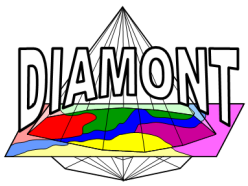
INTERREG III B "Alpine Space

DIAMONT

Data Infrastructure for the Alps / Mountain Orientated Network Technology



WP7
Identification and Selection of Indicators

Work package report
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Bayerisches Staatsministerium für Umwelt, Gesundheit und Verbraucherschutz

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EU – INTERREG III B, Alpine Space

Index

Detailed Index

Annexes

Index of Tables

Index of Figures

Index of abbreviations

BayStMUGV	Bayerisches Staatsministerium für Umwelt, Gesundheit und Verbraucherschutz
DG	Directorate General / Direction Générale
DPSIR	Driving Forces – Pressure – State – Impact – Response
EEA	European Environment Agency
ESDP	European Spatial Development Perspective
ESPON	European Spatial Planning Observation Network
EUROSTAT	Statistical Office of the European Communities
EU	European Union
GDP	Gross Domestic Product
NUTS	Nomenclature des unités territoriales statistiques
OECD	Organisation of economic co-operation and development
R&D	Research and development
REMO	REgionales Klima-MOdell
RSA	Report on the State of the Alps
SMESTO	Small and medium sized towns
SOIA	System of Observation of and Information on the Alps
SPESP	Study Programme on European Spatial Planning
UNCSD	United Nations Commission on Sustainable Development
WBGU	German Advisory Council on Global Change
WG EOI	Working Group on “Environmental Objectives and Indicators” of the Alpine Convention
WP	Work Package

Executive summary

The mission of WP7 was to identify and select indicators for describing basic issues of sustainable regional development in the Alps. Within the overall concept of DIAMONT, WP7 had to create the link between the more thematically oriented WPs 5 and 6, which had the task of giving impulses for a better understanding of the cultural differences of regional development in the Alps and identifying the main themes and problems of Alpine sustainable regional development, and WP8, dealing with data for measuring sustainable regional development. At the same time, WP7 should make a contribution to the extensive “landscape“ of indicators and indicator systems by further developing ideas for suitable indicators to be applied in the Alpine context, relevant for SOIA, the System of Observation of and Information on the Alps.

WP7 aimed to base the indicator discussion on the work already done. Even if it is never possible to analyse and consider all existing indicator systems, it was tried to analyse a spectrum of approaches as broad as possible. Of special interest were indicators systems, developed with special focus on the Alps and on Alpine themes. Therefore the DIAMONT activities were also closely linked with the results of the Working Group “Environmental Objectives and Indicators” of the Alpine Convention, which proposed an Alpine-wide indicator system (also adopted by the Alpine Conference) and the ongoing work of the Working Group “SOIA/RSA” of the Alpine Convention engaged with the elaboration of a first Report on the State of the Alps (RSA).

Starting from a common understanding of all DIAMONT partners on sustainable regional development, a conceptual framework or rather model idea had to be developed for structuring the indicator selection and development. This framework should on the one hand assimilate the work previously done in WP6, and may on the other hand give an input for thematically focussing the data-oriented activities in WP8.

The conceptual model idea was arranged about so-called main trends of regional development in the Alps, which were further developed on the basis of the WP6 results:

- Local centres and fringes between competition and co-operation,
- Marginalisation of rural areas,
- Congestion of transport system,
- Tourism: towards the Alpine experience,
- Innovation and competitiveness:
    - Modernisation of agriculture in favoured areas,
    - Increasing importance of innovative technologies,
- Impacts of climate change,
- Increasing importance of energy from renewable sources.

The sustainability paradigm forms the underlying structure of the conceptual framework requiring the three pillars economy, ecology and society/culture to be adequately reflected by the indicators. For further differentiating the aspects to be considered within the three pillars, so-called dimensions were introduced. It was aimed not to propose only indicators covering

the three pillars of sustainability but also the utmost number of dimensions for allowing a really integrative view on the main trends.

