The choice of case study municipalities was based mainly on their population density, as an objective criterion. It had to be approximately 9 inhabitants per km², which corresponds to the average Scottish population density (ZENNER 2007). The population density of Dalarna (9.8 pop/km²) is similar to Scotland, which implies a quite similar structure of these two regions. The two adjacent municipalities Vansbro (4.5 pop/km²) and Gagnef (13.1 pop/km²) fulfil the population density criterion, and the other aforementioned criteria, best.

The fact that two neighbouring municipalities fulfil the conditions made it possible to maintain ZENNER's approach regarding this aspect. One of her aims was to find out if two adjacent communities are distinguishable through the use of indicators. A direct comparison of municipalities can help to test if the indicator set is suitable to detect differences on this small level, and also if it is worth to conduct examinations at such a small scale.

After verifying that all criteria of scientific relevance were fulfilled, an additional practical factor was considered. The case study municipalities had to be accessible with reasonable effort from Borlänge. Both municipalities also met this pragmatic condition and were therefore chosen as case studies.

3.2 Choice of indicators

The choice of indicators was influenced by the consideration of different and, partly, contradicting aspects. Those factors reached from theoretical requirements, over other existing indicator sets, to pragmatic deliberations.

Main functions of indicators, in general, are to measure, summarise and communicate complex topics. Therefore, indicators are commonly used to conduct follow-ups of sustainability strategies and sustainable development. They can provide guidance for policy-making processes and increase understanding regarding sustainability (HAMETNER & STEURER 2007; MINEUR 2007).

A self-evident selection criterion was, that the indicators need to be informative and relevant in terms of sustainable development. The selection of factors indicating sustainable development in a rural municipality was guided by the underlying sustainability definition of the thesis. The definition also allowed the identification of four strands (*Environment*, *Economy*, *Society*, and *Social Equity*) relevant for sustainable development. The assignment of indicators to strands is commonly used in different indicator sets, but this categorisation does not imply that the indicators are relevant only for *their* strand. This organisation of indicators rather “represents a 'best-fit' to guide the selection of indicators” (UNITED NATIONS 2001, p. 23). It helps to select an equal amount of indicators for every aspect of sustainability. A reasonable balance between the strands is desired to clearly illustrate their equality.

Therefore, ZENNER's (2007) system of five indicators, some with sub-indicators, for each of the four strands is maintained. The resulting total number of 20 indicators meets a requirement, which is frequently requested for indicator sets: A limited number of indicators (BALTIC21 2000b, HAMETNER & STEURER 2007, NLÖ 2004). This aspect is important for indicators in order to truly summarise complex topics.

A long list of indicators could reinforce the impression of sustainability being a too complex and therefore not comprehensible theme. This would contradict a main function of indicators to clarify and simplify information (MINEUR 2007), and would thus be counter-productive.

The selected sound indicators, should also fulfil general requirements, such as:

- validity – be robust and statistically validated
- comparability – enable comparisons in time and space
- availability and timeliness – be based on available data, ideally on time-series
- responsiveness – respond quickly and noticeably to changes
- representativeness – capture the essence of its topic
- stability and reliability – compilation of data is done with systematic and reliable methods

(own compilation after BESLEME *et al.* 1999; LEDOUX *et al.* 2005, NLÖ 2004)

Because ZENNER's (2007) thesis is the base for this study, the indicators presented there were maintained wherever it was reasonable and possible[2]. Additionally, other existing indicator sets (see table 1) served as source of inspiration and to identify parameters which are recognised as being important for sustainable development. These other sets were not only developed for the local level, but also for national as well as international levels, depending on the responsible organisation.

Table 1: Compilation of indicator systems

Organisation	Title	Source
United Nations, Commission on Sustainable Development	Indicators for Sustainable Development	UNITED NATIONS 2001
OECD	Factbook 2008: Economic, Environmental and Social Statistics	OECD 2008
Statistics Sweden	Sustainable Development Indicators for Sweden – first set 2001	STATISTICS SWEDEN 2001
Ministry of Sustainable Development – Sweden	Strategic Challenges – A Further Elaboration of the Swedish Strategy for Sustainable Development	GOVCOM 2005
Swedish Environmental Protection Agency	The Swedish Environmental Quality Objectives	SEPA 2008, ENVIRONMENTAL OBJECTIVES SECRETARIAT 2009
County Administrative Board Dalarna	Environmental Objectives of Dalarna [Rapporten Dalarnas miljömål]	CAB DALARNA 2004
Region Dalarna	Dalamonitorn	DALAMONITORN 2008

2 For a comparison of the two indicator sets see appendix 1

Table 1: continued

Organisation	Title	Source
Swedish Council for Local Government Analysis	Local Government Database (LGDB) [Kommundatabas]	RKA 2009
Swedish National Institute of Public Health	Public Health Policy Report (includes 11 objective domains and 38 principle indicators) [Sveriges elva folkhälsomål - Kommunala basfakta för folkhälsoplanering (KBF)]	SWEDISH NATIONAL INSTITUTE OF PUBLIC HEALTH 2008
German Federal Office for Building and Regional Planing	Indicators for Sustainable Regional Development [Indikatoren für eine nachaltige Raumentwicklung]	BLACH & IRMEN 1999
Agenda transfer	Conjointly Suggested Indicators for Sustainability in Municipalities [Gemeinsam empfohlende Indikatoren für kommunale Nachhaltigkeit]	NLÖ 2004, AGENDA TRANSFER 2003

Practical considerations were also taken into account for the choice of indicators. The use of official statistics as primary data source was decided before the selection and application of indicators. Therefore, data availability was a crucial prerequisite for the choice of indicators. This pragmatic approach is frequently found in studies about sustainable development indicators using official statistics as primary data source (BALTIC21 2000a; LEDOUX *et al.* 2005; MINEUR 2007; STATISTICS SWEDEN 2001). Because of this, LEDOUX *et al.* (2005) split up the indicators into *best-available* and *best-needed* categories. Data of sufficient quality was accessible for the *best-available* indicators. In contrast to that, the *best-needed* indicators were either characterised by a complete lack of data, or the data quality was unknown and did not allow publication (ibid, p. 393/394). A similar approach had to be used in this study for the indicators Biodiversity and Use of Fertiliser (see 4.2.1). Both indicators will be discussed, even though an application was not possible due to a lack of data. The use of such proxies is necessary to at least address all relevant key areas of an issue. It also helps organisations, which compile statistics, to identify areas for which statistics are still needed. A proceeding development of new statistics could therefore influence the development of indicator sets. Especially because indicator sets need to be open for revision (BALTIC21 2000b; STATISTICS SWEDEN 2001) in order to react, for example, to strategy changes or already achieved goals.

Therefore, the indicator set presented here should be seen as the second draft for widely applicable indicators for sustainable development of rural municipalities. Further revisions are needed to enhance and test the quality of these indicators.

3.3 Data acquisition

3.3.1 Official statistics

Official statistics served as primary data source. Two aspects justify the use of this method for the development of indicators for sustainable development. First, comparisons between different regions are made easier and more reliable, because official statistics rely on the same definitions. This is at least true for the regions of one country. Clear and internationally accepted definitions of units and measurements exist mainly for economic issues, like *Gross Domestic Product* or employment. The development of more comparable statistics, at least for members of the European Union, is the task of Eurostat. More initiatives like this are needed to allow comparison on a broad level.

Second, official statistics contribute essentially to an easy use and application of the indicators. Good accessibility of relevant and reliable data reduce the effort needed to apply and use indicators. This requires that official organisations compile data and make them accessible.

The term *official statistics* is interpreted for this study as statistics provided by public agencies. It is assumed that these agencies produce accurate and reliable statistics, which are important features of data chosen to serve as base for indicators. Another important aspect is, that statistics provided by public agencies are most likely to be easily available at no cost or for a low fee. Furthermore, the use of already existing statistics helps to avoid "multiple reporting and double work of compiling and assessing data" (BALTIC21 2000b, p. 9).

Despite all the advantages, the use of this method has, like many other methods, also some drawbacks. To rely on statistics compiled by others, obviously creates a dependency. Relevant data might be unavailable or does not cover different groups or areas of interest. The lack of data might arise from three facts. First, a certain behaviour or aspect is regarded to be immeasurable. Second, the measurement of certain issues is not of interest to the organisation carrying out the measurements. And third, the interest to measure something is given, but it would need too much time and effort to assemble the data.

Another drawback is the time delay between data delivery and publication. The newest available data might therefore be two or three years old before it is published. So, it might be impossible to analyse contemporary events based on official statistics. But, the method offers more advantages than disadvantages regarding the compilation of indicators for sustainable development. Official statistics

already served as data source for several existing indicator sets (BALTIC21 2000a; AGENDA TRANSFER 2003; ECOLOG INSTITUT 2008).

To cover the many different aspects of sustainability indicators, official statistics were needed from a variety of Swedish public agencies. The majority of the statistics used here are also classified as *Official Statistics of Sweden*. This label characterises statistics produced according to the *Swedish Statistical Act and Ordinance* and published as required by official regulations. This means that they are objective, available to the public free of charge, and the statistics and their descriptions should be updated every year (STATISTICS SWEDEN 2006). Statistics Sweden is responsible for many of the *Official Statistics of Sweden* and many of the statistics used in this study were derived from there. Other data sources were, for example, the Swedish Forest Agency, Swedish Social Insurance Agency and Swedish Election Authority. All statistics used were available free of charge and easily accessible, mainly over the Internet. The good accessibility of official statistics in Sweden is based on the *Principle of Public Access to Official Records*. This means, that Swedish public agencies have to grant access to their records, which happens more and more over the Internet. This principle is unique for Sweden (ARL 2001).

It was attempted to use only figures for the year 2007, but due to the time delay described above, older figures had to be used for some indicators. To analyse and assess the development over time, figures from about 20 to 30 years ago were needed for some indicators. These comparisons often have to be treated with care, because of methodical changes which occurred over time. Whenever this applies to statistics used, it is noted at the results of the indicators.

Figures from official statistics were used for own processing of data for the indicator Quality of Public Transport. The analysis was done with ArcView 3.2 by ESRI (Environmental Systems Research Institute).

3.3.2 Interviews

Interviews can be used as primary or additional source for a case study. YIN (2003) even states that interviews are an essential source of case study information. But he also suggests to corroborate interview data with information from other sources. This helps to minimise common problems associated with interview data. Information given by interviewees might be subject to bias, poor recall, and poor or inaccurate articulation. These possible drawbacks have to be kept in mind, when analysing interview data.

Eight semi-structured interviews were conducted between May and October 2008. Employing this rather informal method leaves room for spontaneous ideas and thoughts during an interview. Additionally, interviewees might feel more encouraged to ask questions and give their opinion (HAY 2005; MINEUR 2007; YIN 2003). The latter was explicitly asked for, regarding the list of indicators, which was given to the interviewees. A rough guideline for the interviews were the following questions:

- Do you think it is appropriate to use 20 indicators to measure sustainable development in a municipality?
- Would you choose more or less indicators?
- Are these 20 indicators (on the list) appropriate to measure sustainable development?
- Would you choose different indicators? Which ones?

Additionally, qualitative information about the case study municipalities and other indicator systems in Dalarna (*Environmental Objectives* of Dalarna, *Dalamonitorn*) were obtained. Some interviewees also provided quantitative data for certain indicators.

For the selection of interviewees, two methods were used. First, key actors were identified based on their position or experience with indicators of sustainable development. Second, already existing contacts gave information and recommendations which helped to identify further contact persons. This method is known as *snowballing method* or *chain sampling* (CLIFFORD & VALENTINE 2006; HAY 2005).

Table 2: List of interviewees

Place of work	Date and place of interview	Citation code
Vansbro municipality	1 October 2008, Vansbro	E 4
County Administrative Board Dalarna	2 June 2008, Falun	E 6
Region Dalarna	20 May 2008, Falun	E 1
Gagnef municipality	15 August 2008, Gagnef	E 3
Borlänge municipality	16 May 2008, Borlänge	E 7
County Administrative Board Dalarna	18 June 2008, Falun	E 5
DalaVattenAvfall	12 September 2008, Leksand	E 8
Gagnef municipality	15 August 2008, Gagnef	E 2

Note: All interviewees gave their permission to state place of work for this study.

The interviews were conducted in English, except one, which was carried out in German. The duration of the interviews was on average about one hour and notes were taken. Some interviewees were contacted again after the interview to gather additional information and data.

4 Results

This chapter introduces the case study municipalities and the county of Dalarna. Subsequently, the indicators are described and their results are presented. An overview of all indicators and their results in table form and in a graph, completes the chapter.

4.1 Case studies

Two case study municipalities were chosen to apply and test the indicators developed in this study. Both municipalities, Gagnef and Vansbro, are located in the south-western part of Dalarna county, Sweden. Dalarna itself is located in middle Sweden and borders Norway in the west (see fig.1). The chapter first introduces the county of Dalarna and then the municipalities of Gagnef and Vansbro. The description of Dalarna provides information on the development and situation of the region both case studies are located in.

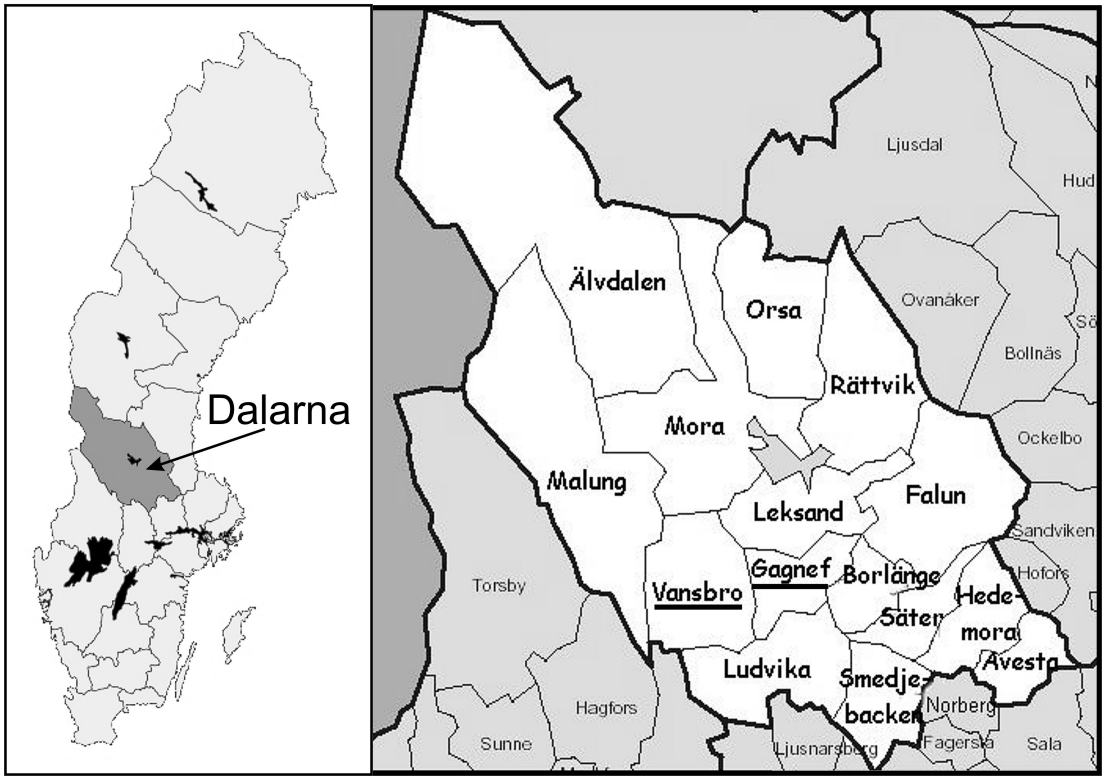

Fig. 1: Map of Sweden and Dalarna

4.1.1 Dalarna

The word *Dalarna* means *valleys* and refers to the varied landscape, which the region is known for. The lowest point, 55 m above sea level, is located in south-eastern Dalarna where the Dalälven, Dala River, leaves the county. The elevation increases steadily towards the alpine regions in northern Dalarna. The highest point is at Storvätteshågna with 1,204 m above sea level (CAB DALARNA 2006).

The gradual transition of foothills to alpine regions creates various natural geographic regions. The landscape is dominated by forest land, lakes and rivers of various sizes. About 67% of the county are covered by forest, mainly by different types of coniferous woodland. Deciduous trees grow on the banks of the Dalälven and other rivers. Mires cover 14% of the land area of Dalarna (SKOGSSTYRELSEN 2007).

About 8% is protected as nature reserves or national parks. Three national parks are located in Dalarna: Färnebofjärden national park (Avesta municipality), Töfsingdalens national park and Fulufjällets national park (both Älvdalen municipality). The largest lake of Dalarna is lake Siljan with a size of 280 km² (CAB DALARNA 2006).

The term *Dalarna* can refer to the province or landscape Dalarna and to the county of Dalarna[3]. Swedish provinces are historical and cultural entities and serve no administrative or political purpose. The latter is the function of Swedish counties, which are further divided into municipalities. Dalarna county covers almost the same area as the province of Dalarna, except for Orsa Finnmark in the north-east, which is part of Ljusdal municipality, Gävleborg county (CAB DALARNA 2006).

In this study, the term *Dalarna* refers to the county of Dalarna, if not stated otherwise.

Dalarna county covers about 28,000 km², which is equal to 6.8% of the territory of Sweden (STATISTICS SWEDEN 2008a). Dalarna is divided into 15 municipalities and Falun is the capital and seat of the local government. It is also the biggest city of Dalarna with regard to the number of inhabitants (ca 55,000). Thus, Falun falls into the SALAR class of *Large Cities*[4]. SALAR's classification system consists of nine categories, based on structural parameters such as population, commuting patterns and economic structure.

3 The county changed its name in January 1997 by an act of Parliament. It was previously known as Kopparberg County (Source: CAB DALARNA 2006).
4 Large Cities: Municipalities with 50,000-200,000 inhabitants and more than 70% of urban area.

The other 14 municipalities are classified as:

- Commuter Municipalities[5]: Gagnef, Säter
- Sparsely Populated Municipalities[6]: Malung, Orsa, Rättvik, Vansbro, Älvdalen
- Other Municipalities, more than 25,000 inhabitants[7]: Borlänge, Ludvika
- Other Municipalities, 12,500-25,000 inhabitants[8]: Avesta, Hedemora, Leksand, Mora
- Other Municipalities, less than 12,500 inhabitants[9]: Smedjebacken

Dalarna had about 257,000 inhabitants in 2008 (STATISTICS SWEDEN 2008b), which corresponds to about 3% of the Swedish population. Most of the people live in South Dalarna and around Lake Siljan, which is reflected by the SALAR classification. Figures about the population density of the single municipalities illustrate the uneven population distribution more clearly (see table 3).

Table 3: Population density, municipalities of Dalarna listed in descending order

Municipality	Population density (population / km²)
Borlänge	80
Avesta	36
Falun	27
Säter	19
Hedemora	18
Ludvika	17
Leksand	13
Gagnef	13
Smedjebacken	11
Mora	7
Rättvik	6
Vansbro	5
Orsa	4
Malung	3
Älvdalen	1

Source: CAB DALARNA 2006

5 Commuter Municipalities: Municipalities in which more than 40% of the night-time population commute to work in another municipality.
6 Sparsely Populated Municipalities: Municipalities with less than 7 inhabitants per km^2 and less than 20,000 inhabitants.
7 Other Municipalities, more than 25,000 inhabitants: Municipalities that do not belong to any of the previous categories and have a population of more than 25,000.
8 Other Municipalities, 12,500-25,000 inhabitants: Municipalities that do not belong to any of the previous categories and have a population of 12,500-25,000.
9 Other Municipalities, less than 12,500 inhabitants: Municipalities that do not belong to any of the previous categories and have a population of less than 12,500 (SKL 2005).

Geology, Climate, Wildlife

The geological development of Dalarna was influenced by glacial as well as volcanic processes. This resulted in a bedrock composed of different rocks, for example gneiss, Dala-sandstone and porphyry. The south-eastern part of Dalarna is composed of gneiss, granite and other detrital of magmatic and metamorphic rocks. A mixture of Dala-graniter, porphyry and Dala-sandstone can be found in the rest of Dalarna, except for the Siljan-ring. The latter is composed of sedimentary rocks from the Silurian and Cambrian (SIND 1983). The ring-like structure of this formation and lake Siljan were created by a meteorite impact about 360 million years ago (VENZKE 2003).

The overall climate in Sweden is influenced by the Scandinavian Mountains. Gulf stream and western winds determine the mild climate in South Sweden. Further up north, the Scandinavian Mountains act as a barrier for the oceanic influence. This results in a more continental climate in the northern parts of Sweden (HÄRTLING 1988). Thus, Dalarna falls into the north cool temperate zone. The temperature during the winter months is on average below minus 3°C and can be as low as minus 20°C (LÄNSSTYRELSEN DALARNA 2009). The summer months are rather warm with temperatures up to 30°C. The temperature can be up to 10°C lower in the mountainous north-west compared to the south-eastern part of the county (CAB DALARNA 2006), reflecting the different heights above sea level. The same applies to the length of the vegetation period[10], which is shorter in the north-west than the south-east of the county. The annual rainfall varies between 600-800 mm in the eastern parts and 700-1,000 mm in the western parts of Dalarna (LÄNSSTYRELSEN DALARNA 2009).

Dalarna is located just above 60° of latitude. This location results in a great difference of day length between summer and winter. The summer months are characterised by long hours of daylight, with the maximum around midsummer when during night time only a slight gloaming takes place. The winter months on the other hand are characterised by very short hours of daylight.

The varied landscape of Dalarna is accompanied by a rich wildlife, ranging from various insects, fish and birds to large predators. The county is home to the four native Swedish predators Brown bear[11], Wolf, Wolverine and Lynx. The vast forests are also home of Elks as well as birds like the Eurasian three-toed wood pecker and Goshawk. Other birds occurring in Dalarna are, for example, the Peregrine falcon, Common snipe and Crane. Some of these are protected under the Habitat Directive

10 Time when the average temperature is above 5°C.
11 Note: for scientific species name see appendix 2

from the European Union (NATURVÅRDSVERKET 2008). Wildlife in and around the rivers and lakes is equally rich. They are home to, for example, the European otter and Beaver and various fish like Pike, Trout, Grayling and Zander (LÄNSSTYRELSEN DALARNA 2009).