As precursors of indicators and for orienting their interpretation, phenomena were formulated which shall describe important characteristics of the respective main trends (cp. Fig. 0-1:).

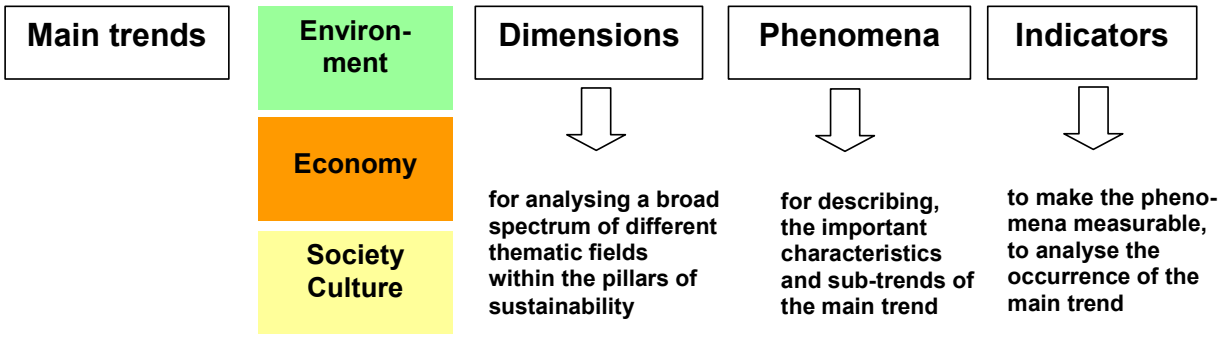


Fig. 0-1: Conceptual framework of WP7

Referring on the term sustainable regional development and having in mind the main trends, two leading questions for indication were formulated:

- Where, i.e. in which individual parts of the Alps (municipalities, districts), and to what extent are the main trends occurring?
- Are the individual parts of the Alps, where the main trend is occurring, developing in a sustainable way?

With respect to these questions, the DIAMONT indicators comprise two categories:

- the “identification indicators” for identifying the occurrence of a main trend, and
- the “evaluation indicators” aimed to describe if the manifestation of the respective trend can be characterised as sustainable or not.

The indicator selecting and developing was concentrated on four main trends, the “Congestion of transport system”, “Modernisation of agriculture in favoured areas”, “Increasing importance of energy from renewable sources”, and “Local centres and fringes between competition and co-operation”. The latter had been chosen by the DIAMONT partners for being studied with more emphasis in the WPs 7, 8, 9, 10 and 11.

In the framework of DIAMONT a web-based was installed and developed in order to facilitate the exchange of knowledge and data between the partners. The XML-based database was installed and developed with the support of the Bavarian State Ministry of the Environment, Health and Consumer Protection (BayStMUGV). Within WP7, the database was used as an instrument for documenting metadata describing phenomena and indicators. It can be accessed at www.diamont.bayern.de.

If coherent and comprehensive information on the main trends is to be achieved, then the single items of information must of necessity be aggregated. Therefore WP7 dealt with possible methods and techniques of indicator aggregation. Due to the fact that processes of aggregation are contested in principle and often seen as not sufficiently transparent and not substantively justified, WP7 worked to the rule of „as little aggregation as possible, as much aggregation as necessary.“ Experiences of pre-DIAMONT indicator projects dealing with

aggregation issues, such as RAUMALP, MARS, and FUNalpin, technical recommendations given, for instance, by the OECD, and numerous proposals for aggregation procedures coming from economics and social science were considered to deduce a suitable methodology for DIAMONT. As visualisation element the formation of so-called “main trend images” was proposed, based on a visual aggregation of the values of “identification indicators”. By means of these images and the underlying data comparisons between municipalities but also between bigger entities as for examples municipalities within an urban areas will be possible, if data are available. To facilitate an Alpine-wide overview of regional development trends, it is proposed to use statistical methods such as cluster analysis in order to achieve a comprehensive classification of the Alpine municipalities with respect to the main trends.

The check of data availability and data collection were not intended to be realised within WP7, but in WP8. Therefore WP7 results in main trends based on expert knowledge, and indicators derived from at least rough estimations of data availability and having used experiences of other indicator systems. These results have to be tested in the ongoing DIAMONT project. Indicators have to be calculated by working with the proposed calculation methods, and aggregation methods have to be experimented.

Section I: Introduction

1 Tasks of Work Package 7

The task of Work Package 7 (WP7) of the DIAMONT project was to elaborate core and sectoral indicators for selected issues of sustainable regional development with special focus on the Alps. Furthermore a more detailed indicator set should be proposed for one specific sector determined in WP6. At the start of WP7 a common conceptual model of main issues of regional development in the Alps and of cause-relationships between drivers and protagonists of sustainable regional development and the effects on economy, society and environment was lacking. So WP7 had to create certain model ideas to focus the indicator selection and development. Even if this step was not foreseen in the application form of DIAMONT, all DIAMONT partners agreed that a conceptual basis would be inevitable to ensure transparency and methodological continuity.

Within the DIAMONT WP structure, WP7 followed upon the WPs 5 and 6, which had the tasks of giving impulses for a better understanding of the cultural differences of regional development in the Alps respectively of identifying the main themes and problems of Alpine sustainable regional development. The subsequent WPs 8 and 9 – having a stronger pragmatic focus – are dealing with data for describing regional development and instruments to steer it. WP7 should link these two approaches by selecting indicators, which are on the one hand oriented on the main important themes and problems and can on the other be described by available data.

The input of WP5 to WP7 consisted in particular in offering a better understanding of the very broad and complex term of culture and its integration into an indicator system. Nevertheless it caused some difficulties to extract concrete contributions from WP5 papers' to be operationalised in WP7. This refers for instance to the question, which cultural influences will be most important in future, or to the question, which relevant effects on cultural identity or on self-perception of the Alpine population will economic changes bring about, and which of these influences and developments should be described by indicators.

In terms of main issues respectively main trends, an intensive exchange occurred with WP6. The creation of common structural elements to be used in WPs 6 and 7 was of great importance for WP7 to ensure that the results of WP6 could also be used in WP7. Therefore several e-mail exchanges and one joint meeting concerning the structure especially of the 3rd round of the Delphi survey and the definition of the main issues or trends took place.

Between WP7 and WP8 very close relations exist. On the one hand the investigations on data availability realised in WP8 gave input to the indicator discussion in WP7. On the other hand the conceptual structure developed in WP7 and, as a matter of course, the indicator proposals are an important basis for WP8 (for more details cp. Fig. III-3).

The indicators proposed in WP7 also form an important link to WP9, where instruments for stimulating and steering sustainable regional development will have to be elaborated and optimised. The indicators should be suitable for assessing the effects of implementing these tools. The activities in the selected test regions (WP10 and WP11) will provide the framework for testing the indicators (for more details cp. Fig. III-4).

Fig. I-1 provides a comprehensive overview.