Historical and socio-economic development

Several times, Dalarna played an important role in the history of Sweden. The Dales were known for their patriotism, courage and urge for freedom. The majority of them were farmers, but they were willing to fight for their rights (MEYERS 1908). Thus, two historical rebellions were basically started there. In 1434, the miners started a rebellion, led by Engelbrekt Engelbrektsson, against the oppression and heavy taxation of Eric of Pomerania, king of the Kalmar Union. The rebellion spread all over Sweden and eventually forced the king to resign. The second, more important revolt, was caused by the mass execution in Stockholm in 1520, known as the *Stockholm Massacre*. The Danish king Christian II ordered the execution to suppress the ongoing rebellion against the Danish regency over Sweden. From Dalarna, Gustav Vasa organised the successful resistance against the Danes. Eventually, this forced Christian II to resign as king of Sweden and ended the Kalmar Union. In 1523 Gustav Vasa was elected king of Sweden and the country's power started to increase (HÄRTLING 1988).

Besides the political influence, Dalarna also influenced the economic development of Sweden. The copper mine in Falun was of great importance in the past. About two third of the worldwide copper production were generated there in the 17th century. In the second half of that century, iron and copper accounted for 80% of the Swedish exports. During that time, the mine was at its zenith and Falun was with 6,000 inhabitants the second largest city in Sweden. The mine was mentioned for the first time in 1288, but mining in Falun presumably started already in the early Middle Ages, making it the oldest Swedish copper mine. In 1992 the mine was eventually closed down. The well preserved facilities, including the large open pit, were added to the list of World Heritage Sites in 2001 (GLÄSSER *et al.* 2003).

Closely connected to the mine in Falun is the red paint, used all over Sweden to paint houses. Falu red is produced from ruddle, the red ochre from the mine. Production on an industrial scale started in 1764 and is still going on today, despite the closing down of the mine. Sweden is known for it's red houses with their white corners, thus the red paint has become a national symbol.

Another icon associated with Sweden, rather than only with Dalarna, is the Dala Horse. This brightly painted hand carved wooden horse was originally a toy,

sometimes also sold to supplement the household money. Over the years it has become a popular tourist souvenir all over Sweden. Today, the Dala Horses are manufactured only at Nusnäs, a village located in the municipality of Mora (LÄNSSTYRELSEN DALARNA 2009). Thus, two well-known Swedish symbols have their origin in Dalarna. Because of this and the county's historic significance some people call Dalarna the 'heart of Sweden'.

Recent development

The county's prosperity and wealth lasted until the beginning of the 20th century, which is reflected by population figures. The number of inhabitants doubled between 1805 (ca 124,000 inhabitants) and 1915 (ca 242,000 inhabitants). But during the next decades the increase slowed down distinctly, with a population growth of only about 33,000 inhabitants from 1915 to 2008 (ca 275,000 inhabitants). During the 1940s and 1970s the population even slightly declined (STATISTICS SWEDEN 2008c). The most recent positive radical change during the 90s was a result of a combination of the baby boom, the employment peak of 1990 and the large inward migration of refugees. Since then, a slight decrease of the population has taken place.

Dalarna benefited from regional policy measures taken by the Swedish government in the early 70s. Stockholm county had been the target location of emigrants from Dalarna, as well as of most other counties, for a long time. This might be partly due to the concentration of many administrative and technical authorities in Stockholm. The government decided to relocate some of these authorities to other cities, in order to stop the great inward flow to the Stockholm region. At the same time, this was supposed to improve the employment situation in less developed parts of the country (HÄRTLING 1988). Therefore, the Swedish National Rail Administration and the National Road Administration were relocated to Borlänge in Dalarna county (ARL 2001). Another positive impulse for the development of Dalarna was the foundation of Dalarna University in 1977. It expanded quickly and had already about 10,000 students in 2006 (CAB DALARNA 2006).

Nowadays, tourism is a quite prosperous industry in Dalarna. The varied landscape offers different possibilities for summer and winter activities, like hiking, skiing or canoeing. Especially the skiing industry is well-developed. The biggest skiing centre of Sweden is located in Sälen, in the north-western part of Dalarna (GLÄSSER *et al.* 2003). Additionally, the county is also known for its extensive and traditional midsummer celebrations. Overall, Dalarna is well-known in Sweden and has one of the strongest regional brands in the country (REGION DALARNA 2006a).

4.1.2 Gagnef[12]

The municipality of Gagnef, as it exists today, was founded by a merger of Gagnef and Floda municipalities in 1971. It contains the three parishes of Floda, Mockfjärd and Gagnef. Settlements are widely spread along the rivers Österdalälven and Västerdalälven, which merge together in Djurås into the Dalälven (GAGNEFS KOMMUN 2007). The biggest settlements, classified as *Urban Locality*[13] by Statistics Sweden, are Björbo, Bäsna, Djurås, Floda, Djurmo, Gagnef, Mockfjärd and Sifferbo. Out of these eight, Mockfjärd had with 1,935 the most inhabitants in 2005. In 2008, Gagnef municipality had 10,107 inhabitants[14], which accounted for 3.7% of the population of Dalarna (STATISTICS SWEDEN 2008b).

The municipality lacks a natural centre due to the widespread settlement. Main seat of the municipal administration is Djurås, but the other urban localities still have their own little centres (OTTOSSON 2006). Gagnef municipality covers an area of about 772 km².

Landscape

The landscape of Gagnef is characterised by rivers and moraines, the latter consist of detritus. The two large rivers Österdalälven and Västerdalälven dominate the scenery and their merger is even eternalised in the coat of arms of Gagnef. Over the centuries the rivers carved into the soft substrate creating ravines. These are partly inaccessible deciduous woodland, creating a green belt along the rivers (GAGNEFS KOMMUN 2007). Fertile soil is located on both sides of the rivers . These fertile belts extend up till the edge of the forest and can be up to three kilometres wide. The arable land is quite hilly and replaced by grassland at sites where the slope is too steep for farming or where swamps make the area inaccessible.

The first buildings were located close to the rivers, because of the fertile soil and access to water. Some of the old buildings were later on moved up to the edge of the forest in order not to waste fertile land for buildings. This measure also provided protection from the floods occurring each spring after the snow melting.

Historical development

The first proof of human activities in Gagnef dates from 875 AD (± 100 years). It is a coal sample from an iron production site in Dikmyran in Floda. The first written historical source about the area is from the 14th century. Back then, two parishes,

12 If not stated otherwise, information and figures in this chapter were derived from DALARNAS MUSEUM & GAGNEFS KOMMUN (n.d.). Use of the term Gagnef in this study always refers to the municipality of Gagnef. Gagnef parish is part of the municipality of Gagnef.

13 Urban Locality: In Swedish 'tatört', refers to any settlement with a population of at least 200 people and a maximal distance of 200 meters between their houses (ARL 2001, p. 141).

14 The population's age structure and recent development are described by the indicators C1. Population Structure and C2. Population Development respectively.

Gagnef and Nås, already existed. Floda belonged to Nås parish and its church was built in 1221. Gagnef parish already had about the same borders as today. People lived mainly from agriculture and livestock breeding as well as fishing, especially salmon.

In the 18th century, the population grew considerably, leading to a decline of the average standard of living. Farming land was extended to the summer pastures, because space around the villages was completely utilized. Another problem was the declining size of plots, due to the system of partible inheritance practised in Dalarna. This system was unique for the region, primogeniture was practised in the rest of Scandinavia (GLÄSSER et al. 2003). In 1804, the government decided to conduct a land consolidation in order to solve these problems. It was carried out in Floda in 1806 and 1811, and in Gagnef parish in 1812 and 1817. These early land reforms did not succeed due to the fact that land fragmentation continued in the traditional way. The effort to sort out the land fragmentation even continued until the 1990's (personal communication E. Westholm, June '09).

During the second half of the 19th century the traditional farming was at its peak. The farming villages and the summer pasture system reached their largest extent. The modern agriculture had its decisive breakthrough in Gagnef with the turn of the century. As a result, the population grew considerably. For example, Floda's population increased between 1825 (1,804 inhabitants) and 1900 (2,412 inhabitants) by about 30%. The huge population growth resulted in an increased pressure on food supply and many were forced to emigrate to America, e.g. in 1904, 200 persons from Gagnef parish emigrated.

Around 1900, railways were built which led to a great boost of the economic development. This was the beginning of industrialisation in the Gagnef area. Like the whole country, Gagnef was transformed quickly from a distinctive farming area into a modern industrialised region, accompanied by, for example, population movements and changed job opportunities.

Infrastructure

Railways and roads as well as settlements are concentrated along the rivers, crossing Gagnef in a north-south and east-west direction. The Borlänge-Mora-Railway connects Gagnef to the regional centre of Dalarna, Borlänge-Falun, as well as to the Lake Siljan area. The railway from Falun to Vansbro and Malung makes the regional centre accessible from the western part of Gagnef. It also grants access to western Dalarna and the skiing area in Sälen.

Bus connections complement the public transportation system. Train and bus connections to Borlänge-Falun and further to Stockholm are fairly well developed. But the bus-system within the municipality needs to be improved in order to facilitate travel within Gagnef. This is especially important for students, for example to reach sport facilities on their own (E 3).

Roads 70 and 71 are the most important routes in the municipality. Road 70 crosses the municipality in north-south direction and is thus used by numerous tourists visiting Siljan and its surrounding locations. Road 70 is, together with road 50, the route on which larger traffic flows throughout Dalarna are primarily concentrated on. Road 71 runs through the municipality in east-west direction and connects the regional centre with the skiing area in western Dalarna. Traffic flow on this road can sometimes be very heavy. On certain weekends and holidays during the winter tourist season, about 9,000 vehicles pass by on road 71 every day (CAB DALARNA 2006). Thus, the two roads 70 and 71 are well-developed. They make the 20 to 30 km distance from Gagnef municipality to Borlänge-Falun easily manageable on a daily basis.

Economy

The largest employer in Gagnef municipality was 3M (Hörnells) in 2005. The company belongs to the plastic industry sector and employed around 150 persons. Other large employers, each with about 100 employees, were either municipality employers or within the County Council's Health and Social Care Administration. These were the municipality's office (Kommunkontoret – public administration), Gagnefsgården (elderly care), Djurås school (education) and Gagnef vårdcentral (care). In the private sector NOTE Björbo AB/Åkerströms and Moelven Dalaträ AB are two other large employers (CAB DALARNA 2006).

Timber industry is a major business in Gagnef municipality, especially in Mockfjärd. In 1992, a factory for building houses closed down there. This had a great negative impact on the local economy, because 300 employees lost their jobs resulting in a high unemployment rate (GAGNEFS KOMMUN 2007). The economical structure changed since then from large factories to mainly small to medium size companies (E 2). Several businesses are now using the former house factory for production (GAGNEFS KOMMUN 2007), and also the unemployment rate decreased again (E 2). Several of the big Swedish manufacturers of doors, timber flooring as well as kitchen and bathroom furniture are located in Dala-Floda, Björbo and Gagnef (GAGNEFS KOMMUN 2007).

This concentration of companies building any kind of house equipment, mainly made out of wood, could become a critical factor. A decreasing demand for this kind of products would endanger the local economy (E 2). Another disadvantage for the economy of Gagnef is that many employees work outside the municipality and thus commute between work and place of living (GAGNEFS KOMMUN 2007) (see chapter 5.2.2, B4.b).

4.1.3 Vansbro[15]

Vansbro municipality was founded in 1971 through a merger of the former municipalities of Järna, Nås and Äppelbo. These are also the three parishes Vansbro municipality is divided into. The municipality is named after the town of Vansbro.

The municipality is situated around 100 km north-west of the regional centre Falun and Borlänge (CAB DALARNA 2006). The biggest settlements, classified as *Urban Locality* by Statistics Sweden are Järna, Nås, Vansbro town and Äppelbo. In 2005, the town of Vansbro, with 2,030 inhabitants, had the most residents out of these four. The municipality had a total of 6,916 inhabitants[16] in 2008, which accounts for 2.5% of the population of Dalarna. It is the smallest municipality in Dalarna with respect to population figures (STATISTICS SWEDEN 2008b).

Seat of the municipal administration is Vansbro town. It can also be regarded as the centre of the municipality. The total area of Vansbro municipality amounts to about 1,667 km².

Landscape

The municipality's landscape shows the characteristic features of the Norrland area, which Vansbro belongs to. These characteristics are striking hill formations with wide-spread forests, distinctive valleys and many small lakes and moorland. The elevation varies between 220 m above sea level in the eastern part and 550 m above sea level in the western part of the municipality.

During the Ice Age, the area was covered with an ice sheet more than 1 km thick. Rivers beneath the ice formed detritus ridges, which now provide raw material for the extraction of natural gravel and the cement industry. Most of the land along the rivers is easily cultivable sandy soil. Clay soil occurs very sparsely in Vansbro municipality. The dominating types of soil are different kinds of moraines.

15 If not stated otherwise, information and figures in this chapter were derived from SUNDSTRÖM (2005). Use of the term Vansbro in this study always refers to the municipality of Vansbro. The town of Vansbro is part of the municipality of Vansbro.

16 The population's age structure and recent development are described by the indicators C1. Population Structure and C2. Population Development respectively.

The Västerdalälven crosses Vansbro municipality in east-western direction. The town of Vansbro is located at its merger with Vanån. Due to this location the town experienced several severe floods. One of the worst occurred in 1916 (SANDBERG & LIND 1999).

Historical development

During the iron age, settlements in Vansbro started to develop as the production of iron in that area began. Järna was probably the parish with the largest production. The name 'Järna' is presumably connected to this, since 'järn' means iron in Swedish. Several of these production places were dated to 400 – 1050 AD. Besides iron production, the inhabitants also lived from hunting, fishing and fur trading. In the 15th century, the Vansbro area is mentioned in written sources for the first time. This is quite late, compared to parishes around lake Siljan and in south Dalarna.

In the 17th century, Nås was already a parochial centre in western Dalarna and the provost for that area lived there. The priest for the four villages Floda, Nås, Järna and Äppelbo lived in Nås too. The first school in the Vansbro area opened in Nås in 1687. This is no coincidence, because the church was responsible for education in that era.

The villages grew and in 1760 Järna and Nås each had 1,252 inhabitants. Äppelbo only had 747 residents in that year. Population decline occurred in the years with severe crop failures (1772-73). In Äppelbo about 14% of its 872 inhabitants died and in Järna even more dead (154) were registered in only the first seven months of 1773. Farmers started to carry out other works as well, in order to eke out their income. For example, they produced charcoal and conducted mining transports during winter time. At the time of the emigration wave to America the three villages in Vansbro lost a considerable number of inhabitants. Between 1850 and 1930 1,972 persons emigrated from Järna, 1,148 from Nås and 733 from Äppelbo.

The land consolidation from 1802 was carried out in Nås between 1803 and 1807. Between 1817 and 1825 it was Järna's turn. From 1816 to 1823 it was conducted in Äppelbo. But this first land consolidation was insufficient. Therefore, another one was launched in 1845 and conducted in Äppelbo between 1852-59. In the course of this, even the buildings changed their appearance. Many farmsteads were moved away from rivers, up to the edge of the forest, resulting in a more widely spread settlement structure.

During the 1890s, industrialisation in Sweden started and railways were built. In the wake of this, a new kind of community developed: the railway town, of which the town of Vansbro is a good example. Its location at the merger of Vanån and

Västerdalälven had good premises to operate profitable saw mills. Raw material was easily accessible, two rivers provided energy and plenty of space was available there, due to no previous settlements at that site. The railway transported wood products further south. The railway station in Vansbro town was built in 1899 and is protected as a national monument today. Also, the whole station precinct and the area around Järnvägsgatan, the main street, enjoy special heritage status in Sweden. They are exceptionally well-preserved contemporary 19th century houses and facilities. Vansbro town is still a big railway intersection today (see below) (SANDBERG & LIND 1999).

Infrastructure

The town of Vansbro is a big railway intersection. The Mora-Vänern-Railway (Inlandsbanan), Stockholm-Västerås-Bergslagsbanan and Södra-Dalarnas-Railway meet there (SANDBERG & LIND 1999). Construction of the Mora-Vänern-Railway up to Vansbro town was finished in 1890. One year later, it was extended to Mora. This part of the tracks was only operated until 1969, when the connection between Mora and Lesjöfors was closed down. Today, the Inland Railway Line (Inlandsbanan) still connects Vansbro and Mora and is trafficked by road buses between these two stations (INLANDSBANAN AB 2009). The Inland Railway Line is a beautiful railway, mainly used by tourists, which runs 1,300 km from Kristinehamm along the northern shore of lake Vänern via Östersund to Gällivare (GLÄSSER *et al.* 2003). Additionally, tourists pass through Vansbro on road 71 to Sälen, which crosses the municipality in east-west direction parallel to the railway from Borlänge to Malung.

Economy

In 2005, the largest employer in Vansbro municipality was Procordia Food. The company belongs to the food industry sector and employed around 150 persons. Other large employers were either municipality employers or part of the County Council's Health and Social Care Administration. These were Bäckaskogs sjukhem (care), Bäckaskogs vårdcentral (care) and Söderåsen (elderly care) (CAB DALARNA 2006). Within the private sector, Rågsvedens Säg (wood industry), Waltech AB and Westling Industri AB (both steel industry), and Sepson AB (manufacturing) are other large employers (VANSBRO KOMMUN 2008).

4.2 Indicators

The chapter introduces the indicators developed in this study. The 20 selected indicators are listed in table 4. A description of each indicator and its assessment scale is presented. Results of each indicator are also given in this chapter. An assessment scale was developed for each indicator. If an indicator is divided in sub-indicators, they are assessed separately. The average of these separate results forms the indicator's total score. The assessment scales reach from 0 to 5 points. Five points were defined to be the best and zero the worst result. For most scales a reference value was used for dividing them reasonably. This reference value is often the average of all municipalities in Dalarna.

Table 4: Set of indicators, divided into the four strands of sustainability

	Strands			
Indicators	A. Environment	B. Economy	C. Society	D. Social Equity
	1.Population Density	1.Employment 1.a Unemployment 1.b Economic Diversity	1.Population Structure	1.Gender Equality 1.a Leading Positions 1.b Income Differences between Genders
	2.Land Use	2.Level of Education	2.Population Development	2.Quality of Life
	3.Nature Protection 3.a Biodiversity 3.b Nature Protection Areas	3.Cost of Living	3.Health 3.a Sick-Leave Rate 3.b Life Expectancy	3.Access to Facilities
	4.Environmental Awareness 4.a Use of Fertiliser 4.b Resource Saving Measures 4.c Waste Separation	4.Economic Vitality 4.a New Businesses vs. Bankruptcies 4.b Commuting Habits	4.Culture 4.a Municipal Expenditures 4.b Cultural Events	4.Quality of Public Transport
	5.Energy- and Water-Consumption 5.a Energy Consumption 5.b Water Consumption	5.Mobility 5.a Car Ownership 5.b Internet Access	5.Incidence of Crime	5.Voter Turnout

4.2.1 Environment

The Environment strand (A) consists of the five indicators 1. Population Density, 2. Land Use, 3. Nature Protection, 4. Environmental Awareness and 5. Energy- and Water-Consumption.

A 1. Population Density

Population density is a widely used and established figure to describe the relationship between population and area. Calculation of this figure is simple and necessary data is easily available (KULS 1993). Thus, population density is a basic component of, for example, country profiles (OECD 2008) as well as description of a region (CAB DALARNA 2006). It allows estimations about the degree of urbanization and fragmentation, despite the limitations of average figures like this.

The indicator Population Density is measured as total number of inhabitants per km². The area of a municipality is taken as reference area. The choice of administrative borders to define the reference area is viewed with some scepticism and will be discussed in chapter 5.2.1. The average population density of Dalarna serves as reference value, equal to 2.5 points. Upper and lower end of the assessment scale is set by subtracting and adding the average to itself.

Table 5: Population density, figures for 2007

points	0 (worst)	0.1 – 2.4	2.5	2.6 – 4.9	5 (best)
Population density	20 + pop/km²	10 – 19 pop/km²	9.8 pop/km²	1 – 8 pop/km²	0 pop/km²
results		Gagnef: 13.1 pop/km² → 1.8 points		Vansbro: 4.5 pop/km² → 3.9 points	

Source: STATISTICS SWEDEN 2008d
Note: For figures of all municipalities in Dalarna, see 4.1.1

Both case study municipalities have a rather low population density compared to the Swedish average density of 17.3 pop/km² (STATISTICS SWEDEN 2008d). But Gagnef has with 13.1 pop/km² a higher population density than the average density of Dalarna of 9.8 pop/km². Vansbro on the other hand has a lower population density (4.5 pop/km²) than the average of Dalarna. This discrepancy between both municipalities results in quite different scores (see table 5).

A 2. Land Use

The types of land use differ between regions in their extent and characteristics. Specific utilisation types form the landscape and they also influence a region's image quite often. Especially traditional cultivation methods like crofting (Scotland) or summer pastures (Alps, Dalarna) influenced people's lifestyle and the region's products to a great extent. Additionally, these methods often resulted in a higher

biodiversity and more structured landscape. Both aspects are thus effected by changes of land use, partly in a positive but more often in a negative way.

But the term *land* includes the physical space and the surface, as well as the

> "*associated natural resources of soil, mineral deposits, water, and plant and animal communities*" (UNITED NATIONS 2001, p. 41).

Only the first aspect is covered with the indicator Land Use, which measures changes over time of different utilisation types. Different indicators deal with the other aspects of land (see 4.2.1, Indicators A 3 and A 4).

Changes in the distribution of four types of land use (arable land, permanent grassland, forest land, other land) were assessed. Due to limited availability of reliable time series, figures from 1981 and 1999 were compared to each other. Following ZENNER (2007), the situation in 1981 is assumed to represent a healthy situation and differences between both years were assessed.

Table 6: Land Use

points	0 (worst)	0.1 – 2.4	2.5	2.6 – 4.9	5 (best)
differences	100%	50.1 – 99.9%	50%	49.9 – 0.1%	0%
results				Gagnef: 9.2% → 4.5 points Vansbro: 11.4 → 4.4 points	

Source: STATISTICS SWEDEN 2008e

Both case studies reach a comparable good score of 4.5 points (Gagnef) and 4.4 points (Vansbro). The overall changes in distribution add up to about 10% in both municipalities. These results do not show different developments of the four examined types of land use, because the percentages of change were summed up to one figure. The land use did not change very much during these years (see appendix 3), therefore this approach seems sufficient here.

The results are only indicative, because the statistic covers only 7% (Vansbro) and 12% (Gagnef) of the case studies total land area. But one interviewee confirmed that the proportions of land use types did not change much over the last decades (E 2). One possible explanation of the little change in land use could be the large areas covered by forest in Dalarna. This type of land use accounts for 78% of the total area in Gagnef as well as in Vansbro (see appendix 3).

A 3. Nature Protection

The indicator Nature Protection is divided into two sub-indicators A 3.a Biodiversity and A 3.b Nature Protection Area.

A 3.a Biodiversity

The first sub-indicator Biodiversity was not applied in this study, because no data was available on the level of municipalities. But this aspect is important and thus the indicator is maintained and discussed (see 5.2.1).

A 3.b Nature Protection Areas

The underlying definition of sustainability stresses the importance of life in a healthy natural environment. Sustainable development thus

> "*depends on a sound environment, which in turn depends on ecosystem diversity. Protected areas are essential for maintaining ecosystem diversity, in conjunction with management of human impacts on the environment*" (UNITED NATIONS 2001, p. 193).

Nature Protection Areas measures protected ground and water as percentage of the total area. Protected areas include national parks, nature reserves, nature conservation areas and animal- and plant conservation areas. The figure for Dalarna as a whole is assumed to represent a good situation (= 5 points). No protected areas would result in zero points on the assessment scale.

Table 7: Nature protection areas, figures for 2006

points	0 (worst)	0.1 – 2.4	2.5	2.6 – 4.9	5 (best)
Protec-ted Area	0%	0.1 – 3.9%	4% (half of the figure for Dalarna)	4.1 – 7.9%	8% (figure for Dalarna)
results		Vansbro: 0.8% → 0.5 points Gagnef: 1% → 0.7 points			

Source: STATISTICS SWEDEN 2008f
Note: for figures of all municipalities in Dalarna see appendix 4

The status protected area applies to 8% of the total area of Dalarna. This rate is lower than nationwide protection rate of about 12%. Figures for both case studies are significantly lower than on county and nation level. In Gagnef only about 1% of the area is somehow protected. The figure for Vansbro with about 0.8% is even less. Vansbro also had approximately half as many protected areas (9) as Gagnef (20) in 2006. But with 1.54 km², protected areas in Vansbro on average are three times bigger than in Gagnef (CAB DALARNA 2006). It is better to designate large, non dissected areas as protected zones (NLÖ 2004), but still the sheer existence of protected areas is also important.

A 4. Environmental Awareness

The indicator Environmental Awareness is divided into three sub-indicators: A 4.a Use of Fertiliser and Pesticides, A 4.b Resource Saving Measures and A 4.c Waste Separation.

A 4.a Use of Fertiliser and Pesticides

The sub-indicator Use of Fertiliser and Pesticides was not applied in this study, because no data was available on the level of municipalities. But this aspect is important and thus the indicator is maintained and discussed (see 5.2.1).

A 4.b Resource Saving Measures

The indicator Resource Saving Measures deals with the use of non renewable resources. The majority of exploited resources are not renewable, at least not in human time frames. Their use should be limited to insure sustainable development (NLÖ 2004).

The amount of extracted natural gravel is examined as an example of non renewable resource use. A reduced production of natural gravel is part of the Environmental Goals of Dalarna. In 1997 the aim of a 50% reduction until 2010 was defined (CAB DALARNA 2007). Therefore, figures from 1997 and 2007 were compared and the difference expressed as percentage of the figure from 1997. A reduction of 50% is defined to equal 5 points. The average reduction for all production units in Dalarna is used as reference value, equal to 2.5 points.

Table 8: Resource Saving Measures

points	0 (worst)	0.1 – 2.4	2.5	2.6 – 4.9	5 (best)
	30% reduction	39 - 31%	Dalarna average (= 41% reduction)	42 – 49 %	50% reduction
results					Gagnef: 51.6% → 5 points Vansbro: 94% → 5 points

Source: LÄNSSTYRELSEN DALARNA 2005, personal communication A. Lundmark August 2008 → figures for 2007

Despite the big difference of the reduction rate between the case study municipalities, both receive the highest score of 5 points. Gagnef is slightly above the necessary reduction rate of 50%, but Vansbro is well above this figure. The second highest amount of natural gravel in Dalarna was produced in Gagnef in 2007. Its six mines extracted 153,765 tons during that year. This fact makes the reduction of about 50% over the last ten years even more remarkable. The three mines in Vansbro extracted 665 tons in that year, which is negligible compared to the production of Gagnef. In 2007 Vansbro was one of the smallest producers of natural gravel in Dalarna. The average reduction in Dalarna sums up to about 41%, which indicates that Environmental Goal of Dalarna might be reached until 2010. The average conceals the extreme differences between municipalities in the county. In Leksand no mine existed any more in 2007, which results in a 100% reduction compared to 1997. Älvdalen on the other hand increased the production rate by 118% during the same time frame (see appendix 5).

A 4.c Waste Separation

The amount of waste tends to grow steadily during times of prosperity, due to increased consumption (AVFALL SVERIGE 2006). To be able to sufficiently handle large quantities, it is essential that waste is separated. Recycling and incineration of waste help to recover valuable materials and to protect non renewable resources. Waste itself has thus become a valuable resource.

The percentage of waste that is recovered or burned to produce energy or heat is assessed. These processes require separated waste. It is therefore assumed that the recycling and waste separation rate are comparable figures. A recycling rate of 100% would reach the highest score (5 points). Such a result implicates a waste separation rate of 100%.

Table 9: Waste Separation, figures for 2007

points	0 (worst)	0.1 – 2.4	2.5	2.6 – 4.9	5 (best)
Recycling rate	0%	0.1 – 49.9%	50%	50.1 – 99.9%	100%
results				Gagnef: 91.6% → 4.5 points Vansbro: 86.4% → 4.3 points (Sweden*: 91% → 4.5 points)	

Source: AVFALL SVERIGE 2008
*Note: figure for 2006, Source: AVFALL SVERIGE 2006

Separation of waste is quite common in Sweden and most people are familiar with returning items to recycling stations and centres. The good results for both case study municipalities reflect this attitude. The recycling rate in Vansbro is only slightly lower (86%) than in Gagnef (91%) and the Swedish average of 91%. All waste that is handled through recycling and biological treatment as well as incineration with energy recovery is included in the recycling rate. The classification of different waste types (see appendix 6) follows classes used on nationwide level for Sweden (AVFALL SVERIGE 2006).

Waste-to-energy plants are located in Dalarna at three places. In Avesta and Mora plants producing heat exist for district heating. The plant in Borlänge produces heat as well so far, but an additional production of electricity is already being deliberated (E 8). Biological treatment in composting plants is done in Borlänge and Ludvika (AVFALL SVERIGE 2006). The construction of a digestion plant is being considered in Vansbro and possible locations are already under discussion. Biological waste from households and the food industry in Vansbro could provide raw material for the plant, as well as sewage sludge from waste-water treatment plants. The idea is to produce biogas for cars. In that way, Vansbro could profit from tourists, which are just passing trough the municipality on their way to/from Sälen (E 4) (see also 4.1.2).

A 5. Energy- and Water-Consumption

The indicator Energy- and Water-Consumption is divided into two sub-indicators: A 5.a Energy Consumption and A 5.b Water Consumption.

A 5.a Energy Consumption

Energy is still mainly derived from non-renewable, fossil resources. Their use has negative impacts on air quality and climate through the release of greenhouse gases. The indicator Energy Consumption thus touches upon two aspects relevant for the environment.

Total energy consumption of a municipality is measured here as kWh per inhabitant and year. Figures for 2006 were compared to figures for 1990 and the difference was rated. The year 1990 was chosen as reference year, because many climate and energy related programs, like the Kyoto protocol, use this year as reference too. No change in the energy consumption is defined to equal 2.5 points. A decreasing consumption results in increasing number of points and vice versa.

Table 10: Energy Consumption

points	0 (worst)	0.1 – 2.4	2.5	2.6 – 4.9	5 (best)
Difference from 2006 to 1990	20% more	19.9-0.1% more	0% difference	0.1-19.9% less	20% less
results		Vansbro: 19% more → 0.1 points		Gagnef: 14.2% less → 4.2 points	

Source: STATISTICS SWEDEN 2008g

The development of energy consumption in both case study municipalities varies significantly. The development of Vansbro is similar to the development of Dalarna. Both experienced an increase of about 20% of the total energy consumption. The nationwide consumption increase added up to only about 10%. Gagnef on the other side experienced a decrease of about 14%, which results in a quite high score (4.2 points). The big difference between the two case studies is mainly due to differences in the industry's energy consumption. In 2006 the industry in Vansbro consumed more than twice as much energy as in 1990. Whereas the industry in Gagnef used about 20% less energy in 2006 than in 1990 (see appendix 7).

Figures for the official statistic about energy consumption are derived by Statistics Sweden from three surveys: *Yearly Electricity-, Gas- and District Heating Statistics*, *Industry's Energy Consumption* and *Oil Deliveries – divided by municipality*. This could generate insufficiencies in the statistic's quality and reliability (SCB 2008). These limitations should be kept in mind when analysing the indicator's result.

A 5.b Water Consumption

Despite the fact that water is a renewable resource, a moderate consumption should still be the aim. Mainly to avoid overexploitation of existing resources, but also because processes to provide clean drinking water and to treat waste water consume a lot of energy.

Water consumption is measured in litre per day and inhabitant. The average consumption of Dalarna was chosen as reference value, equal to 2.5 points.

Table 11: Water consumption, figures for 2007

points	0 (worst)	0.1 – 2.4	2.5	2.6 – 4.9	5 (best)
Water use in litre/day /inhabitant	50% more	1 – 49 % more	Dalarna average (= 172.9 l/d/i*)	1 – 49% less	50% less
results		Vansbro: 177.8 l/d/i → 2.3 points Gagnef: 232.8 l/d/i → 0.7 points			

Source: VANSBRO KOMMUN 2008, DALA VATTEN OCH AVFALL 2008
*Note: only figures for households not industry were considered, figures for 2005, Source: STATISTICS SWEDEN 2008h

In 2005, one person in Dalarna used on average 172 litres of water per day. In Vansbro the consumption in 2007 was slightly more, with 177 litres/day and person. The water consumption in Gagnef in the same year was also higher than the average of Dalarna, but with 232 litres/day/person it was considerably more than in Vansbro.

Figures for this indicator were derived from different sources and could thus be based on different methods of data acquisition. Even though the aim was to examine only personal or household consumption, it is possible that figures for Gagnef also include water consumption of industry. The waterworks' statistics of Gagnef state the number of people connected, which could include small to medium size enterprises. That would be a possible explanation of the considerably higher figures of this municipality. The waterworks' statistics of Vansbro state estimated people equivalents for the water consumption of one big enterprise located in Vansbro. Those were considered for the analysis. The newest numbers for Dalarna are from 2005, because Statistics Sweden displays figures only in five year intervals. The different time frame is thus another problem. These limitations constrict comparability of the figures and the results are therefore only indicative.

4.2.2 Economy

The Economy strand (B) consists of the five indicators 1. Employment, 2. Level of Education, 3. Cost of Living, 4. Economic Vitality and 5. Mobility.

B 1. Employment

The indicator Employment is divided into two sub-indicators: B 1.a Unemployment and B 1.b Economic Diversity.

B 1.a Unemployment

The unemployment rate is a widely used figure to describe a region, regardless if the focus is on a single municipality (AGENDA TRANSFER 2003), a region (BLACH & IRMEN 1999) or a whole country (OECD 2008). The widely available data probably contributes to the frequent use of this figure.

Unemployed persons are defined by Swedish Public Employment Service as

> "persons without a job seeking actively for work and are able to take on a job immediately and who do not participate in a labour market policy program" (ibid 2008b, own translation).

This relatively narrow measurement of unemployment corresponds to the definition used by ZENNER (2007) and allows comparison of the results. It is measured here as the percentage of unemployed persons between 16 and 64 years of the total population of the same age range.

The average for Dalarna county is taken as reference value. The upper and lower end of the assessment scale were set by adding and subtracting the average's standard deviation times two from the reference value.

Table 12: Unemployment rate, figures for January 2008

points	0 (worst)	0.1 – 2.4	2.5	2.6 – 4.9	5 (best)
Unemployment rate	4.34%	3 – 4.2%	Dalarna average (= 2.9%)	2.8 – 1.5%	1.46%
results		Vansbro: 3.6% → 1.3 points		Gagnef: 1.5% → 4.9 points	

Source: SWEDISH PUBLIC EMPLOYMENT SERVICE 2008a

The results for the two case studies vary considerably: unemployment rate of Vansbro of 3.6% is slightly higher than the average of Dalarna (2.9%) and much higher than in Gagnef (1.5%).

The development in Vansbro is still positive due to a decline of the unemployment rate of 1.6 percentage points. Together with Avesta municipality this is the highest decline of all municipalities in Dalarna (see appendix 8). In contrast to that Gagnef

experienced a rather moderate decline of 0.7 percentage points compared to 2007. Nevertheless it is still the municipality with by far the lowest unemployment rate in Dalarna and the rate is even about only half of the Swedish average.

The comparison to the Western Isles shows a very similar situation. The average unemployment rate in Dalarna was about the same as on the Western Isles (3.6%) in January 2007. Both were below the Scottish unemployment rate of 4.6% (ZENNER 2007).

B 1.b Economic Diversity

This sub-indicator reflects the assumption, that a high economic diversity can lead to a higher economic stability in a region. ZENNER (2007) assumed that

> "*in the ideal situation, the main occupation of wage-earners in the household is prorated to equal parts in every of the ten employment categories*" (p. 27).

This assumption is maintained here, even though the classification of the ten employment categories is slightly different. Statistics Sweden displays economic statistics using the *Swedish Standard Industrial Classification*, which is based on the *Statistical Classification of Economic Activities*, also known as NACE[17]. NACE is a standard developed and recommended by the European Commission (EUROSTAT 2003). The ten employment categories are listed in table 14.

Table 13: Assessment scale for economic diversity

points	0 (worst)	0.1 – 2.4	2.5	2.6 – 4.9	5 (best)
	> 10% difference	5.1 – 9.9% difference	5% difference	0.1 – 4.9% difference	Every category at 10%

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Table 14: Employees by employment category, figures for 2006

	Gagnef		Vansbro		Dalarna	
Employment categories	%	points	%	points	%	points
A+B agriculture, hunting, forestry, fishing	1.6	0.8	2.6	1.3	1.4	0.6
C+D mining and quarrying, manufacturing	25.6	0	28.6	0	21.7	0
E+90 energy- and water-supply, sewage and refuse disposal	0.7	0.4	0.4	0.2	1.1	0.6
F construction	7.9	4	7.4	3.7	7.0	3.5
G+I trade, transport, storage, communication	12.4	3.8	12.7	3.6	15.4	2.3
H+Oexkl90+P personal and cultural services	4.2	2.1	5.1	2.6	7.1	3.5
J+Kexkl73 financial intermediation; real estate, renting and business activities	3.6	1.8	5	2.5	8	4
L+Q public administration, defence, international organisations	5	2.5	3.3	1.6	5.9	3
M+73 research and development, education	13.6	3.2	11.2	4.4	10.7	4.7
N health and social work, veterinary	23.8	0	22.4	0	20.8	0
00 unknown	1.5		1.4		0.9	
Points		1.9		2		2.2

Source: STATISTICS SWEDEN 2008i
Note: Employees with workplace in the region by employment category in percent of overall employees, classification after SNI 2002. Employee is defined as someone (aged 16 to 64) who on average worked one hour per week in the month of November, included are also temporarily absent people (e.g. due to illness), the same definition is used in the Swedish Labour Statistics based on Administrative Sources (STATISTICS SWEDEN 2008i)

The largest share of employees in both municipalities works in mining, quarrying and manufacture sector. About a quarter of the labour force in Gagnef is engaged there. In Vansbro the rate is even higher with 28.6%. Another important sector is health and social work, veterinary where 23.8% (Gagnef) and 22.4% (Vansbro) work. The public sector in general (public administration, defence, education, health and social work) plays an important role as an employer in both case studies and in Dalarna. In all three regions about 40% of the labour force works there. This situation is quite common in rural areas in Sweden (PERSSON & CECCATOR 2004).

B 2. Level of Education

Education is an important aspect for individual as well as for sustainable development. People can reach their fullest potential through the education process (UNITED NATIONS n.d.), thus enhancing their quality of life. Education is also positively connected to economic growth, with some limitations for rural areas.

The Level of Education is measured as the development of the distribution of degrees inhabitants achieved during their education. To measure development over time, figures from 1985 and 2007 were compared to each other. This time frame was chosen despite the methodical change for this statistic in 2000. The results

should thus be treated with care. Degrees which can be achieved during education were grouped in four categories (see appendix 9). The development over time of each category in the municipalities is compared to the development of Dalarna and rated separately. The overall score is calculated as average of the four different scores.

Table 15: Level of education

points	0 (worse)	0.1 – 2.4	2.5	2.6 – 4.9	5 (best)
Level of education	- 5 p.p. or less than figure for Dalarna	0.1 – 4.9 p.p.	develop-ment in Dalarna	0.1 – 4.9 p.p.	+ 5 p.p. or more than figure for Dalarna
results	Vansbro: 3.2 points; Gagnef: 3.2 points				

Source: STATISTICS SWEDEN 2008j
Note: For category 1 a decrease was rated higher than an increase, the assessment scale was thus turned around. The statistic takes only persons between 16 and 74 years into account.

Gagnef and Vansbro both reach fairly good results of 3.2 points. The development of their inhabitant's level of education is better than on average in Dalarna. The only exception of this overall trend is the number of persons with post secondary education in Vansbro (see appendix 9). The increase in this category is lower than the average of Dalarna. To calculate the total score as average of the different points conceals these different developments.

The level of education in Dalarna can be described as being lower than in Sweden in general. The number of persons who did not fulfil the Swedish compulsory school attendance is lower in the whole of Sweden than in Dalarna and both case study municipalities. To complete this level of education should be the minimal aim and is nowadays often required even for simple jobs.

The comparison between figures from 1985 and 2007 shows that the above described situation applies for both years. The level of education has been traditionally low compared to the whole of Sweden, due to the rural structure of Dalarna.

B 3. Cost of Living

The Cost of Living reflects how people handle the economic conditions they have to live with. People's socio-economic status or place of residence greatly influence their amount of expenses (SCB 2008a). The *Household Budget Survey* of Statistics Sweden provides data for this indicator. The survey is based on a sample of four thousand households throughout Sweden and shows their expenditures in Swedish Krona in one year.

The surveys results are only available for aggregated municipalities following the definition of SALAR (see 4.1.1). Gagnef falls into the category *Commuter Municipalities* and Vansbro into the category *Sparsely Populated Municipalities*. The average

of figures for categories *Large Cities* and *Other Municipalities, More Than 25,000 Inhabitants* is defined to equal 2.5 points and is used as reference value. It is assumed that these two categories represent a good reference, because the two biggest cities of Dalarna and densely populated areas fall into these groups. Lower costs of living than the reference result in a better score and higher costs in a lower score.

Table 16: Cost of living, figures for 2007

points	0 (worst)	0.1 – 2.4	2.5	2.6 – 4.9	5 (best)
Cost of Living	> 25.1% more	0.1 – 25.0% more	Reference value	0.1 – 25% less	< 25.1% less
results		Gagnef: 23.6% more → 0.2 points		Vansbro: 1% less → 2.6 points	

Source: STATISTICS SWEDEN 2008k, Household Budget Survey

The results for both case study municipalities differ greatly from each other. In Vansbro, the overall Cost of Living is slightly less than the reference value. In contrast to that the Cost of Living in Gagnef is much higher compared to the reference. These results should be treated with care, since data was only available for aggregated municipalities.

The overall Cost of Living can be divided into different groups of expenses (see appendix 10). This gives a clearer picture of the differences between areas. People in more rural areas, for example, spend more money on transportation than in cities. The reason for this might lie in higher fuel prices or a more frequent use of transportation in rural areas.

Regional differences of the price level can not be detected with the measurement applied here. But knowledge about the overall Cost of Living is also important, for example, with regard to the people's choice of residence.

B 4. Economic Vitality

The indicator Economic Vitality is divided into two sub-indicators: B 4.a New Businesses vs. Bankruptcies and B 4.b Commuting Habits.

B 4.a New Businesses vs. Bankruptcies

Newly started businesses and bankruptcies are important factors for the assessment of a municipality's economy. Both factors depend on “competition and structural changes as well as economic development” (STATISTICS SWEDEN 2001, p. 37). They thus reflect a municipality's economic vitality and adaptability.

The indicator measures the difference between numbers of newly started businesses and numbers of bankruptcies per 1,000 inhabitants between 16 and 64 years. The average of Dalarna functions as reference value, equal to 2.5 points. The average's standard deviation determines the upper and lower end of the scale.

Table 17: Economic vitality, figures for 2007

points	0 (worse)	0.1 – 2.4	2.5	2.6 – 4.9	5 (best)
	Dalarna average minus 5 times the standard deviation of the average (= 0.6)	7.1 – 0.7	Dalarna average (= 7.2)	13.7 – 7.3	Dalarna average plus 5 times the standard deviation of the average (=13.8)
results		Vansbro: 5.5 → 1.8 points		Gagnef: 8.4 → 2.9 points	

Source: STATISTICS SWEDEN 2008l (Bankruptcies), ITPS 2008 (New Businesses)

The result of Gagnef of 2.9 points indicates that its economy is slightly more viable than on average in Dalarna. It is the only municipality without any bankruptcies in 2007 (see appendix 11). The result of Vansbro on the other side lies slightly below the average of Dalarna. With a ratio of only 5.5 new businesses per 1,000 inhabitants, Vansbro had the second lowest result besides Ludvika. The results are indicative, because the change in business should better be "measured by the net addition of enterprises (real birth – real death)" (STATISTICS SWEDEN 2001, p. 37). Reliable statistics about real death are not available, therefore the number of bankruptcies is considered instead. Statistics about these are very detailed and available on municipality level.

B 4.b Commuting Habits

"For most people in the Western world, commuting is part of their daily activity pattern" (SANDOW 2008, p. 15). This applies to many persons in Dalarna, as the county has been described to have many commuters (LANDSTINGET DALARNA 1997). A positive effect of commuting is to open up more job and career possibilities (SANDOW 2008), which is quite important for people living in rural areas. But, the question of how to measure and assess commuting is influenced by different and partly contradicting factors, reaching from government policies, over monetary costs to social and environmental impacts. In order to find a balance between them, Commuting Habits is measured here as the percentage of gainfully employed inhabitants over 16 years leaving the local labour market[18] their municipality belongs to on a regular basis in order to work in another place. Figures on commuting for

18 Local labour markets are a concept developed by Statistics Sweden based on flows of commuting between municipalities. In a first step a local centre is determined, which only 15% of gainfully employed inhabitants leave for work. The second step takes into account where most commuters of dependent municipalities travel to (SCB 2005). Thus a local labour market can consist of one or more municipalities. The last revision of the current classification is based on statistics from 2003 (STATISTICS SWEDEN 2007).

Vansbro and Gagnef are compared to the average of all municipalities in Dalarna, which is defined to equal 2.5 points. A higher score than the average will be achieved if less commuters leave their local labour market. If the opposite is the case, the score will be less than 2.5 points.

Table 18: Commuting habits, figures for 2006

points	0 (worse)	0.1 – 2.4	2.5	2.6 – 4.9	5 (best)
Commuting rate	65% more	0.1 – 64.9 % more	Dalarna average	0.1 – 64.9 % less	65 % less
result		Vansbro: 16.2% → 1.2 points		Gagnef: 7.6% → 3.9 points	

Source: STATISTICS SWEDEN 2008m+n, REGION DALARNA 2008

On average 12.2% of gainfully employed inhabitants in Dalarna leave their local labour market, but individual figures vary from only 7% (Borlänge) up to 19% (Smedjebacken and Hedemora).

Together with Borlänge, Gagnef has, with only 7.6% the lowest rate of commuters considered here. This result is no surprise, since both municipalities form, together with the municipalities of Leksand, Rättvik, Falun and Säter, a quite large local labour market with a wide variety of job opportunities.

Vansbro on the other side constitutes a single municipality local labour market, so that the amount of commuters is equal to the number of people working in other municipalities (see appendix 12).

B 5. Mobility

The indicator Mobility is divided into two sub-indicators: B 5.a Car Ownership and B 5.b Internet Access.

B 5.a Car Ownership

In Dalarna county, a car is important for the way to work and in leisure time (LANDSTINGET DALARNA 1997). This is still true today, even though public transportation is well developed in the south-eastern part of Dalarna. But in more rural areas, like Gagnef and Vansbro, it is difficult to get around using public transportation (E 3).

To have access to a car is crucial for development in these areas. Therefore ZENNER (2007) assumed “that a car ownership rate of hundred percent (every household at least one car) is useful for a community's sustainable development” (p. 30). This assumption is maintained in this study. One household, in Gagnef and Vansbro, on average exists of two persons (see appendix 13).

A result of 500 cars per 1,000 inhabitants is thus defined to be equal to one car per household and 5 points on the assessment scale. With an increasing number of cars the potential score decreases gradually.

Table 19: Car Ownership, figures for 2007

points	0 (worse)	0.1 – 2.4	2.5	2.6 – 4.9	5 (best)
Number of cars per 1,000 inhabitants	> 620 (24% more)	561 - 619	560 (12% more)	501 - 559	500 <
result		Vansbro: 582 → 1.6 points Gagnef: 592 → 1.1 points			

Source: SIKA 2008

Gagnef has the third (592 cars / 1,000 pop) and Vansbro the fourth (582 cars / 1,000 pop) highest car ownership rate in Dalarna county. Only in Älvdalen (631 cars / 1,000 pop) and in Malung (632 cars / 1,000 pop), more passenger cars are in use. All four municipalities are above Dalarna county's average of 538 cars per 1,000 inhabitants (see appendix 13). This is well above the Swedish average of 462 cars / 1,000 inhabitants. Sweden has a higher car ownership rate than other countries in Europe. Countries of the EU-25 have on average only 446 cars per 1,000 inhabitants (SIKA 2008a).

B 5.b Internet Access

Internet Access is measured as percentage of inhabitants aged 16 to 84 who have Internet access at home. The idea of *digital equity* used by ZENNER (2007) is maintained, but the assessment scale was changed slightly. Figures for this indicator are available at individual level and not for households. A household in Gagnef and Vansbro consists statistically of two persons (see above). So, a result of at least 50% of the population with Internet access is defined to equal access in every household and 5 points on the assessment scale.

Table 20: Internet access at home, measured as percentage of inhabitants aged 16 to 84 with access at home

points	0 (worse)	0.1 – 2.4	2.5	2.6 – 4.9	5 (best)
scale	0%	0.1 – 24.9%	25%	25.1 – 49.9 %	50% or more
results					Gagnef: 71,5%; Vansbro: 68,9% both 5 points

Source: STATISTICS SWEDEN 2008o, Living Conditions Survey
Note: Figures are only available for aggregated municipalities (H-Regions): Gagnef → H4 södra mellanbygden, Vansbro → H6 norra glesbygden

Use of Information Technologies (IT) is quite common in Sweden (SIKA 2006). The high figures of about 70% for both case studies are in line with the overall development in Sweden. In SIKA's *National Communications Survey,* around 70% of the

sample population stated that they use a computer and Internet regularly and also on the day of survey. Especially younger persons use computers and Internet on a regular basis. Older persons, in particular old age pensioners, form the group where this is least common (SIKA 2006).

A European comparison shows that Sweden has a well developed IT infrastructure. Internet access at home is quite common in Sweden, whereas in 2005 only about 50% of households in Scotland and on the Western Isles had Internet access at home (ZENNER 2007).

4.2.3 Society

The Society strand (C) consists of the five indicators 1. Population Structure, 2. Population Development, 3. Health, 4. Culture and 5. Incidence of Crime.

C 1. Population Structure

The percentage of young and old inhabitants as well as gender ratio is covered with the indicator Population Structure. A well-balanced population in regard to these aspects is important to keep a municipality viable and ensure sustainable development. This is especially true for rural areas, since younger persons tend to leave these regions due to a lack of perspectives and job opportunities.

Figures for Dalarna were taken as reference (= 2.5 points), because it is assumed, in accordance with ZENNER (2007), that they represent a healthy pattern. The total score is composed to equal parts of three aspects: percentage of population between 0 and 14, percentage of population over 65 years of age and gender ratio. High numbers of young persons, low numbers of elderly persons and an even gender distribution result in a high score.

Table 21: Population Structure, figures for 2007

points	0 (worse)	0.1 – 2.4	2.5	2.6 – 4.9	5 (best)
age pattern	> 5 % of 0-14 less; >5% of +65 more than average	0.1 – 4.9% less/more than average	Dalarna average	0.1 – 4.9% more/less than average	> 5% of 0-14 more; >5% of +65 less than average
gender ratio	< 0.80; > 1.20	0.81 – 0.89 0.11 – 1.19	0.90; 1.10	0.91 – 0.99 1.01 – 1.09	1.0

Source: STATISTICS SWEDEN 2008b

Both case studies receive a high score for their gender ratio. Their population consists of almost equal parts of men and women. Differences in the gender ratio for different age groups are negligibly small. The opposite is true for ZENNER's sample population on the Western Isles. For example, about two thirds of persons aged 65 years and older, who participated in the survey in Galson township, were men (ZENNER 2007).

Vansbro has about the same amount of inhabitants between 0 and 14 years of age (15.8%) as Dalarna (15.7%). Gagnef on the other hand has with 18% more young people than the average of Dalarna. The opposite is true concerning the percentage of inhabitants over 65 years of age. In Gagnef live slightly less elderly persons (19%) than on average in Dalarna (20.3%). In contrast to that, more inhabitants in Vansbro are older than 65 (23.1%). The total score for Gagnef with 3.8 points therefore is higher than the score of Vansbro of 2.8 points.

Differences regarding the number of residents aged 65 years and older in the two case studies compared to the average of Dalarna are rather small. At least in contrast to figures found by ZENNER (2007) for the Western Isles and Scotland. In one case study community, Galson township, almost one third of the sample population was 65 years and older. In Scotland, this age group accounts on average for only about 16% of the population (ZENNER 2007). Compared to Scotland, the share of this age group of the total population of Dalarna is, with about 20%, higher.

C 2. Population Development

Decisions regarding sustainability often draw on indicators for population development. It is closely linked to other demographic and social factors, as well as to economic and environmental issues (UNITED NATIONS 2001). This applies both to rapid decline and rapid increase in the population. Long-term population development is significant for assessment of sustainability. The measurement used in this study therefore takes population changes over the last 25 years into account. Differences between the municipalities' changes in population are compared to the change of Dalarna. The scale assesses these differences in percentage points (p.p.).

Table 22: Population Development, figures for 2007 and 1982

points	0 (worse)	0.1 – 2.4	2.5	2.6 – 4.9	5 (best)
scale	10 p. p. less than average	0.1 – 9.9	Dalarna average	0.1 – 9.9	10 p. p. more than average
results	Vansbro: 12.9 p.p. less → 0 points			Gagnef: 6.2 p.p. more → 4 points	

Source: STATISTICS SWEDEN 2008b

Dalarna experienced a population decline of 3.7% over the last 25 years. The population decrease in Vansbro adds up to 16.7%, which is far above the average of Dalarna. In contrast to that, Gagnef, with an increase of 2.4%, has a positive population development.

The population decrease of Vansbro is the third highest of all municipalities in Dalarna and with only 6,959 inhabitants in 2007, it now has the fewest

(see appendix 14). The population decline of Dalarna over the last 25 years is slightly higher than the average population drop of Scotland's population of 2.4% (ZENNER 2007).

C 3. Health

The indicator Health consists of two sub-indicators: C 3.a Sick-Leave Rate and C 3.b Life Expectancy.

C 3.a Sick-Leave Rate

The Sick-Leave Rate is the sum of sick-leave days with any kind of payment by the Swedish Social Insurance Agency in proportion to the population aged 16 to 64 years. The average of Dalarna is taken as the equivalence to 2.5 points on the assessment scale. The average of Sweden is defined to be equal to 5 points, setting the upper end of the scale. To set the lower end of the scale the difference between the average of Dalarna and Sweden is added to the average of Dalarna. This difference is about 15% of the figure for Dalarna.

Table 23: Sick-Leave Rate in days, figures for 2007

points	0 (worse)	0.1 – 2.4	2.5	2.6 – 4.9	5 (best)
Sick-leave rate	48.3	42.2 – 48.2	42.1 (Dalarna average)	42 – 35.8	35.9 (Swedish average)
results		Vansbro: 47.6 → 0.3 points		Gagnef: 41.8 → 2.6 points	

Source: SWEDISH SOCIAL INSURANCE AGENCY 2008

The average sick-leave rate of Dalarna is well above the Swedish average, which applies for the total figure as well as gender differentiated figures (see appendix 15). Quite big differences exist between sick-leave rate for men and women. But for a municipality's overall social and economic state the total amount of sick-leave days is regarded more important here, thus gender differences did not influenced the assessment.

The sick-leave rate of Gagnef (41.8 days) is slightly below the average of Dalarna (42.1 days), the rate of Vansbro (47.6 days) on the other side is clearly above the average. Still, the figure for Vansbro is rather moderate compared to Hedemora, which, with 52.4 days, has the highest sick-leave rate in Dalarna. The sick-leave rate of Falun is identical to the Swedish average of only 35.9 days and is thus the lowest rate of all municipalities in Dalarna.

C 3.b Life Expectancy

The second Health sub-indicator considers average life expectancy at birth. This factor measures quite clearly mortality, but it also displays the overall socio-economic development (WEINSTEIN & PILLAI 2005).

Life Expectancy is measured in years and differentiated by gender, in order to show the existing differences in most western countries between women and men. The life expectancy for both genders is rated separately and the total score represents their average. The upper and lower end of the assessment scale are the average of Dalarna plus, respectively minus, three times its standard deviation.

Table 24: Life Expectancy at birth in years, figures for the period 2002-2006

points	0 (worse)	0.1 – 2.4	2.5	2.6 – 4.9	5 (best)
women	79.8	79.9 – 82.2	82.3 (Dalarna average)	82.4 – 84.6	84.7
results		Vansbro: 80.7 → 1 point		Gagnef: 82.3 → 2.6 points	
men	74.9	75 – 79.9	78 (Dalarna average)	78.1 – 81.2	81.3
results		Vansbro: 77.6 → 2 points		Gagnef: 78.7 → 2.9 points	
Total score	Gagnef: 2.7 points; Vansbro: 1.5 points				

Sources: SWEDISH NATIONAL INSTITUTE OF PUBLIC HEALTH 2008+a

The difference between the highest and lowest life expectancy in all municipalities in Dalarna, with a little more than three years for both genders, is quite similar. Men in Gagnef tend to live slightly longer (78.7 years) than on average in Dalarna (78 years), as well as on average in Sweden (78.2 years).

The opposite is true for men living in Vansbro (77.6 years). Women of Vansbro also tend to live shorter (80.7 years) than on average in Dalarna (82.3 years). And it is the municipality with the shortest life expectancy in Dalarna. Women's life expectancy in Gagnef on the other side is identical with the county's average. Both are slightly below the Swedish average of 82.6 years (see appendix 16).

C 4. Culture

The indicator Culture is divided into two sub-indicators: C 4.a Municipal Expenditures for cultural concerns and C 4.b number of Cultural Events.

C 4.a Municipal Expenditures

Municipal Expenditures for cultural issues is measured as percentage of the total municipal running costs. This reflects indirectly figures about cultural events and facilities in the municipality (ECOLOG INSTITUT 2008).

A result of two percent expenditures for cultural issues is defined to equal 2.5 points on the assessment scale. This corresponds approximately to the average of Dalarna of 2.3%. To set the upper and lower end of the scale, half of the middle figure was added to and subtracted from it.

Table 25: Municipal Expenditures, figures for 2007

points	0 (worse)	0.1 – 2.4	2.5	2.6 – 4.9	5 (best)
Municipal expenditures in %	1%	1.9 – 1.1%	2%	2.1 – 2.9%	3%
results			Vansbro: 2% → 2.5 points	Gagnef: 2.4 → 3.5 points	

Source: RKA 2009

Vansbro spends 2% of its running costs on cultural concerns resulting in the middle score of 2.5 points. Gagnef, on the other hand, with 2.4%, spends slightly more on culture. Both municipalities are about average in the comparison with the other municipalities in Dalarna. Avesta ranks on top of the list with 2.9% expenditures of its running costs on culture. Älvdalen ranks last with expenditures of 1.7%. But differences between expenditures for cultural issues of all municipalities in Dalarna range closely in-between the above mentioned figures (see appendix 17).

C 4.b Cultural Events

The second Culture sub-indicator is the number of participants in Cultural Events per 1,000 inhabitants. Only cultural events organized by the Swedish Arts Council were considered, due to data availability. Cultural events are defined as

> "*an activity or production that is conducted in front of an audience. The number of persons in the audience is counted as part of the participants*" (STUDIFÖRBUNDEN 2008, p. 6).

The assessment scale's division for this indicator follows a classification used by the Swedish Arts Council (STUDIFÖRBUNDEN 2008, p. 38). The average of Dalarna is defined to equal 2.5 points. Twice this figure is added to and subtracted from it to set the upper and lower end of the scale.

Table 26: Cultural Events, figures for 2007

points	0 (worse)	0.1 – 2.4	2.5	2.6 – 4.9	5 (best)
	0	1 – 1,843	1,844 (Dalarna average)	1845 – 3,687	3,688
results		Vansbro: 1,657 → 2.2 points		Gagnef: 3,496 → 4.7 points	

Source: STUDIFÖRBUNDEN 2008

With 1,657 participants per 1,000 inhabitants, Vansbro is close to the average of Dalarna of 1,844. In contrast to that, Gagnef, with 3,496 participants

per 1,000 inhabitants, is way above average. It is the municipality with the highest number of participants in cultural events. There are big differences between municipalities in Dalarna regarding this point. With its number of participants in cultural events per 1,000 inhabitants (720), Säter reaches only one-fifth of the result of Gagnef. It is thus the municipality with the lowest number of participants in cultural events (see appendix 18).

C 5. Incidence of Crime

Incidence of Crime is an important aspect of the quality of life in a municipality. If people feel secure in the place of resident it contributes essentially to their overall well-being. Additionally to this individual aspect, this indicator is linked to social and economic factors, for example population development and unemployment rate.

The number of reported crimes per 10,000 inhabitants is used here to measure Incidence of Crime. The average of Dalarna is defined to equal 2.5 points on the assessment scale.

Table 27: Incidence of Crime, figures for 2007

points	0 (worse)	0.1 – 2.4	2.5	2.6 – 4.9	5 (best)
	>1,577.13 (40% more than figure for Dalarna)	1,127 – 1,576	1,126.52 (figure for Dalarna)	1,125 – 674	675.91 < (40% less than figure for Dalarna)
results				Vansbro: 685.4 → 4.9 points	Gagnef: 537 → 5 points

Source: BRÅ 2008

The number of reported crimes per 10,000 inhabitants in Dalarna (1,126) in 2007 was well below the Swedish average of 1,423. The crime rate is even lower in Gagnef, where the amount of reported crimes (537) is only half of the average of Dalarna. It is thus the municipality in Dalarna with the lowest number of reported crimes. In Vansbro, slightly more crimes were reported, but it still ranks third in Dalarna behind Gagnef and Leksand (642) (see appendix 19). Both case studies are quite safe places to live, even though reported crimes are assessed here. The number of actually committed crimes might be lower than the number of reported crimes. This could be caused by the fact that in Sweden “it has been decided to prepare statistics at the time crimes are reported to the police” (BRÅ 2008a). Some reported incidents may prove not to be crimes after completed investigation.

The situation in Scotland is quite similar to Dalarna. On average, 863 crimes per 10,000 inhabitants were committed in Scotland. The Western Isles are an even safer place to live with only 346 crimes per 10,000 inhabitants. This comparison should be treated with care, because a definition of 'crime', e.g. reported or cleared-up, is not given (ZENNER 2007).

4.2.4 Social Equity

The Social Equity strand (D) consists of the five indicators 1. Gender Equality, 2. Quality of Life, 3. Access to Facilities, 4. Quality of Public Transport and 5. Voter Turnout.

D 1. Gender Equality

The indicator Gender Equality is divided into two sub-indicators: D 1.a Leading Positions and D 1.b Income Differences between Genders.

D 1.a Leading Positions

The first sub-indicator of Gender Equality concentrates on the division of leading positions in municipalities among genders. The municipal council is the highest decision making institution in a municipality and is elected every four years. The percentage of women in this institution is considered here.

Equal division of seats among both genders is assumed as the ideal situation, thus resulting in 5 points. The average of Dalarna is, again, used as reference value and equal to 2.5 points. The difference of the average to the ideal situation corresponds to the increase of the women ratio in Dalarna from 2005 to 2006.

In order not to create disadvantages for men, the assessment scale rates a higher proportion of women than 50% after the same pattern as a lower proportion.

Table 28: Gender equality in leading positions, figures for 2006

points	0 (worse)	0.1 – 2.4	2.5	2.6 – 4.9	5 (best)
Percentage of women in municipal councils	< 36 % / > 64 %	36.1 – 42.9 % / 57.1 – 63.9%	43 % (= Dalarna average) / 57%	43.1 – 49.9% / 50.1 – 57.9%	50 %
results		Gagnef: 40% → 1.4 points Vansbro: 40.5% → 1.6 points			

Source: DALAMONITORN 2008a

About 40% of municipal council members in both case studies are women. The average of Dalarna of 43% lies slightly higher. In two municipalities, Avesta and Leksand, even slightly more women than men were elected for the council (see appendix 20).

This indicator was part of *Dalamonitorn's* indicator list. The positive overall development of this aspect in Dalarna was also acknowledged there (DALAMONITORN 2008a).

D 1.b Income Differences between Genders

Commitment of Sweden for equal pay for men and women reaches back to 1979, when a UN convention against all discrimination against women was ratified. Additionally, the government is bound to Article 141 of the EU Treaty, which

> *"states that every Member State shall guarantee the principle of equal pay for women and men doing equal work or work of equal value."* (STATISTICS SWEDEN 2001, p. 27).

Income Differences between Genders is measured as women's income as percentage of men's income. The statistic used here takes into account incomes of one year from all men and women, aged 16 years and older, living in the municipality[19]. Figures for the case studies are compared to the average of Dalarna. The upper and lower end of the assessment scale were set by adding and subtracting the average's standard deviation times two to/from the average.

Table 29: Income Differences between Genders, figures for 2006

points	0 (worse)	0.1 – 2.4	2.5	2.6 – 4.9	5 (best)
women's income as percentage of men's income	66.9%	73.2 - 67%	73.3% (= Dalarna average)	73.4 – 79.4%	79.5%
results		Gagnef: 70.2% → 1.2 points		Vansbro: 75.9% → 3.5 points	

Source: STATISTICS SWEDEN 2008p

In 2006, women in Dalarna on average earned only 73% of men's income. The situation in Vansbro was slightly better (76%) than both the average and the situation in Gagnef (70%). These figures correspond to the Swedish average of around 73% (see appendix 21).

D 2. Quality of Life

Quality of life is a very subjective matter, yet happy inhabitants are important for municipal development. "(..) general contentment, confidence and optimism of the inhabitants" (ZENNER 2007, p. 33) contribute to sustainable development in the same extent as for example hard economic factors contribute to it.

The indicator Quality of Life uses the risk of poverty as an indirect measurement of this aspect. People at risk of poverty are defined by the statistic, used for this indicator, as persons with income less than 60% of the median income. The statistic

19 Note:Income Statistics – based on Administrative Register is an annual survey covering the whole Swedish population. The statistics describe income and transfers and are based on register data from the National Tax Board (i.a. data from taxation), the Swedish Social Insurance Agency, the Swedish National Board of Student Aid (CSN) and other authorities. Since the survey covers the whole population and lacks samplings errors, it is particularly suitable for studying different regional divisions or smaller groups in society. The register covers i.a. income from work, total income from employment and business, income from capital and different kinds of transfers (grants). It is also possible to provide statistics on small regional areas such as parishes, postal areas or subareas of municipalities. (STATISTICS SWEDEN 2008)

takes only persons with disposable income into account, which is about the same as the population aged 16 and older. Disposable income is defined as

> "*the sum of all taxable and non-taxable income (income from employment and capital, as well as transfers), less tax and other negative transfers*." (GOVCOM 2005, p. 83).

The average of Dalarna sets the middle score (2.5 points). The upper and lower end of the assessment scale were set by adding and subtracting the average's standard deviation times three from the reference value.

Table 30: Risk of poverty, figures for 2006

points	0 (worse)	0.1 – 2.4	2.5	2.6 – 4.9	5 (best)
Percentage of inhabitants at risk of poverty	19.45%	19.3 – 14.7%	14.6% (= Dalarna average)	14.5 – 9.8%	9.7%
results		Vansbro: 17.7% → 0.8 points		Gagnef: 13.17% → 3.2 points	

Source: STATISTICS SWEDEN 2008q

In 2002 about 12% of the Swedish population lived in households with income less than 60% of the median. The EU wide comparison shows that this figure is quite low (GOVCOM 2005), making Sweden "the envy of many countries, because of its high standard of living" (PETERS & LARKIN 2005, p. 110).

The risk of poverty is measured in this study as percentage of the population with disposable annual income below 60 % of the median. The official statistic divides the population into income classes, which creates inaccurate results due to over- and underestimation of all people, who are defined to be at risk of poverty. Because of this limitation, the income class which the average income of Dalarna below 60% of the median falls into, is defined to be the poverty threshold for all municipalities in Dalarna. The majority of the individual poverty thresholds for the different municipalities also falls into the same income class, which is 60 to 79 tkr (thousand SEK) annual income.

Application of this measurement results in a fairly good score for Gagnef (3.2 points) and a rather low score of 0.8 points for Vansbro. Fewer people in Gagnef than in Vansbro thus earn the minimal income or even less. The median annual income reflects these disparities, since it is higher in Gagnef (125.9 tkr) than in Vansbro (112.1 tkr) (see appendix 22).

D 3. Access to Facilities

Good accessibility of facilities, like grocery stores, post offices or local government facilities, is a fundamental aspect in the choice of residence and quality of life of inhabitants (BLACH & IRMEN 1999). Due to data availability this indicator is measured as distance to the next office of the Swedish Social Insurance Agency. The mean distance, in kilometres, of the case studies is compared to the average of Dalarna. A mean distance of two km would result in the highest score (5 points), since this distance is assumed to still be manageable by bicycle or foot.

Table 31: Access to Facilities, figures for 2003

points	0 (worse)	0.1 – 2.4	2.5	2.6 – 4.9	5 (best)
Mean distance to Social Insurance Agency	14	8.1 – 13.9	8 (Dalarna average)	7.9 – 2.1	2
results		Gagnef: 10 km → 1.6 points	Vansbro: 8 km → 2.5 points		

Source: BRANDT & WESTHOLM 2006

People in Dalarna live on average 8 km away from the next insurance office. The same applies to Vansbro. But the mean distance of inhabitants of Gagnef is with 10 km well above the average of Dalarna.

The nationwide comparison shows, that Dalarna is about average with regard to accessibility of certain facilities. About 83% of the inhabitants of Dalarna live within a range of 2 km from a grocery store, which is slightly more than the Swedish average of 79%. The same amount of Swedes live within a range of 2 km of a post office. The figure for Dalarna, with 72%, is slightly below the nationwide average (LANDSTINGET DALARNA 1997) (see appendix 23).

D 4. Quality of Public Transport

Mobility is an important aspect in today's society. Persons without access to a car often depend on public transportation. This applies especially to elderly, handicapped and young people. A well-developed public transportation system would enable a lot of inhabitants to be involved in the community.

Quality of Public Transport is measured as percentage of inhabitants who live within about two kilometres of train stations. Since settlements in rural areas are often spread out, a result of 80% is assumed to be a good situation (5 points). If half of the inhabitants would live close to a train station, it is assumed to be a fairly well situation (2.5 points).

Table 32: Quality of public transport, figures for 2003

points	0 (worse)	0.1 – 2.4	2.5	2.6 – 4.9	5 (best)
Percentage of inhabitants living within a 2 km radius around train stations	20%	49.9 – 20.1%	50%	50.1 – 79.9%	80%
results				Gagnef: 53% → 2.7 points Vansbro: 64% → 3.7 points	

Source: own procession of data from Statistics Sweden

Both case study municipalities have five train stations, the highest amount of stations in Dalarna. The high scores for Gagnef (2.7 points) and Vansbro (3.7 points) reflect this high concentration. In contrast to that, only one train station is located in Borlänge and Falun respectively. Even though these are the two biggest cities in Dalarna, only about 38% (Borlänge) and 30% (Falun) of their inhabitants live close to the train station. But better bus connections in both municipalities compensate for that.

D 5. Voter Turnout

Figures about voter turnout reflect the level of participation of inhabitants in the community. It also indicates trust in political institutions. Despite some limitations of this indicator (see discussion) it is maintained in this study.

Voter Turnout is measured as percentage of inhabitants who are eligible to vote and did vote in the last election. The average voter turnout of the Swedish Parliament and municipal councils in the 2006 election is used here. A result of 100% would result in the highest score of 5 points.

Table 33: Voter turnout, figures for the election in 2006

points	0 (worse)	0.1 – 2.4	2.5	2.6 – 4.9	5 (best)
Voter Turnout	0%	49.9 – 0.1%	50%	50.1 – 99.9%	100%
results				Gagnef: 80.9% → 4 points Vansbro: 79.2% → 3.9 points	

Source: VALMYNDIGHETEN 2007

Participation in elections is generally high in Sweden. ZENNER (2007) detected an average voter turnout of about 65% in communities on the Western Isle, which is much lower than the average of Dalarna of about 80% (see appendix 24). Both, Gagnef and Vansbro, had an average voter turnout of about 80% in the last election in 2006. In Sweden, elections for all three levels (parliament, county council, municipal council) are generally conducted on one day (STATISTICS SWEDEN 2001). This is a main reason for the high participation rate (OLSSON & ÅSTRÖM 2004).

4.3 Compilation of all results

An overview of all indicators and their results in table form and in a graph are presented in this chapter. Table 34 lists all indicators and sub-indicators. The indicator's results are given for both case study municipalities. The indicators are grouped according to the sustainability strands set by the underlying definition of sustainability.

The average scores of each of the four strands imply a moderate, yet above average, sustainable development of both case study municipalities. Calculating the average score of each strand naturally conceals differing scores of indicators within the same strand. These differences are partly quite large. For example, for Incidence of Crime, Vansbro, with 4.9 points, almost received the highest score, but it scored zero points at Population Development.

Table 34: Lists of indicators and their results, by case study municipality

	Gagnef municipality	Vansbro municipality
A. Environment	2.8	2.9
A 1. Population Density	1.8	3.9
A 2. Land Use	4.4	4.5
A 3. Nature Protection	0.7	0.5
A 3.a Biodiversity	n.a.	n.a.
A 3.b Nature Protection Areas	0.7	0.5
A 4. Environmental Awareness	4.7	4.6
A 4.a Use of Fertiliser and Pesticides	n.a.	n.a.
A 4.b Resource Saving Measures	5	5
A 4.c Waste Separation	4.5	4.3
A 5. Energy- and Water-Consumption	2.4	1.2
A 5.a Energy Consumption	4.2	0.1
A 5.b Water Consumption	0.7	2.3
B. Economy	2.7	2.4
B 1. Employment	3.4	1.7
B 1.a Unemployment Rate	4.9	1.3
B 1.b Economic Diversity	1.9	2
B 2. Level of Education	3.2	3.2
B 3. Cost of Living	0.2	2.6
B 4. Economic Vitality	3.4	1.5
B 4.a Bankruptcies vs. New Businesses	2.9	1.8
B 4.b Commuting Habits	3.9	1.2
B 5. Mobility	3.1	3.3
B 5.a Car Ownership	1.1	1.6
B 5.b Internet Access	5	5

Table 34: continued

	Gagnef municipality	Vansbro municipality
C. Society	3.9	2.2
C 1. Population Structure	3.8	2.8
C 2. Population Development	4	0
C 3. Health C 3.a Sick-Leave Rate C 3.b Life Expectancy	2.6 2.6 2.7	0.9 0.3 1.5
C 4. Culture C 4.a Municipal Expenditures C 4.b Cultural Events	4.1 3.5 4.7	2.3 2.5 2.2
C 5. Incidence of Crime	5	4.9
D Social Equity	2.5	2.7
D 1. Gender Equality D 1.a Leading Positions D 1.b Income Differences between Genders	1.3 1.4 1.2	2.5 1.6 3.5
D 2. Quality of Life	3.2	0.9
D 3. Access to Facilities	1.6	2.5
D 4. Quality of Public Transport	2.7	3.7
D 5. Voter Turnout	4	3.9

A further summation of the strands' average scores would result in a *sustainable development index* (ZENNER 2007). Such indices, also called *composite indicators*, have the ability "to integrate large amounts of information into easily understood formats for a general audience" (FREUDENBERG 2003, p. 5). They allow comparisons between regions, mostly on nation level, and the compilation of rankings.

Furthermore, they provide a starting point for further analysis, for which the original data should be revisited, for example, to identify strengths and weaknesses at a disaggregated level (FREUDENBERG 2003). This is an important aspect, because the compilation of indices balances positive and negative values (BLACH & IRMEN 1999). It is not very common to consult the original data, instead the overall result of an index is discussed and cited. This contradicts the aim of an index to easily communicate large amounts of information, but at the same time build the base for further analysis at a disaggregated level. Another problem of these average figures is the implicit assumption of the substitutability of their components.

> "*For example, composite environmental indicators imply that clean air can compensate for water quality. In fact, the multidimensional nature of most performance areas argues for a set of indicators and against composites.*" (FREUDENBERG 2003, p. 53).

The latter applies to sustainable development, because this subject touches upon a wide variety of factors, often resulting in very different findings of the single indicators. It is thus not feasible to calculate a sustainable development index based on average figures.

Yet, a tool is still needed to communicate sustainable development indicators. Such a tool should be easy to understand, but at the same time integrate large amounts of information to be able to communicate complex topics. Such a tool could be the graph presented below (fig. 2), a so called *Sustainability Spider Diagram*. This kind of graph visualises the assessment of regional sustainability and regional variations relating to other regions or to a reference value (NLÖ 2004). Figure 2 shows the results for all indicators divided by municipality, allowing a direct and easy comparison between both case study municipalities. The biggest disparities exist in the areas of Population Density, Cost of Living, Economic Vitality, Population Development, Health and Quality of Life.

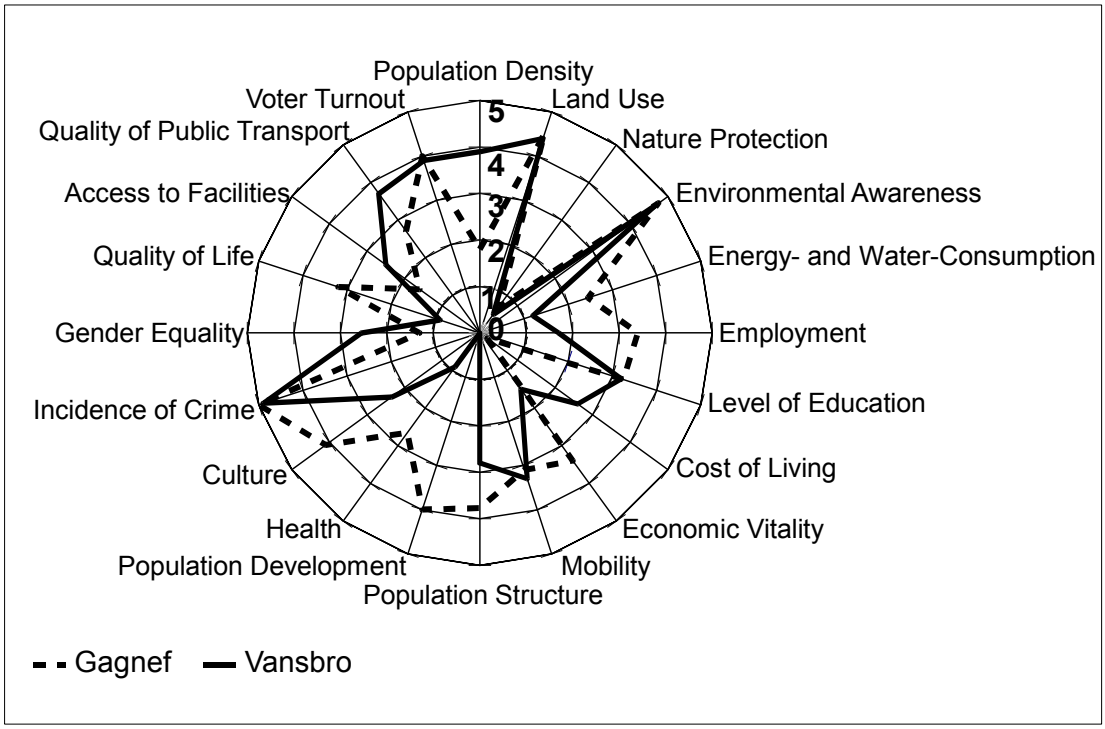

Fig. 2: Local sustainability of the study areas – results for all indicators, divided by municipality

5 Discussion

The chapter first discusses aspects, which influenced the methods applied. This is followed by the indicators' discussion. The chapter is concluded by a compilation of the indicators' discussion.

5.1 Methods

Three basic aspects influenced the methods used and are discussed in this chapter. First, the choice of case study areas is discussed with regard to the focus on rural municipalities. This focus naturally influenced the choice of case study areas and units. Second, choice of two adjacent municipalities as case studies is considered. Third, the aim to develop generally applicable indicators is discussed. This aim guided the choice of indicators to a great extent.

Rural municipalities are in focus of this study. The choice of rural areas as case study area has to be discussed relating to the situation of rural areas in Sweden. In the last two decades, Swedish regional policy underwent major changes. It shifted from securing equal opportunities in all parts of the country towards the aim that all regions should work to contribute to the nation's economic growth (QUIOGUE 2005). This shift resulted in an "exodus of the rural dimension from the regional policy" (WESTHOLM 2003, p.6). The emphasis is now laid on local labour markets, because they are recognized as a key factor to boost economic growth. Areas beyond the local labour markets are not regarded in the new regional development policy. Thus, large parts of rural areas of Sweden are excluded from the new policy. It is suspected that

> "*the government wants to withdraw its frontlines for regional growth to those regions it thinks most likely to succeed, leaving the rest of the country to the laboratories of some kind of rural development*" (KNUDSEN 2003, p.13).

Rural regions are considered to not be able to keep up with concentration and specialisation demanded by the new market, due to their low level of education and unfavourable age structure. A rural development system is not considered as being relevant any more and is thus neglected (WESTHOLM 2003). The avoidance of having rural areas is also reflected by the definition of *Urban Locality* (see footnote 13) used in Sweden. The resulting degree of urbanization of 84% (LINDEMANN 2004) has to be treated with care and with the underlying definition in mind.

To focus on an area which the Swedish Government excludes from regional development policies, effects the choice of indicators and their results. The indicator Commuting Habits touches upon the problem of local labour markets as spatial

units. Measurement of this indicator was greatly influenced by the Government's focus on local labour markets (see 5.2.2). Besides this direct impact, other indicators and their results could be influenced in a rather indirect way. Municipalities in rural areas probably experience disadvantages, in regard to their economic performance, because of the new regional policy. This in turn could have negative impacts on the population development of these municipalities and thus on the indicators grouped under the social and social equity strands.

The choice of two adjacent case study municipalities proved to be suitable for the selection of indicators. The chosen indicators were able to detect differences between the two case study municipalities, and are thus suitable for this small level. Additionally, it helped to test their transferability, especially with regard to data availability. This aspect was important for indicators, which are based on statistics from municipal or county authorities (e.g. waste and water statistics). The replication logic of multiple case studies becomes apparent there. Availability of certain data in one case could be a coincidence. But existence of comparable data in two cases implies a broad availability of figures. Thus, the approach of using two adjacent case study municipalities should be maintained in future studies.

The aim of creating generally applicable indicators needs to be discussed as well. This aim could facilitate the comparability of regions, which is an aspect that gains more importance on a European level, since European regions are engaged in an increasing 'competition of regions' (MOSE 2005). In contrast to this, VALENTIN & SPANGENBERG (2000) postulate that an individual set of indicators has to be developed for each community. This approach underlines the individuality of different communities. But, development of indicators should follow a common structure, which “provides a possibility to compare communities without ignoring their specific needs and situations.“ (ibid, p. 384). This approach also recognises the need of comparisons between regions.

Yet, comparisons of results, which are based on different definitions and measurements, are of questionable value. There is no doubt, that each community is different. The best way to express this individuality is to develop individual indicator sets for every community. But, these indicators should be integrated or accompanied by a set of generally applicable indicators to allow reliable comparisons between communities (KREFT 2001). This supports the aim of this study to develop a generally applicable set of indicators for rural municipalities.

5.2 Indicators

The 20 indicators, including all sub-indicators, are discussed in this chapter. The indicators are grouped under the four strands of sustainability set by the underlying definition of sustainability (Environment, Economy, Society, Social Equity). Thus, they appear in the same order as in the previous chapter.

5.2.1 Environment

The Environment strand (A) consists of the five indicators 1. Population Density, 2. Land Use, 3. Nature Protection, 4. Environmental Awareness and 5. Energy- and Water-Consumption.

A 1. Population Density

The indicator Population Density allows estimations about the degree of urbanization and, especially, fragmentation of an area. A high population density results most likely in a high fragmentation of the landscape. The opposite is probably true for regions with a low population density. But population density, as it is measured here, is only an average figure, which does not necessarily reflect reality. Kiruna municipality is an extreme, yet very descriptive, example for the discrepancy of average density figures to reality. The municipality of Kiruna has on average a population density of 1.1 pop/km². But around 79% of the total population live in Kiruna locality, which accounts for only 0.08% of the total area of Kiruna municipality. This results in the enormous population density of 1,140 pop/km² for Kiruna locality (STATISTICS SWEDEN 2008a+b). Thus, the average density figure for the municipality of Kiruna covers the regional differences within the municipality.

This example also poses the question if administrative units are appropriate reference areas for calculating population density. The total area of a municipality might be too large as reference area (LINDEMANN 2004). Additionally, administrative borders often cross natural regions, making it impossible to compare population densities of these regions. This is relevant to determine the life-sustaining capacity of regions. But reliable data about population and area, are often available for administrative units rather than for natural regions (BÄHR *et al.* 1992). This speaks for the use of administrative units as reference area. An alternative reference area could be, for example, only the settlement area of a municipality (KULS 1993). Lack of reliable data often prevents use of this more accurate measurement.

The assessment scale of the indicator rates no inhabitants as the best possible result. The idea behind this scale is that wild land, which is unaffected by human impacts, has a high ecological value. Such areas could provide essential habitat

networks for species, especially for the survival of species which require large habitats and minimal contact to humans (POWELL & HERLIN 2006). The assignment of this indicator to the environment strand justifies that the assessment scale neglects negative impacts of low population density on economic and social issues. These impacts are, for example, problems with the supply of groceries and profitability of shops as well as a lack of qualified employees (LÖFFLER 2004).

One way to avoid all the above mentioned limitations of the indicator Population Density, could be the use of an indicator Fragmentation of Habitats. The UNITED NATIONS (2007) suggest the use of this indicator, because

> "*the fragmentation of habitats caused by human activities has significant, largely negative implications for their native biodiversity, through the effects of area reduction, edge exposure and isolation, as well as through interruption of ecosystem processes and associated ecosystem degradation.*" (ibid, p. 73).

Such an indicator would reflect the degree of human impact on nature in a region. Even though this indicator is suggested by the United Nations, no unit of measurement or underlying definitions are determined yet (ibid n.d.).

Until reliable data is available for the above mentioned alternatives, the indicator Population Density, as it was applied in this study, is recommend for future studies. But, the indicator's limitations should be kept in mind and results should thus be interpreted with caution.

A 2. Land Use

> "*Land is becoming an increasingly scarce resource, particularly quality land for primary production of biomass and for conservation, due to expanding human requirements*" (UNITED NATIONS 2001, p. 41).

Changes in land use because of increasing settlement activities mainly result in irreparable damages to the soil. If a deconstruction becomes necessary, the further use of these areas is very limited. Additionally, urban sprawl reduces the size of wildlife habitats, as well as recreation areas for people (BLACH & IRMEN 1999). These aspects should be considered before the designation of new areas for settlement and industry.

Changes in the distribution of agricultural land can reflect increasing or decreasing pressure on this sector. The situation for agriculturists has become more and more difficult in the last years. Despite mainly falling food prices they have to achieve food security and support social and economic development as well as the maintenance of rural lifestyles. These challenges can be met if agriculture is practised in a sustainable way. The same is true for forests. In order to secure their many resources and functions for future generations, they have to be managed according

to sustainable principles. The analysis of land use changes can thus provide valuable information for land planning decisions (UNITED NATIONS 2001).

The significance of an indicator Land Use, measured as land use change, is explained above. Another measurement for this indicator could be to assess proportions of different kinds of land uses. This would avoid problems in obtaining reliable times series to monitor development in a municipality (see 4.2.1, A 2). But a lot of research would be necessary to determine a sustainable distribution of land use types in a region. Additionally, separate analyses would be needed for different regions due to differences regarding climate, geology and soil. As long as there exists no reliable solution for this aspect, the indicator's measurement applied in this study should be maintained.

A 3. Nature Protection

Previously, this indicator was divided into the two sub-indicators Nearness to Natural State and species diversity of the Vegetation (see ZENNER 2007). But no official statistic was available providing this kind of data for the whole area of a municipality. To conduct a vegetation mapping that covers both case study municipalities could not be done with reasonable time and work effort, because they cover a quite large area of around 800 km² (Gagnef) and 1600 km² (Vansbro). The use of a vegetation indicator is also problematic in terms of easy applicability and transferability of the indicators to other regions. Additionally, it is questionable if data from vegetation mapping should be compared to figures from surveys or administrative registers. So the indicator was changed and divided in two different sub-indicators: A 3.a Biodiversity and A 3.b Nature Protection Areas.

A 3.a Biodiversity

Decreasing biodiversity threatens the stability of ecosystems as well as potential utilisation of species by men. The latter includes for example medical and agricultural utilisation of wild species. Agriculture has to compensate loss of biodiversity through increased use of pesticides and insecticides, which in turn threatens the quality of ground and drinking water (BLACH & IRMEN 1999).

Additionally, the *Convention on Biological Diversity* (CBD) assigns biodiversity its own intrinsic value and an essential part in maintaining human life and sustainable development (UNITED NATIONS n.d.). Sweden ratified the convention in 1993, one year after it was opened for signature at the *Earth Summit* in Rio de Janeiro in 1992 (SCBD 2008). Biodiversity is part of the national *Sustainable Development Indicators* of Sweden and measured as number of endangered and extinct species. The “maintenance and conservation of biological diversity for future generations” justifies

the indicator's choice (STATISTICS SWEDEN 2001, p. 51). This indicator is also connected to all Swedish Environmental Objectives and relevant to numerous other global and regional environmental agreements[20].

Despite the great importance of biodiversity, no practicable and universally accepted measurement exists for this indicator. Lack of reliable time-series of population data is the main factor preventing its application. Biodiversity changes at species and habitat level are mainly measured and assessed specifically for individual cases. Although it is widely accepted to avoid further loss of biological diversity, no quantified international targets exist (UNITED NATIONS n.d.). The same is true on national level for Sweden (STATISTICS SWEDEN 2001). Lack of data about endangered and extinct species constrains the indicators use. Additionally, the lack of knowledge about the total number of species occurring, restricts the application of this indicator in general and in this study (E 5). Some of the indicator's limitations could be avoided through concentration on a specific group of species, like population of farmland birds (LEDOUX *et al.* 2005). If reliable data of this kind is available for the whole area of a municipality, its use is recommended for a future study.

A 3.b Nature Protection Areas

The proportion of protected areas of the total area is one of few quantifiable dimensions regarding nature conservation. This indicator provides no information about the quality or state of these areas and is thus limited in its significance (NLÖ 2004). Additional figures would be needed to express this (UNITED NATIONS 2001). Information about the quality of protected areas might be available if these areas are also protected under the *Habitat Directive* from the European Union. In Sweden, areas belonging to the Natura 2000 network, are described in detail on the Natura 2000 web page from SEPA (NATURVÅRDSVERKET 2008). Despite the detailed description, no single figure could be derived from there to be used as an indicator. If such a figure could be obtained, its use is recommended for a future study, for example, in combination with the indicator Nature Protection Areas.

Despite this limitation, the indicator is still a widely used environment indicator and is also part of the *Sustainability Indicators* of Sweden (GOVCOM 2005). Its relevance is stated as:

> *"Setting aside protected areas is a measure to conserve and protect valuable natural environments for future generations, preserve biological diversity and species of special conservation value, and secure land areas for outdoor activities"* (STATISTICS SWEDEN 2001, p. 49).

20 For example: Convention on the Conservation of Migratory Species of Wild Animals (Bonn); Convention on Wetlands of International Importance especially as Waterfowl Habitat (Ramsar); Convention on the Conservation of European Wildlife and Natural Habitats (Bern Convention) (UNITED NATIONS n.d.)

Especially the aspect of protecting areas for future generations stresses the importance of this indicator. The designation of conservation areas generally preserves species and habitats as well as acute endangered species. But it also helps to prevent negative effects from future building projects and promotes environment friendly land use (NLÖ 2004).

To secure land areas for outdoor activities enables people to experience nature, which is important to understand the significance of a healthy environment. This aspect might be less important in Sweden, where the Right of Public Access grants access to public and privately owned land for recreation or exercise. This Right comes along with the responsibility to not destroy or disturb anything or anyone. But the Right of Public Access might cause problems if the recreation pressure increases or if too many persons do not respect the Right's restrictions. This underlines the importance of nature reserves and other protected areas, even in Sweden, for which special restrictions and exceptions from the Right exist.

A 4. Environmental Awareness

The indicator Environmental Awareness is divided into three sub-indicators: A 4.a Use of Fertiliser and Pesticides, A 4.b Resource Saving Measures and A 4.c Waste Separation.

A 4.a Use of Fertiliser and Pesticides

The use of fertiliser and pesticides potentially threatens biological diversity and people's health. This indicator is especially important in regions with a high amount of agricultural industry. Intensive fertiliser application can accelerate eutrophication of water bodies, soil acidification and contaminate drinking water sources with nitrates. Pesticides can accumulate in the soil, biota and groundwater and eventually enter the human food chain.

Especially substances that accumulate in plants, animals and humans should be applied carefully or abandoned, because “the use of chemicals today can also pose a threat to coming generations” (STATISTICS SWEDEN 2001, p.47). Reduced consumption of fertiliser and pesticides can diminish their negative impacts. But agriculture also has to ensure the food production and supply. The challenge is to accomplish this in a sustainable way (UNITED NATIONS 2001).

Due to lack of data on municipal level, this indicator was not applied to the case studies in Dalarna. But agricultural land makes up only a small amount of the area in Dalarna (see 4.2.1, A 2).

Therefore the indicator is of limited significance in this region. The indicator is still important for sustainable development and is thus maintained in the set. If a future study is conducted in a region with a higher amount of agricultural land, it is recommended to apply this indicator.

A 4.b Resource Saving Measures

The use of non renewable resources not only diminishes these finite sources, but production processes also harm the environment. This is particularly true for construction minerals like natural gravel. Mining of these resources is often done in open pits, which usually make a drawdown of the groundwater level necessary. The negative impacts on the environment of this method are tremendous. Additionally, large areas are occupied by the mines, which can create conflicts with other land utilisations (BLACH & IRMEN 1999).

Gravel is an important material for building streets and it is also used for the production of concrete. But this material is quite limited in its amount. Therefore, it is important to replace gravel with other renewable resources (CAB DALARNA 2007). A future study could also examine other near to the surface materials, like sand, for this indicator.

A 4.c Waste Separation

Increasing quantities of waste reflect, to a certain extent, unsustainable consumption. More and more waste is produced because of an increasing urge of people for consumption and shorter durability of products (BLACH & IRMEN 1999). A minimal aim of waste management should be the reduction and eventually abolishment of waste stored in landfills. In Sweden, landfilling of sorted combustible and organic waste is not allowed any more since 2002 and 2005 respectively (STATISTICS SWEDEN 2001). Further actions should promote waste reduction as well as reuse, recycling of materials and recovery of energy (STATISTICS SWEDEN 2001, NLÖ 2004).

Despite increasing quantities of waste, the Swedish waste management is still successful because “the recycling capacity has increased even further” (AVFALL SVERIGE 2006, p. 4). Commitment of Swedish residents, industry, several organisations and authorities accomplished this situation and is necessary for further progress.

A 5. Energy- and Water-Consumption

The indicator Energy- and Water-Consumption is divided into two sub-indicators: A 5.a Energy Consumption and A 5.b Water Consumption.

A 5.a Energy Consumption

It is a widely accepted fact that energy is essential for industrial development and to provide services to improve the quality of life. Especially economic development is coupled to energy use. But

> "*its production, use and by-products have resulted in major pressures on the environment, both by depleting resources and by creating pollution*" (UNITED NATIONS 2007, p. 86).

The development should steer towards higher energy efficiency, lower consumption and increased use of renewable resources (BLACH & IRMEN 1999). But still the most environmental friendly option is to reduce energy consumption, because all kinds of energy production are connected to some kind of negative environmental impacts: Combustion of fossil fuels depletes non-renewable resources and releases greenhouse gases. The use of nuclear power is connected to the risk of accidents and the unsolved question of safe keeping of radioactive waste. Wind turbines can create conflicts with nature and landscape protection as well as residents, if they are located improperly. Hydropower stations are problematic for the ecology of watercourses, especially as barriers for migrating fish. And the net energy balance as well as material input of solar and biomass energy have to be considered in their environment track record (NLÖ 2004).

To avoid many of these problems, a drastic reduction of energy consumption would be helpful. The minimal aim should at least be a transition towards the more environmentally friendly energy production with renewable resources. Knowledge about the amount of renewable resources of the total energy production could complete the analysis of energy consumption in a municipality. If this kind of data is accessible, its use is additionally recommended in a future study.

A 5.b Water Consumption

Water consumption in terms of drinking water in its true sense only accounts for a very small amount of people's daily water use. For example, figures for Germany show that from approximately 130 litres/day/person, only five litres of water are consumed as "food" (DEUTSCHE UMWELTHILFE 2004). Cleaning, washing, toilet flushing and many other things take up the whole rest. Some of these activities could be done with rain- or grey-water instead of drinking water. Even if plenty of high quality water is available, such water saving measures would contribute to sustainable depletion of groundwater sources. The protection and reasonable use of the groundwater system are covered by one of the Swedish *Environmental Objectives*, called *Good-Quality Groundwater* (SEPA 2008). This is a first step towards recognizing the importance of water supply and use in Sweden.

Water consumption is not considered a problem in Dalarna, because water of high quality is widely available throughout the county (E 5). Only minor pH-adjustments are necessary in one of the four waterworks of Gagnef, which proves the high quality of water in the whole area (DALA VATTEN OCH AVFALL 2008). Another hint about the water quality is the number of people connected to the municipal water system. People who are not connected to the system have a well on their own. This applies to about 6% (Gagnef) and 17% (Vansbro) of the case studies' inhabitants (DALA VATTEN OCH AVFALL 2008, VANSBRO KOMMUN 2008). The big difference might explain the very different figures for water consumption in both municipalities.

Despite limitations of the available data (see 4.2.1) the indicator is kept in the list. More accurate data could result in more reliable results in a future study. Also, time-series about water consumption could provide interesting results about consumption development. If this kind of data is available, it could be used as reference instead of a regional comparison in the assessment scale.

5.2.2 Economy

The Economy strand (B) consists of the five indicators 1. Employment, 2. Level of Education, 3. Cost of Living, 4. Economic Vitality and 5. Mobility.

B 1. Employment

The indicator Employment is divided into two sub-indicators: B 1.a Unemployment and B 1.b Economic Diversity.

B 1.a Unemployment

Unemployment rate is a widely used figure to describe a region, regardless if the focus is on a single municipality (AGENDA TRANSFER 2003), a region (BLACH & IRMEN 1999) or a whole country (OECD 2008). It effects not only the economic and social situation of a region, but it can also cause personal difficulties for persons confronted with unemployment (BLACH & IRMEN 1999). Data to measure this indicator is easy to gather, since in most countries unemployed persons have to report to an employment office. The widely available data probably contributes to the frequent use of this figure. In order to get a clearer picture of which groups are affected most by unemployment, it is advisable to look at figures differentiated by age and gender (AGENDA TRANSFER 2003). Especially unemployment among young people is often high in rural areas, which causes this group to move to bigger cities. This contributes to the population decline most rural areas face today. A weighted assessment of unemployment rates by age groups could be considered in a future study.

B 1.b Economic Diversity

The indicator Economic Diversity reflects the assumption, that a high economic diversity can lead to a higher economic stability in a region. The presence of only a few industry sectors in a region can result in a strong dependency which in turn makes the region vulnerable to structural changes. A high economic diversity also offers a broader range of possible occupations, making a region attractive for employees (BLACH & IRMEN 1999).

The primary sector (agriculture, hunting, forestry, fishing) is often an important sector in rural areas. This does not apply to the two case study municipalities, since this category only accounts for 1.6% (Gagnef) and 2.8% (Vansbro) of the employees. But agriculture in Dalarna in general is not of great importance, since about 70% of the area is forest land and arable land is rare (see 4.2.1, A 2). Additionally, forest work in Sweden is highly mechanized nowadays, so that this work requires only a few qualified persons (GLÄSSER *et al.* 2003).

Overall, the two regions examined here show a similar distribution pattern in the ten categories. Due to the dominance of two sectors, where about half of the employees work, the economy is not very diverse in both case study municipalities. The negative experience in Gagnef regarding the concentration on one sector, underlines the importance of the indicator Economic Diversity for rural municipalities (see 4.1.2).

B 2. Level of Education

The national indicator set of Sweden also contains an indicator Level of Education. Its use is justified as follows:

> *"The level of education is crucial to many aspects of sustainable development, especially the development and adaptation of new techniques, logistics, planning and management needed to move towards sustainability. It is also of great individual importance and varies in relation to many health aspects, salary and employment status, all of which are essential to our well-being. A high educational level among the population is also considered to have major significance for the economic development of a country."* (STATISTICS SWEDEN 2001, p. 38).

This may be true for the development of a whole nation, but a high level of education is not necessarily positive for rural areas. Well-educated people tend to be mobile and move away from these areas in order to find a qualified employment. Modern transportation and communication systems could enable them to combine their job with living in rural areas (see 5.2.2, B 4 and 5). Nevertheless, a certain level of education is necessary for sustainable development, regardless of the spatial unit or area.

The measurement applied for Level of Education in this study creates the possibility to include degrees achieved through adult educational programs. ZENNER (2007) measured this indicator as the age when people finished education. Considerations of the kind of degree achieved results in more reliable and comparable data.

B 3. Cost of Living

The *Household Budget Survey* of Statistics Sweden provides the data base of the indicator Cost of Living. Despite some limitations of the available data, its use is still reasonable. The use of figures which are only available for aggregated municipalities as measurement for Cost of Living can be scrutinized. Throughout this study, municipalities are the spatial level in focus. To look at a different spatial level for one indicator might be criticised, but the quality of data from the *Household Budget Survey* justifies their utilization. The different groups of expenses take into account everything a household has to spend money on. This gives a very precise picture of the overall cost of living in different areas. It also takes on ZENNER's (2007) suggestion to consider more aspects than only food prices for the measurement of this indicator.

Use of the measurement applied here is also recommended for a future study, with respect to transferability and comparability of indicators. Eurostat published guidelines for conduction of household budget surveys in the EU, which Statistics Sweden follows as far as possible (SCB 2008a). Statistic authorities in other European countries might do the same, which should result in comparable data for different EU members.

B 4. Economic Vitality

The indicator Economic Vitality is divided into two sub-indicators: B 4.a New Businesses vs. Bankruptcies and B 4.b Commuting Habits. This indicator was chosen to replace the indicator Condition and Tenure of Housing, which was used by ZENNER (2007). Three factors caused this change. First, data availability of housing statistics is rather limited, especially with regard to condition of housing. This applies to most European countries, including Sweden (OTB 2008).

Second, comparisons between different European countries would be of limited value, because data, definitions and methods used, differ in each country (OTB 2008). National statistical institutes were not able to provide housing statistics suitable for a comparison between European countries (BOVERKET 2005). These factors contradict the aim of this study to create generally applicable indicators. To omit condition of housing as an indicator does not imply that this topic is not relevant for sustainable development. But until reliable data, and not only expert

estimations, about this topic are available, an indicator Condition of Housing should be omitted. Despite the mentioned limitations of housing statistics, a report on this topic implies that the Swedish housing stock is well insulated. For example, the amount of triple glazing is higher than the amount of double glazing, which is, together with Finland, a quite unique situation in Europe. The good insulation of houses is probably related to the cold climate in both countries (OTB 2008). These findings do not necessarily apply to holiday houses in Sweden, which are usually used only during the warm summer months.

Third, introduction of an indicator Commuting Habits takes up ZENNER's (2007) suggestion to include commuting in the set of indicators.

B 4.a New Businesses vs. Bankruptcies

A municipality's economy can be regarded viable if the number of new businesses is higher than the number of bankruptcies. This indicator should at least be balanced, but the long term development should aim at higher numbers of new businesses (ECOLOG INSTITUT 2008). The measurement applied for this indicator has a positive as well as a negative aspect. To set the difference between newly started businesses and bankruptcies in relation to the number of inhabitants allows comparisons between different regions. This is positive for the use and transferability of the indicator. But a better result could be achieved through the use of *real death* figures instead of number of bankruptcies (see 4.2.2, B 4). It is more common for an enterprise to simply close down than to go into bankruptcy (STATISTICS SWEDEN 2001), which results in a possible overestimation of this indicator. If figures about the real death rate of enterprises are available, their use should be preferred in a future study.

B 4.b Commuting Habits

The assessment of Commuting Habits was influenced by a wide variety of factors. First to mention is that the Swedish Government supports mobility of the labour force as an important part of a well functioning labour market (PROP 2001). Regional development policies aim at creating balanced and sustainable local labour markets in the whole country. This can be achieved through larger and therefore more competitive regions, based on short- and long-distance commuting (SANDOW 2008). Larger local labour markets offer a wider variety of job opportunities, making it easier for individuals to find a qualified job (PROP 2005). But the daily journeys to work are often done by car, even though this varies greatly throughout the regions of Sweden. In *Large Cities* the difference between journeys to work by car (41%) and using public transportation (32%) is rather small.

In more rural areas like *Commuter Municipalities* (Gagnef) or *Sparsely Populated Municipalities* (Vansbro) the car is by far the most frequently used mode of transportation (75% and 76% respectively) compared to the use of public transportation (8% and 3% respectively). However, the car is often the only alternative for travels to work in rural areas (SIKA 2007).

At the same time, the distance covered on the daily way to work is important due to social and environmental reasons. Long distance commuting is often time-consuming and expensive (SANDOW 2008). And with most commuting in rural areas done by car commuting costs become more and more important. Additionally, these long travels potentially result in higher emission rates (BLACH & IRMEN 1999). This contradicts the aim of reducing climate impact, which is one of the 15 *Environmental Objectives* adopted by the Swedish parliament in 1999. The increased release of carbon dioxide is mainly caused by all kinds of transportation including cars using fossil fuels (SEPA 2001).

The negative environmental impact is not the only aspect in which the current commuting policy contradicts other government policies. In 1991 the *Act on Equality between Men and Women* was passed with the aim of creating equality in working life for both genders (SFS 1991). This act conflicts with current regional development policies of creating larger labour markets which results in disadvantages for many women. Geographically larger local labour markets are supposed to offer a greater variety of jobs and career possibilities. Due to household and childcare commitments (SANDOW 2008) or a badly developed public transportation system, women often experience a limited mobility, since it is quite common that men use the family car for commuting (OTTOSSON 2006). This means that women cannot benefit from larger local labour markets to the same extent as men. A study about part-time employment and unemployment in Gagnef showed that especially in such a small municipality women are considerably more limited in their mobility than men (OTTOSSON 2006).

Another contradiction is the spatial unit taken into account regarding economic topics. The concept of local labour markets is often used in combination with economic issues like company statistics and labour statistics from administrative sources. But the majority of these functional regions consists of two or more municipalities (STATISTICS SWEDEN 2007) whereas, at the same time, government documents also stress the importance of a municipality as a spatial unit. A good municipal economy is regarded to be fundamental for a positive long term development of a municipality (SOU 2004). So, the spatial unit to focus on when discussing

economic issues is not consistent throughout public institutions in Sweden. The competing models of local labour market vs. municipality make the discussion confusing and many figures and statistics hard to compare.

In order to find a balance between different factors influencing commuting, local labour markets were chosen as the model to focus on, even though the area of interest in this study is the municipality. But high employment rates are important for municipal development, regardless of where people work. This corresponds to government policies supporting commuting to make more and better job opportunities accessible. These aspects determine the spatial unit in focus for this indicator. The assessment scale on the other hand takes into account negative social and environmental aspects of commuting. This study rates fewer commuters to be the better situation, mainly due to huge negative impacts created by intensive car use for these daily travels. If more commuters would use public transportation for their ways to work, a different assessment scale should be considered.

The choice of taking into account only those commuters leaving their local labour market instead of those leaving their municipality has a considerable impact on the result of Gagnef. With the first kind of measurement applied, its result is well below the average of Dalarna. But regarding the percentage of commuters leaving the municipality, Gagnef has, with 46.5%, the second highest amount of commuters in Dalarna and is far above the average of 26.8%. In the case of Vansbro the different measurements do not make a difference, since the local labour market is identical with municipality borders (see appendix 12).

B 5. Mobility

Transportation of any kind, including private car use, is often related to communication and IT technologies. Especially with regard to reduced fuel consumption and achievement of environmental and climate goals (KOMMISSIONEN MOT OLJEBEROENDE 2006). Both sub-indicators, B 5. a Car Ownership and B 5.b Internet Access, contribute with different aspects to an overall topic of Mobility.

B 5.a Car Ownership

Car ownership and thus mobility is important for social and economic development of rural areas (see above Commuting Habits), especially in regions with limited public transportation. However, car use should not be assessed completely positive. Environmental impacts of cars using fossil fuels are well known. Increased traffic also results in more noise, traffic jams and accidents with injured or killed people. To diminish negative effects for environment and climate, the Swedish government in 2007 introduced the *Green Car Premium*. Each private person who buys a green

car is supported with 10,000 SEK (SIKA 2008a). The amount of green cars, measured as percentage of cars in environmental classes I, II and III, is an indicator of the *Sustainable Development Indicators* of Sweden (GOVCOM 2005). These attempts try to make car use more environmental friendly. But in the long run other transportation systems should be supported to reduce resource consumption.

Besides mobility of the work force, car ownership as an economic indicator, can also reflect the community's wealth. Knowledge of the total number of cars owned is necessary to measure this. Even though these figures are available for municipalities in Sweden, negative environmental and social aspects were rated higher. Increasing numbers of cars owned result therefore in lower points on the assessment scale in this study.

B 5.b Internet Access

Widespread access to computers and Internet is often considered conducive to overall and, especially, economic development (UNITED NATIONS n.d.). Internet usage allows access to information, education and communication even in peripheral regions, creating “equal conditions for business and everyday life in different parts of the country” (SOU 2008a, p. 17). The term *digital equity* summarizes this idea accurately.

A well-developed IT infrastructure could also help to reduce the amount of, especially long-distance, commuters from rural areas. Home offices and video meetings are just two of many possibilities to reduce travel and thus resource use (KOMMISSIONEN MOT OLJEBEROENDE 2006). This would have several positive effects:

- create more vibrant rural areas with regard to social aspects
- offer new job opportunities in regions disadvantaged through their geographical location (IT POLICY STRATEGY GROUP 2006)
- reduce negative effects for the environment due to fewer travels by car (UNITED NATIONS n.d.)
- reduce other negative effects of intensive car use, such as noise, traffic jams and accidents

The precondition for all these aspects is a minimum symmetric transmission speed of 2 Mbit/s. Between 2001 and 2007 the Swedish Government already funded broadband expansion in different areas. The state should also take overall responsibility for further expansion of IT infrastructure with high transmission rate (SOU 2008a).

Despite the various opportunities IT offers, it can of course not cure everything. Well developed IT infrastructure can be a catalyst and tool for sustainable

development in rural areas. The national *Sustainable Development Indicators* of Sweden include computers and broadband as an indicator. Similar to this study, this aspect is measured there as percentage of the population with computers and broadband connections (GOVCOM 2005).

5.2.3 Society

The Society strand (C) consists of the five indicators 1. Population Structure, 2. Population Development, 3. Health, 4. Culture and 5. Incidence of Crime.

C 1. Population Structure

The problem of an ageing population is partly considered in national *Sustainability Indicators* of Sweden with an indicator called *Demographic Dependency Ratio*. It is measured as the number of people aged 19 or less and 65 or older divided by the working age population (aged 20-64) and multiplied by 100 (GOVCOM 2005). This indicator concentrates on the number of persons depending on the working age population, regardless if they are too young or too old to work. The dependency ratio is expected to increase from 70 people per 100 members of the working age population in 2005 to about 84 in 2050. Main cause for this increase will be a quick rise in the percentage of elderly people.

The assessment scale used in this study goes one step further than the national indicators of Sweden. Instead of considering only the total percentage of dependent population, the amount of young and elderly persons is rated separately. This approach gives a clearer picture of the age structure of the population.

C 2. Population Development

Population Development can either mean growth or decrease regarding the amount of inhabitants in a municipality. Rapid population changes influence sustainable development in various ways, regardless if the population trend is positive or negative.

Implications of quick population growth exist in regard to indicators dealing with education, infrastructure and employment. It can contribute to environmental degradation, especially if it occurs together

> "*with poverty and lack of access to resources, or unsustainable patterns of production and consumption, or in ecologically vulnerable zones*" (UNITED NATIONS 2001, p.118).

This is quite often, but certainly not always the case.

Population decrease on the other hand can influence the distribution of public services, such as health service, schools and public authorities. In order to maintain this kind of facilities, a certain amount of inhabitants is necessary. Another linkage of population decrease exists towards the distribution of shopping facilities. The change in size, structure and distribution of stores is accompanied by a change in consumer behaviour. People living in rural areas tend to purchase more items in bigger or more central towns. This behavioural change could be related to close-downs of shops in rural areas, but the opposite cause-effect-chain is also possible (LÖFFLER 2004).

C 3. Health

The indicator Health is divided in two sub-indicators: C 3.a Sick-Leave Rate and C 3.b Life Expectancy. This indicator was chosen to replace the indicator Houses with Basic Amenities, which was used by ZENNER (2007). Three facts justify this change. First, basic amenities, like availability of running water, lavatory, bath or shower and central heating, are part of almost every Swedish house (OTB 2008), but not necessarily holiday homes. These results correspond to ZENNER's findings for the Western Isle. The suggestion to consider the dwelling's energy efficiency instead of basic amenities, could not be realized due to lack of data. The aforementioned limited availability of housing statistics (see 5.2.2, B 4) is thus the second reason for the change to a health indicator.

Third, an indicator considering health issues was missing before, even though it was suggested to include this topic (ZENNER 2007). Health is an important issue for sustainable development, because the public health status influences human resources (SZERENYI 2001). It thus has impacts on economic and social development.

C 3.a Sick-Leave Rate

The amount of sick-leave days reflects the overall health state of the population. For most people it is crucial to be healthy is (BLACH & IRMEN 1999), which contributes to a high quality of life. Besides the individual and social importance of a healthy population, it also influences economic development. Illness related absenteeism can create production downtimes. If at the same time continuation of payments occur, negative impacts on a company are even more important (AOLG 2003).

A population's health can be measured in various ways, including surveys with question about the self-perceived health like those conducted by Dalarna County Council (GRANVIK 2007). The *European Working Conditions Survey* also includes one question about illness-related absenteeism from work (PAOLI & MERLLIÉ 2001).

But statements about health derived through surveys will naturally be very subjective. The use of sick-leave days on the other side produces more objective results. Additionally, data about this is quite precise and, at least in Sweden, easily accessible. These three aspects clearly speak for the use of sick-leave rates as a health indicator.

C 3.b Life Expectancy

Life expectancy at birth is regarded to be an effective indicator about general health conditions (WEINSTEIN & PILLAI 2005). This sub-indicator is linked to living conditions, such as medical and child care, nutrition and sanitation. But also actions to improve environmental conditions can result in a higher life expectancy (BLACH & IRMEN 1999). WEINSTEIN & PILLAI (2005) point out the special significance of women's life expectancy:

> "*The relationship between female life expectancy, and seven crucial development variables are all very strong. In particular, where average life expectancy is high, per capita gross national product, contraceptive use, and urbanization rates are also high, whereas death, birth, infant mortality and total fertility rates are low*." (ibid, p. 276).

This clearly shows the linkages of this factor to overall socio-economic development.

Within one country regional differences of life expectancy exist, but are relatively small. These variations could be due to migration for example of elderly people into areas with attractive landscapes or good infrastructure (BLACH & IRMEN 1999). This possible influence should be kept in mind by comparisons of life expectancy on regional level. The comparison of life expectancy by countries on the other hand, is a widely used and accepted figure. It is part of indicator systems for example from the WHO, UN as well as OECD. In the national *Sustainability Indicators* of Sweden life expectancy at birth is also the headline indicator for health (GOVCOM 2005).

The assessment scale used here for this indicator, implies that a longer life expectancy is better. This has to be seen critically with respect to the problems an ageing population could create. For example, an increased amount of elderly people in Sweden is expected to lift the demographic dependency ratio in the next forty years (see above Population Development).

Other possibilities to measure health could be the number of deaths caused by certain diseases. That would mean to only focus on a few factors with negative influence on people's health (BLACH & IRMEN 1999). But the necessary selection could never reflect the wide variety of factors really influencing health.

C 4. Culture

The indicator Culture is divided into two sub-indicators: C 4.a Municipal Expenditures for cultural concerns and C 4.b number of Cultural Events. Cultural customs and traditions can contribute to the attractiveness of a region and underline its uniqueness. A rich cultural life makes a municipality an attractive place to live and can contribute to the quality of life of its inhabitants. This aspect belongs to soft-location factors which gain more and more importance. In a highly specialised service society, economic success depends on qualified employees, transforming the competition of regions into a competition for *creative heads*. Qualified employees demand an attractive living environment, including a rich cultural life (MBV 2006).

C 4.a Municipal Expenditures

To find an appropriate indicator for culture is quite tricky. Cultural customs and traditions are naturally unique for different regions. In order to use them as an indicator it is necessary to express them through a simple figure. This could be achieved through a survey, including for example a question about the use of the regional language or dialect (e.g. ZENNER 2007). Another possibility is to express expenditures for cultural concerns as percentage of the overall running costs of a municipality. Data about this is easily accessible in Sweden and should be accessible in other countries as well. The significance of this indicator is limited by the fact that cultural events are sometimes organized and carried out by private organizations. Voluntary work is often not captured in official statistics and not necessarily funded by municipalities. This should be considered when analysing this indicator.

C 4.b Cultural Events

The indicator Cultural Events takes only events into account, which were organised by the Swedish Arts Council. Certainly, this covers not all cultural events arranged in a municipality. The results could thus be underestimated.

Besides that, there exists another limitation of the indicator. Participants in a cultural event in a certain municipality are not necessarily its inhabitants. The share of inhabitants in participants would be interesting to know, since this would show the extent to which residents participate in cultural activities in their municipality. Here it can only be assumed that most participants attend events in their municipality of residence. An active and committed population can help to preserve, but even more important, keep regional customs and traditions alive. If alternative figures are available, which avoid the above mentioned limitations, their use is recommended for a future study.

C 5. Incidence of Crime

Sustainable development should be able to create living conditions for peaceful and secure co-existence. Poverty and income disparities as well as rapid population growth are "included among those indicators that are generally considered crime-generating" (UNITED NATIONS 2001, p. 116). This illustrates the close linkage of crime to overall economic and social development. Crime is thus not merely a matter of illegal behaviour and law enforcement, which is a widely recognized fact.

Instead of reported crimes, Incidence of Crime could also be measured as perceived crime rate, as suggested by ZENNER (2007). The national *SD Indicators* of Sweden indeed use this measurement for a health indicator. Data for it is derived through the *Living Conditions Survey* of Statistics Sweden (GOVCOM 2005). The results of the survey are only available at the level of aggregated municipalities (H-regions). Since data about reported crimes are available on municipality level in Sweden, it was the preferred data base in this study.

5.2.4 Social Equity

The Social Equity strand (D) consists of the five indicators 1. Gender Equality, 2. Quality of Life, 3. Access to Facilities, 4. Quality of Public Transport and 5. Voter Turnout.

D 1. Gender Equality

The indicator Gender Equality is divided into two sub-indicators: D 1.a Leading Positions and D 1.b Income Differences between Genders.

D 1.a Leading Positions

Like in many other countries, the Swedish government passed the *Act of Equality between Women and Men* in 1991. The aim of this act is to promote equal rights for men and women in working life (SFS 1991). Still existing segregation on labour markets as well as in parliamentary institutions justify this act.

Overall progress of equality between men and women is reflected by the seat distribution among genders in elected local (municipal) councils (BLACH & IRMEN 1999). This indicator is also part of the conjointly suggested indicators of the German *Platform for Indicators on Sustainable Development in Municipalities* (AGENDA TRANSFER 2003).

D 1.b Income Differences between Genders

Inequalities of income between genders means in most cases lower incomes for women compared to incomes of men. The wider this gap is, the less attractive it becomes for women to work. Income differences could also be a hint at inequalities in educational opportunities for women. This indicator is thus linked to economic as well as social factors, like unemployment rate, education and poverty (UNITED NATIONS 2001).

Income differences can partly be explained by two facts: First, men and women tend to work in different sectors and different types of jobs. Higher positions are often held by men, as well as jobs in the better paid private sector. More poorly paid jobs, mostly in the public sector in social and health care, are often filled by women. Second, women often work part-time, naturally resulting in lower incomes than full-time jobs.

> "*However, even when sector, working hours, age and education have been taken into account, women's salaries are still 8 percentage points lower than men's*" (STATISTICS SWEDEN 2001, p. 27).

The indicator thus still is important and needs further attention, despite the already long lasting effort.

D 2. Quality of Life

Quality of life is a very subjective matter and hard to measure. It includes aspects like family and friends, as well as spirituality or faith for which a measurement is infeasible (BESLEME *et al.* 1999). Surveys including questions about quality of life can be influenced by the current mood, well-being or financial situation, which can easily change on a daily basis (ZENNER 2007). One way to avoid these possible complications can be the use of an indirect measurement, like financial security. The ability to maintain an average standard of living contributes to a great extent to the overall personal quality of life. A certain level of income is the precondition for this. No norm exists regarding which income is tolerable or desirable in a society. Thus

> "*the idea of the relative measure is to suggest that income below 60 per cent of the median may make it difficult to maintain a level of consumption that is regarded by society as normal or to be well integrated in the community*" (GOVCOM 2005, p. 83).

The risk of poverty as well as quality of life can be measured in various different ways. Despite the indicator's limitations (see results) it was adopted from the national *SD Indicators* of Sweden. It is listed in the national set as headline indicator for Social Cohesion (GOVCOM 2005).

D 3. Access to Facilities

The main focus of Access to Facilities lies on the possibility of inhabitants to take care of their matters, regardless of the chosen mood of transportation and its environmental impact (BLACH & IRMEN 1999). The assessment scale's division is partly based on the negative environmental impact of motorised individual traffic. But also considerations about persons who do not own a car influenced the choice. The long-term aim should be good accessibility of facilities even with public transportation. If this aim is realized the assessment scale could be changed according to the new situation. This indicator is thus closely linked to the indicator Quality of Public Transport.

The further distribution of Internet access at home could change the whole situation. Parallel to the increased Internet use, more and more institutions expand the range of services which can be used online. This is especially true for Sweden, which is a country with a well-developed IT infrastructure (see Internet Access). For sparsely populated areas this overall development creates new opportunities and perspectives.

A more regular part of people's daily lives is a visit at grocery stores, rather than the Social Insurance Agency offices. If figures about this are available, their use should be preferred in a future study.

D 4. Quality of Public Transport

“Travel is an essential part of the economic and social life of a country” (UNITED NATIONS 2001, p. 268). The social and economic importance of mobility was stressed before (see Car Ownership, Commuting Habits and Access to Facilities), as well as negative impacts of travel. A well-developed public transportation could solve some of the problems related to the indicators mentioned before. Increasing mobility of people should not be developed on expense of the environment.

The use of train stations as part of the measurement of Quality of Public Transport can be justified by four aspects. First, trains are a fairly environmental friendly mode of transportation. Second, long-distance travel is faster and often more comfortable in trains. So, the short- and long-distance mobility of inhabitants can be increased. Third, connection to the railway network is still an important location factor for the industry (BLACH & IRMEN 1999). The ability to transport their goods per trains is especially important for manufacturing industries. And fourth, train stations are often marked on maps, which makes this indicator quite easy to use. Precondition for such a measurement is access and availability of data about the spatial distribution of inhabitants.

D 5. Voter Turnout

Voter turnout, especially on municipal level, reveals if citizens feel noticed and taken seriously by the politicians (ECOLOG INSTITUT 2008). It thus shows if they believe in the democratic system, since important conditions for sustainability are “democratic, knowledge-based decisions” (STATISTICS SWEDEN 2001, p. 28). Success of sustainable development approaches also heavily depends on the inhabitant's possibilities to be involved in such a process. Voter turnout partly reflects the inhabitant's satisfaction with communication- and influence-patterns in the municipality (BLACH & IRMEN 1999).

The Swedish National Institute for Public Health uses voter turnout as an objective domain for their *Public Health Bill*. They consider an increased participation in society as one of the most important public health objectives, because affinity in society and increased trust between people are two factors which promote good health (SWEDISH NATIONAL INSTITUTE FOR PUBLIC HEALTH 2008).

This indicator is limited by two factors. First, results on municipal level often reflect only the level of sympathy for the elected persons, without taking political matters into account (ECOLOG INSTITUT 2008).

Second, if people are happy with the overall situation they could express this through not voting, since the do not feel the need for a change. Low voter turnout could thus be due to a satisfied or an unsatisfied community (HIGGINS & MCCORKLE, quoted in ZENNER 2007).

Despite these strong arguments Voter Turnout is maintained as an indicator, because the pros outweigh the cons. Additionally, considerations about data availability and transferability speak for the use of the indicator in this form. Its use can only be recommended if the case study area is identical with the area at which elections are held.

5.3 Compilation of the indicators discussion

In the previous chapter, all indicators and sub-indicators were discussed. Possible limitations were addressed and recommendations for further use of the indicators were given in detail for each indicator. More general suggestions regarding the indicators' transferability to other case study municipalities are presented below. The indicators can be grouped in four categories of indicators which should be:

- maintained in the existing form
- maintained, unless other recommended data is available
- maintained, but probably need adjustments when applied to an other region
- reassessed, due to limitations of their applicability, mainly with regard to data availability

The indicators presented above are assigned to the four groups as follows:

- maintain in the existing form: A 3.b Nature Protection Areas, A 4.c Waste Separation, A 5.a Energy Consumption, A 5.b Water Consumption, B 1.a Employment, B 1.b Economic Diversity, B 2. Level of Education, B 3. Cost of Living, B 5.a Car Ownership, B 5.b Internet Access, C 1. Population Structure, C 2. Population Development, C 3.a Sick-Leave Rate, C 3.b Life Expectancy, C 4.a Municipal Expenditures, D 1.a Leading Positions, D 1.b Income Differences between Genders, D 2. Quality of Life, D 5. Voter Turnout
- maintain, unless other recommended data is available: A 1. Population Density, A 2. Land Use, B 4.a New Businesses vs. Bankruptcies, C 4.b Cultural Events, C 5. Incidence of Crime
- maintain, but probably need adjustments when applied to another region: A 4.b Resource Saving Measures, B 4.b Commuting Habits, D 3. Access to Facilities, D 4. Quality of Public Transport
- reassess, due to limitations of their applicability, mainly with regard to data availability: A 3.a Biodiversity, A 4.a Use of Fertiliser and Pesticides

These suggestions are based on the lessons learned during this study. The methods used are not specific for the examined case studies and should thus be adaptable to other regions. The actual transferability of the indicators to other regions could only be determined by further tests in other regions. These regions could be located in Sweden or in another European country. Since the majority of the necessary statistics are *Official Statistics of Sweden*, application of the indicators to other Swedish municipalities should not encounter any problems. Such a test would still be interesting to validate the quality of the indicators. Tests in other countries should focus on the actual transferability of the indicators.

6 Conclusion

The set of indicators presented here contributes to the ongoing discussion about sustainability and how to measure it. These indicators cover a wide range of different factors relevant for sustainable development in a rural municipality and are covered by official statistics. The indicators were useful for assessing sustainable development of the two case study municipalities Gagnef and Vansbro, except for two indicators which were not applied due to lack of data. But in general, it can be stated that availability of statistics for various topics is good in Sweden.

Each indicator is equally important for achieving the goal of sustainable development. The division into four strands does not mean that they compete against each other. None of them should be developed at the expense of the others. The classification also helps to select an equal amount of indicators for every aspect of sustainability. A reasonable balance is desired to clearly illustrate their equality. Therefore, results are presented for every indicator individually and not condensed into one *sustainability index*. To create such an index would make comparisons of regions easier, but is not sufficient for measuring sustainable development in a rural municipality.

The indicator set presented here should be seen as the second draft for widely applicable indicators for sustainable development of rural municipalities. Further revisions are needed to enhance and test the quality of these indicators. This also applies to other sustainability indicator sets, because sustainability is widely recognised as being a dynamic concept. Consequently, this leads to changing indicator systems as problems are solved or new measures are developed. Thus, indicators "reflect current concerns, they are not cast in iron" (VALENTIN & SPANGENBERG 2000, p. 388). Future studies could be conducted in Sweden, to test the indicator's quality, or in another European country, to examine the indicator's transferability.

An ideal situation would be the parallel development of indicators and necessary statistics. The need of improving data availability and quality is frequently remarked in studies dealing with indicators. Lack of reliable data influenced the choice of indicators to a great extent.

The indicators presented here reflect the status quo of the two case study municipalities. They do not allow predictions of the future development of the two municipalities. This might be possible through the use of indicators based on time series. For a few indicators of this study, for example, Land Use, Population Development and Level of Education, time series were used. But, their reliability is restricted by

limitations due to changes in definitions or measurements. Thus, development of indicators based on unreliable time series, from which future development could be predicted, would be of limited value. It would be interesting to develop such indicators, but not on the expense of reliable and sound results.

Creating a set of indicators for sustainable development has several effects. Indicators are useful to identify targets for sustainability strategies. Use of assessment scales, as done in this study, can help to make this process transparent and to monitor the success of sustainability strategies. But such assessment scales should not be used as blueprints for the development of targets. These assessments only build the base for comparison of regions, they do not create comparable targets in different regions. Indicators are also useful in drawing attention to particular issues, which are important for sustainable development but are neglected so far.

Finally, indicators for sustainable development contribute to a better understanding of sustainability. They reveal the complexity of this concept on the one hand. But more important, they also make the abstract term sustainability accessible for the public and decision makers. The latter should thus be enabled to pave the way for a sustainable development.

7 Appendices

List of appendices

Appendix 1: Comparison of indicator sets applied in Scotland and Sweden

A. Environment				
Scotland		Sweden		Comments
Population Density		Maintained		
Land Use		Maintained		Land use classes adjusted
Vegetation	Nearness to Natural State	Nature Protection	Biodiversity	New indicator, not applied
	Species Diversity		Nature Protection Areas	New indicator
Environmental Awareness	Use of Fertiliser	Maintained		Not applied
	Resource Saving Measures	Maintained		Changes in measurement and assessment scale
	Waste Separation	Maintained		Change in measurement
Energy- and Water-Consumption	Energy Consumption	Maintained		Change in assessment scale
	Water Consumption	Maintained		Change in assessment scale
B. Economy				
Scotland		Sweden		Comments
Employment	Unemployment Rate	Maintained		Change in assessment scale
	Economic Diversity	Maintained		
Level of Education		Maintained		Change in measurement
Cost of Living		Maintained		Change in measurement
Condition and Tenure of Housing	Condition of Housing	Economic Vitality	New Businesses vs. Bankruptcies	New indicator
	Tenure of Housing		Commuting Habits	New indicator
Mobility	Car Ownership	Maintained		Change in measurement
	Internet Access	Maintained		Change in measurement and assessment scale
C. Society				
Scotland		Sweden		Comments
Population Structure		Maintained		
Growth in Population		Population Development		Change in name and assessment scale
Houses with Basic Amenities		Health	Sick-Leave Rate	New indicator
			Life Expectancy	New indicator
Culture		Culture	Municipal Expenditures	New indicator
			Cultural Events	New indicator
Incidence of Crime		Maintained		Development of an assessment scale

Appendix 1: continued

D. Social Equity			
Scotland	Sweden		Comments
Participation in Community Projects	Gender Equality	Leading Positions	New indicator
		Income Differences between Genders	New indicator
Quality of Life	Maintained		Change in measurement and assessment scale
Access to Facilities	Maintained		Change in measurement and assessment scale
Quality of Public Transport	Maintained		Change in measurement and assessment scale
Voter Turnout	Maintained		

Appendix 2: List of English and scientific species names

English name	Scientific name
Brown bear	*Ursus arctos*
Beaver	*Castro fiber*
Common snipe	*Gallinago gallinago*
Crane	*Grus grus*
Elk	*Alces alces*
Eurasian three-toed wood pecker	*Picoides tridactylus*
European otter	*Lutra lutra*
Goshawk	*Accipeter gentilis*
Grayling	*Thymallus thymallus*
Lynx	*Lynx lynx*
Peregrine falcon	*Falco peregrinus*
Pike	*Esox lucius*
Trout	*Salmo trutta f. lacustris*
Wolf	*Canis lupus*
Wolverine	*Gulo gulo*
Zander	*Sander luciperca*

Appendix 3: Land Use

Distribution of land use, expressed in % of the area covered by the statistic

	Gagnef		Vansbro	
Year	1981	1999	1981	1999
Arable land	28.9	24.9	17.8	22.9
Permanent grassland	2.9	2.8	1	1.6
Forest land	61.2	65.7	68.3	62.6
Other land	6.9	6.5	12.8	12.8

Source: STATISTICS SWEDEN 2008e
Note: The results refer only to agricultural enterprises with more than 2 hectares of arable land. The main part of the forest land and a considerable part of the grazing land are therefore not included in the results. These criteria apply only to 7% and 12% of the total area of Vansbro and Gagnef, respectively.

Forest land in ha and % of the total land area by municipality

Code, municipality	Total area (ha)	Forest land (ha)	% forest land of area
2021 Vansbro	154,870	120,342	78
2023 Malung-Sälen	410,577	269,646	66
2026 Gagnef	76,904	59,941	78
2029 Leksand	122,522	99,205	81
2031 Rättvik	193,202	156,346	81
2034 Orsa	174,227	132,783	76
2039 Älvdalen	691,728	374,302	54
2061 Smedjebacken	95,261	79,378	83
2062 Mora	282,812	231,413	82
2080 Falun	205,265	161,373	79
2081 Borlänge	58,674	37,505	64
2082 Säter	57,391	40,049	70
2083 Hedemora	83,992	59,327	71
2084 Avesta	61,566	39,946	65
2085 Ludvika	149,893	118,815	79
20 Dalarna*	2,819,560	1,890,000	67

Source: SKOGSSTYRELSEN 2007, forest land; STATISTICS SWEDEN 2008a, land area; all figures for 2003
*Source: SKOGSSTYRELSEN 2007, figures for 2002-2006

Appendix 4: Nature Protection Areas

Total area and protected area, by municipality

Code, municipality	Total area (km²)	Protected area (km²)	% protected area of total area
2021 Vansbro	1,667	14	0.8
2023 Malung-Sälen	4,339	66	1.5
2026 Gagnef	814	8	1
2029 Leksand	1,418	8	0.6
2031 Rättvik	2,149	13	0.6
2034 Orsa	1,808	67	3.7
2039 Älvdalen	7,189	1,931	26.8
2061 Smedjebacken	1,062	253	23.8
2062 Mora	3,129	80	2.6
2080 Falun	2,289	10	0.5
2081 Borlänge	639	16	2.5
2082 Säter	628	7	1.2
2083 Hedemora	934	5	0.5
2084 Avesta	673	4	0.6
2085 Ludvika	1,657	5	0.3
20 Dalarna	30,404	2,487	8.2

Source: STATISTICS SWEDEN 2008a, STATISTICS SWEDEN 2008f, figures for 2006

Appendix 5: Resource Saving Measures

Production of natural gravel by municipality

Code, municipality	Production in tons 1997	Production in tons 2007	Number of production units (pits/mines) 2007
2021 Vansbro	11,228	665	3
2023 Malung-Sälen	100,916	86,878	11
2026 Gagnef	317,453	153,765	6
2029 Leksand	6,416	0	0
2031 Rättvik	57,102	20,808	2
2039 Älvdalen	68,397	149,464	8
2061 Smedjebacken	81,800	46,180	4
2062 Mora + 2034 Orsa	112,184	105,457	6 + 1
2080 Falun	5,827	2,297	3
2081 Borlänge	48,491	n.a.	1
2082 Säter	354,674	226,945	4
2083 Hedemora	70,804	n.a.	1
2084 Avesta	304,570	109,741	2
2085 Ludvika	21,633	15,458	3
20 Dalarna	1,561,495	917,658	55

Source: LÄNSSTYRELSEN DALARNA 2005, personal communication A. Lundmark August 2008 → figures for 2007
Note: For municipalities with only one production unit, the figures for 2007 cannot be given due to business privacy reasons. The county figures for 2007 include all production units and the total production (personal communication A. Lundmark, August 2008).

Appendix 6: Waste Separation

Waste separation and recycling in % of the total amount of waste, figures for 2007

	Vansbro	Gagnef	Sweden*
Hazardous waste	1.04	1.59	0.84
Waste handled through recycling and biological treatment	38.03	55.72	45.75
Recycling (packaging, waste paper, metal..)	24.32	43.87	35.64
Biological treatment	13.71	11.85	10.1
Incineration with energy recovery	48.41	35.91	45.33
Landfill	7.99	2.78	4.86
Electrical and electronic equipment	4.53	4	3.22

Source: AVFALL SVERIGE 2008
*Note: figure for 2006, Source: AVFALL SVERIGE 2006

Appendix 7: Energy Consumption

Energy Consumption expressed in kWh/inhabitant/year

	20 Dalarna		Sweden	
Year	1990	2006	1990	2006
Total consumption	53,047	64,567	41,501	45,545
Total cons. Agriculture, Forestry, Fishery	1,053	555	892	812
Total cons. Industry, Construction firms	24,609	35,925	16,160	20,250
Total cons. Public authorities	2,906	2,469	2,772	2,170
Total cons. Transport	10,255	11,162	8,367	9,444
Total cons. Other Services	2,675	3,791	2,818	4,530
Total cons. Households	11,548	10,665	10,299	8,339
	2026 Gagnef		2021 Vansbro	
Year	1990	2006	1990	2006
Total consumption	36,702	31,495	38,623	45,972
Total cons. Agriculture, Forestry, Fishery	557	507	3,134	810
Total cons. Industry, Construction firms	11,428	8,926	7,716	16,967
Total cons. Public authorities	1,083	1,414	2,647	950
Total cons. Transport	9,992	9,107	9,472	13,542
Total cons. Other Services	1,066	1,002	1,892	2,867
Total cons. Households	12,576	10,540	13,763	10,835

Source: STATISTICS SWEDEN 2008g

Appendix 8: Unemployment

Unemployed persons in number and percentage of the population aged 16 to 64 years, figures for January 2008, change compared to January 2007

Code, municipality	Number	Percentage (%)	Change (%)
2021 Vansbro	153	3.6	-1.6
2023 Malung-Sälen	160	2.5	-0.2
2026 Gagnef	91	1.5	-0.7
2029 Leksand	237	2.5	-0.9
2031 Rättvik	223	3.5	-1.1
2034 Orsa	165	3.9	-0.8
2039 Älvdalen	199	4.5	-0.7
2061 Smedjebacken	185	2.7	-0.6
2062 Mora	380	3.0	-1.1
2080 Falun	1,041	2.9	-1.0
2081 Borlänge	920	3.0	-0.8
2082 Säter	146	2.1	-0.8
2083 Hedemora	223	2.3	-1.2
2084 Avesta	382	2.8	-1.6
2085 Ludvika	471	3.0	-0.8
20 Dalarna	4,976	2.9	-0.9
Sweden	164,702	2.8	-0.8

Source: SWEDISH PUBLIC EMPLOYMENT SERVICE 2008a

Appendix 9: Level of Education

Swedish degrees which can be achieved during education, grouped in four categories:

1. primary and secondary education less than 9 years (förgymnasial utbildnind kortare än 9 år): a high percentage of people in this category is not desirable, since it means that they did not fulfil the Swedish compulsory school attendance
2. compulsory education (förgymnasial utbildnind, 9 (10) år): achievement of this degree ends compulsory school attendance
3. upper secondary education (gymnasial utbildning): can last two or three years, degrees grant admission to university
4. post secondary education (eftergymnasial utbildning och forskarutbildning): this category includes all kinds of university degrees, including doctor's degree and researchers training
5. no information: this category is not included in the assessment, but figures are given for the sake of completeness

Level of education in % of population between 16 and 74 years

Year	1985				2007			
Level of education	Gagnef	Vansbro	Dalarna	Sweden	Gagnef	Vansbro	Dalarna	Sweden
1. primary and secondary education less than 9 years	37.41	43.17	34.25	28.14	9.97	15.78	9.91	8.07
2. compulsory education	14.83	16.01	15.28	15.57	15.9	17.26	15.75	15.03
3. upper secondary education	35.28	27.42	35.63	36.96	51.88	51.5	49.96	44.6
4. post secondary education	9.39	5.72	10.93	13.76	21.61	14.67	23.05	30.42
5. no information	3.09	7.69	3.91	5.56	0.64	0.79	1.33	1.88

Source: STATISTICS SWEDEN 2008j

Appendix 10: Cost of Living

Cost of living, differentiated by group of expenses, expressed in percentage of total expenses, figures for 2007

Group of expenses	Commuter Municipalities	Sparsely Populated Municipalities	Reference Value
1. Food and Drink	11.04	12.83	13.25
2. Alcoholic Drinks and Tobacco	2.71	2.08	2.15
3. Household Goods and Services	12.6	11.81	10.87
4. Personal Goods	24.13	27.49	32.15
4.1 including Labour	7.42	10	11.56
4.2 other	16.71	17.49	20.58
5. Transportation	28.1	24.42	17.31
6. Housing	21.43	21.38	24.28

Source: STATISTICS SWEDEN 2008k, Household Budget Survey

Appendix 11: New Businesses vs. Bankruptcies

Total number of new businesses and bankruptcies for 2007, by municipality

Code, municipality	New Businesses	Bankruptcies
2021 Vansbro	30	7
2023 Malung-Sälen	70	3
2026 Gagnef	52	0
2029 Leksand	90	3
2031 Rättvik	46	3
2034 Orsa	38	3
2039 Älvdalen	42	7
2061 Smedjebacken	49	4
2062 Mora	103	12
2080 Falun	309	26
2081 Borlänge	219	23
2082 Säter	50	5
2083 Hedemora	72	5
2084 Avesta	105	14
2085 Ludvika	92	10
20 Dalarna	1,367	125
Sweden	57,194	6,152

Source: STATISTICS SWEDEN 2008l (Bankruptcies), ITPS 2008 (New Businesses)

Appendix 12: Commuting Habits

Division of the municipalities of Dalarna into local labour markets

Code	Local labour market	Associated municipalities
LA0349	Vansbro	2021 Vansbro
LA0350	Malung	2023 Malung
LA0351	Mora	2034 Orsa; 2039 Älvdalen; 2062 Mora
LA0352	Falun-Borlänge	2026 Gagnef; 2029 Leksand; 2031 Rättvik; 2080 Falun; 2081 Borlänge; 2082 Säter
LA0353	Avesta	2083 Hedemora; 2084 Avesta
LA0354	Ludvika	1864 Ljusnarsberg; 2061 Smedjebacken; 2085 Ludvika

Source: STATISTICS SWEDEN 2007

Figures for 2006 on commuters

Code, municipality	Gainfully employed inhabitants* over 16	Commuters leaving municipality (persons / %)	Commuters leaving local labour market (persons / %)	Working and living in municipality (persons / %)
2021 Vansbro	3,126	507 / 16.2%	507 / 16.2%	2,619 / 83.8%
2023 Malung-Sälen	4,929	509 / 10.3%	509 / 10.3%	4,420 / 89.7%
2026 Gagnef	4,737	2,202 / 46.5%	362 / 7.6%	2,535 / 53.5%
2029 Leksand[2]	7,154	1,970 / 27.5%	670 / 9.4%	5,184 / 72.5%
2031 Rättvik[2]	4,773	1,514 / 31.7%	704 / 14.7%	3,259 / 68.3%
2034 Orsa	3,028	1,299 / 42.9%	339 / 11.2%	1,729 / 57.1%
2039 Älvdalen	3,356	683 / 20.3%	303 / 9%	2,673 / 79.6%
2061 Smedjebacken[3]	4,926	2,123 / 43.1%	943 / 19.1%	2,803 / 56.9%
2062 Mora	9,713	1,317 / 13.6%	857 / 8.8%	8,396 / 86.4%
2080 Falun	26,461	5,202 / 19.6%	2,102 / 7.9%	21,259 / 80.3%
2081 Borlänge	22,028	4,657 / 21.1%	1,537 / 7%	17,371 / 78.9%
2082 Säter[2]	5,259	2,722 / 51.8%	982 / 18.7%	2,537 / 48.2%
2083 Hedemora	6,927	1,786 / 25.8%	1,326 / 19.1%	5,141 / 74.2%
2084 Avesta	10,114	1,555 / 15.4%	1,255 / 12.4%	8,559 / 84.6%
2085 Ludvika	11,274	1,741 / 15.4%	1,251 / 11.1%	9,533 / 84.6%
20 Dalarna		26.8%	12.2%	73.2%

Source: STATISTICS SWEDEN 2008m+n, REGION DALARNA 2008

* Note: Gainfully employed population is defined as “any person who has worked for at least one hour per week during the month of November. Those temporarily absent during the survey period, for instance due to sick leave, are also included.” (STATISTICS SWEDEN 2008i).

[2]No exact figure due to compilation restraints of the statistic, could be up to 10 persons more (REGION DALARNA 2008)

[3]No exact figure due to compilation restraints of the statistic, could be up to 30 persons more (REGION DALARNA 2008)

Appendix 13: Car Ownership

Number of households and inhabitants, figures for 2007

	Gagnef	Vansbro
Household in one- or two family house	3,917	2,882
Household in multiple dwelling	433	903
Inhabitants	10,111	6,959
Inhabitants / household	10,111 / 4,350 = 2.32	6,959 / 3,785 = 1.84

Source: AVFALL SVERIGE 2008

Passenger cars in use per 1,000 inhabitants at the end of year 2007, by municipality

Code, municipality	Passenger cars per 1,000 inhabitants
2021 Vansbro	582
2023 Malung-Sälen	632
2026 Gagnef	592
2029 Leksand	569
2031 Rättvik	580
2034 Orsa	554
2039 Älvdalen	631
2061 Smedjebacken	554
2062 Mora	578
2080 Falun	496
2081 Borlänge	495
2082 Säter	564
2083 Hedemora	537
2084 Avesta	544
2085 Ludvika	511
20 Dalarna	538

Source: SIKA 2008

Appendix 14: Population Development

Number of inhabitants, figures for 1982 and 2007, by municipality

Code, municipality	1982	2007
2021 Vansbro	8,354	6,959
2023 Malung-Sälen	11,839	10,428
2026 Gagnef	9,870	10,111
2029 Leksand	13,779	15,338
2031 Rättvik	11,092	10,883
2034 Orsa	7,332	7,091
2039 Älvdalen	8,333	7,392
2061 Smedjebacken	13,373	10,715
2062 Mora	19,655	20,143
2080 Falun	51,116	55,220
2081 Borlänge	46,766	47,756
2082 Säter	10,997	11,000
2083 Hedemora	16,936	15,301
2084 Avesta	25,750	21,886
2085 Ludvika	31,086	25,425
20 Dalarna	286,278	275,618

Source: STATISTICS SWEDEN 2008b

Appendix 15: Sick-Leave Rate

Sick-leave rate in days per year, divided by gender, figures for 2007

	Gagnef	Vansbro	Dalarna	Sweden
men	35.4	38.5	34.2	28.4
women	48.6	57.4	50.4	43.7
total	41.8	47.6	42.1	35.9

Source: SWEDISH SOCIAL INSURANCE AGENCY 2008

Appendix 16: Life Expectancy

Life expectancy at birth in years, figures for 2002-2006, divided by gender and municipality

Code, municipality	women	men
2021 Vansbro	80.7	77.6
2023 Malung-Sälen	82.2	76.7
2026 Gagnef	82.3	78.7
2029 Leksand	82.8	78.9
2031 Rättvik	83.6	79.1
2034 Orsa	83.8	78.3
2039 Älvdalen	82.3	75.8
2061 Smedjebacken	81	76.7
2062 Mora	81.9	79.4
2080 Falun	82.6	78.9
2081 Borlänge	82	78.1
2082 Säter	83.2	77.6
2083 Hedemora	82.4	76.9
2084 Avesta	81.5	77
2085 Ludvika	82.7	77.6
20 Dalarna	82.3	78
Sweden	82.6	78.2

Source: SWEDISH NATIONAL INSTITUTE OF PUBLIC HEALTH 2008+a

Appendix 17: Municipal Expenditures

Municipal expenditures for cultural issues, expressed as % of the total municipal running costs, figures for 2006 and 2007

Code, municipality	2006	2007
2021 Vansbro	2	2
2023 Malung-Sälen	1.9	1.9
2026 Gagnef	2.4	2.4
2029 Leksand	2.7	2.5
2031 Rättvik	2.4	2.4
2034 Orsa	2.6	2.4
2039 Älvdalen	1.7	1.7
2061 Smedjebacken	1.8	2
2062 Mora	2.7	2.8
2080 Falun	2.1	2
2081 Borlänge	2.6	2.5
2082 Säter	2.2	2.3
2083 Hedemora	2	2.1
2084 Avesta	2.9	2.9
2085 Ludvika	2.4	2.3
20 Dalarna	2.3	2.3

Source: RKA 2009, figures for Dalarna own calculation

Appendix 18: Cultural Events

Number of participants in cultural events per 1,000 inhabitants, figures for 2007, by municipality

Code, municipality	Number of participants per 1,000 inhabitants
2021 Vansbro	1,657
2023 Malung-Sälen	963
2026 Gagnef	3,496
2029 Leksand	3,275
2031 Rättvik	3,445
2034 Orsa	2,950
2039 Älvdalen	2,618
2061 Smedjebacken	898
2062 Mora	1,452
2080 Falun	1,504
2081 Borlänge	1,674
2082 Säter	720
2083 Hedemora	1,295
2084 Avesta	2,460
2085 Ludvika	1,573
20 Dalarna	1,844

Source: STUDIFÖRBUNDEN 2008

Appendix 19: Incidence of Crime

Number of recorded crimes per 10,000 inhabitants, figures for 2007, by municipality

Code, municipality	Crimes per 10,000 inhabitants
2021 Vansbro	685
2023 Malung-Sälen	1,132
2026 Gagnef	537
2029 Leksand	642
2031 Rättvik	685
2034 Orsa	818
2039 Älvdalen	822
2061 Smedjebacken	738
2062 Mora	929
2080 Falun	1,037
2081 Borlänge	1,649
2082 Säter	874
2083 Hedemora	1,070
2084 Avesta	1,287
2085 Ludvika	947
20 Dalarna	1,126
Sweden	1,423

Source: BRÅ 2008

Appendix 20: Leading Positions

Number of members of municipal councils and women in municipal councils, expressed as figure and percentage of all members of the council, figures for 2006, by municipality

Code, municipality	Number of women	Number of members	% women of all members
2021 Vansbro	15	37	40.5
2023 Malung-Sälen	17	43	39.5
2026 Gagnef	14	35	40
2029 Leksand	25	48	52.1
2031 Rättvik	14	39	35.9
2034 Orsa	15	31	48.4
2039 Älvdalen	13	35	37.1
2061 Smedjebacken	14	35	40
2062 Mora	17	41	41.5
2080 Falun	24	59	40.7
2081 Borlänge	27	61	44.3
2082 Säter	16	35	45.7
2083 Hedemora	20	41	48.8
2084 Avesta	21	41	51.2
2085 Ludvika	17	44	38.6
20 Dalarna (average)	269	625	43

Source: DALAMONITORN 2008a

Appendix 21: Income Differences between Gender

Mean income in thousand SEK by gender, and women's income as percentage of men's income, figures for 2006, by municipality

Code, municipality	Mean income, th. SEK		Women's income in % of men's income
	men	women	
2021 Vansbro	206.2	156.5	75.9
2023 Malung-Sälen	212.7	164.3	77.24
2026 Gagnef	231.3	162.4	70.2
2029 Leksand	234	168	71.8
2031 Rättvik	214.6	158.8	74
2034 Orsa	201.3	157.7	78.3
2039 Älvdalen	200.5	158.7	79.1
2061 Smedjebacken	243.7	167.8	68.86
2062 Mora	224.9	172.2	76.6
2080 Falun	246	180.5	73.4
2081 Borlänge	237.4	170.9	72
2082 Säter	219.4	171.5	78.2
2083 Hedemora	223.6	163.8	73.3
2084 Avesta	238.6	171.1	71.2
2085 Ludvika	236.6	167.4	70.7
20 Dalarna	231.9	169.9	73.3

Source: STATISTICS SWEDEN 2008p

Appendix 22: Quality of Life

Median income in thousand SEK and percentage of people with income less than 60% of the median, figures for 2006, by municipality

Code, municipality	Median income, th SEK	% of persons with less income than 60% of the median
2021 Vansbro	112.1	17.7
2023 Malung-Sälen	117.3	16.2
2026 Gagnef	125.9	13.2
2029 Leksand	126.9	15
2031 Rättvik	120.3	16.4
2034 Orsa	109.9	16.2
2039 Älvdalen	115.3	17
2061 Smedjebacken	142.8	13.2
2062 Mora	134.6	13.9
2080 Falun	137.1	12.6
2081 Borlänge	133.8	12.9
2082 Säter	130.1	13.3
2083 Hedemora	125.4	14.5
2084 Avesta	140.7	13.6
2085 Ludvika	135.5	13.6
20 Dalarna	131.1	13.9

Source: STATISTICS SWEDEN 2008q

Appendix 23: Access to Facilities

Average distance to Social Insurance Agency offices in km, by municipality

Code, municipality	Distance in km
2021 Vansbro	8
2023 Malung-Sälen	19
2026 Gagnef	10
2029 Leksand	6
2031 Rättvik	10
2034 Orsa	3
2039 Älvdalen	5
2061 Smedjebacken	7
2062 Mora	6
2080 Falun	9
2081 Borlänge	4
2082 Säter	6
2083 Hedemora	7
2084 Avesta	5
2085 Ludvika	8
20 Dalarna (average)	8.4

Source: BRANDT & WESTHOLM 2006

Accessibility of grocery stores and post offices

Population's distance to stores and post offices (%)	Grocery stores	
	Dalarna	Sweden
0-250 m	21	14
Ca 500 m	31	28
1 km	21	25
2km	10	12
3-4 km	8	8
5-10km	8	8
More than 10 km	1	6
	Post offices	
	Dalarna	Sweden
0-250m	13	14
500m	21	28
1 km	25	25
2 km	13	12
3-4 km	14	8
5-10 km	12	8
More than 10 km	3	6

Source: LANDSTINGET DALARNA 1997

Appendix 24: Voter Turnout

Voter Turnout, expressed as percentage, in the 2006 election of the Swedish Parliament and municipal councils

Code, municipality	Parliament, voter turnout (%)	Municipal councils, voters (%)
2021 Vansbro	79.38	78.97
2023 Malung-Sälen	80.82	79.68
2026 Gagnef	81.47	80.4
2029 Leksand	82.88	81.48
2031 Rättvik	78.97	77.81
2034 Orsa	80.3	78.87
2039 Älvdalen	76.71	75.18
2061 Smedjebacken	81.62	79.16
2062 Mora	77.72	74.91
2080 Falun	82.23	80.22
2081 Borlänge	80.71	78.47
2082 Säter	81.17	79.14
2083 Hedemora	78.29	75.55
2084 Avesta	80.57	78.9
2085 Ludvika	79.18	76.73
20 Dalarna (average)	80.13	78.36

Source: VALMYNDIGHETEN 2007

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Erklärung

Hiermit versichere ich, dass ich diese Arbeit selbstständig verfasst und keine anderen als die angegebenen Hilfsmittel und Quellen benutzt habe.

Judith Niggemann