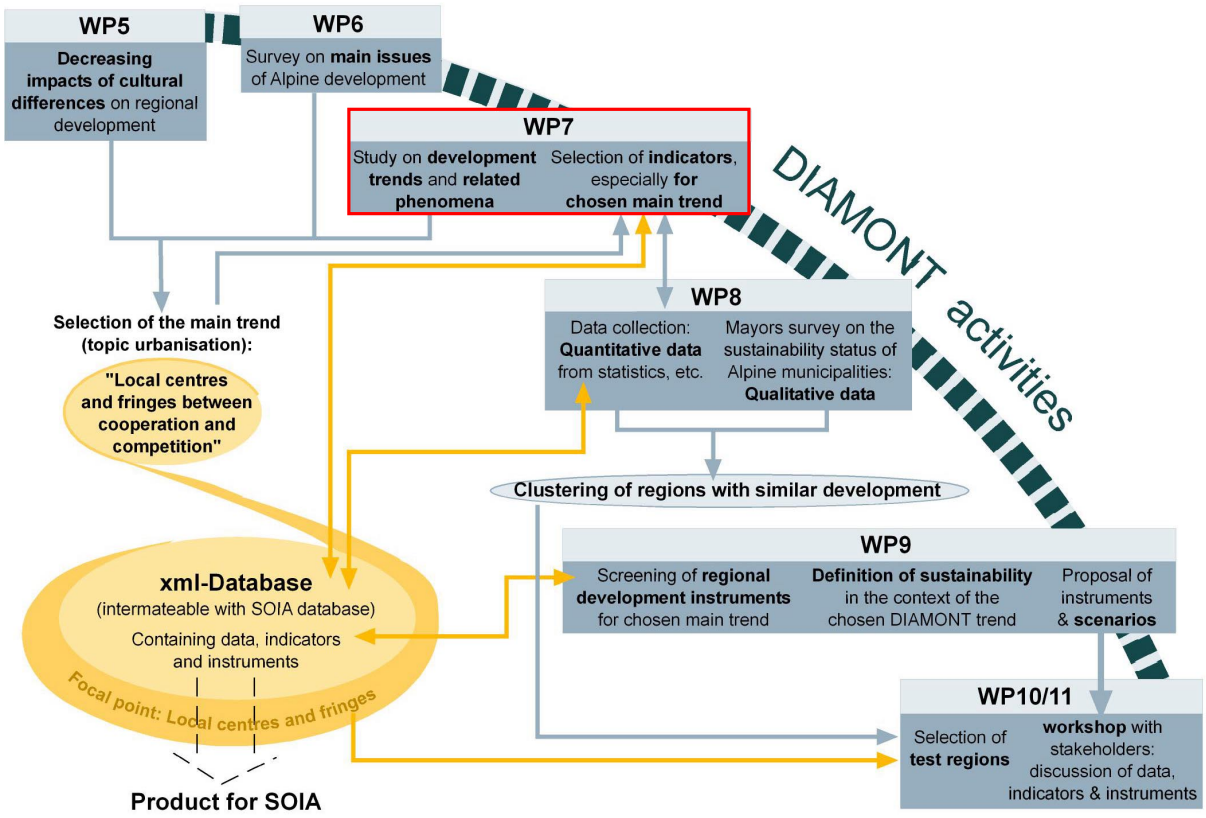


Fig. I-1 Overall concept of DIAMONT – relationships of WP7 with other workpackages

2 Main activities of Work Package 7

According to the tasks of WP7 and the extended mission to create a suitable conceptual model idea for the selection and development of indicators, the main activities carried out in WP7 were the following:

- Development of a common conceptual model idea consisting of main trends, dimensions, phenomena and indicators,
- compiling phenomena from literature analyses and interpretation of WP6 results as well as weighting these phenomena in order to focus the indicator selection and development,
- establishment of a database on national and international indicator systems, in collaboration with the project partner ifuplan and the Bavarian State Ministry of the Environment, Public Health and Consumer Protection, to base the selection and development of DIAMONT indicators on already existing knowledge in the international (especially the European and Alpine-wide) context and on the proposals and concepts elaborated for and used by the signatory states of the Alpine Convention,
- discussion, selection and development of suitable indicators according to the main trends of regional development in the Alps,
- proposal of procedures for the interpretation of indicators with respect to the main trends (aggregation methods).

In the application form it had been foreseen to carry out work on indicators to a certain general degree for all main trends (in the application form still called “basic issues”). Additionally more detailed work on indicators should be realised concerning one selected main trend (originally called “specific sector”). The decision on the selected main trend was taken in March 2006, based on the previous results of WP6 and 7. Its detailed formulation was provided by the Austrian partners at the end of May 2006. The main trend is entitled “Local centres and fringes between competition and co-operation - Steering towards sustainability” (cp. Section II:2.3).

WP7 does not work with concrete data yet. Collecting and harmonising data is a task of WP8. Therefore some methods elaborated and proposed in WP7, such as the transformation of indicator values and aggregation procedures could not be tested within this WP. This steps will be realised in the context of WP8 using collected data to describe the selected main trend.

The main contributions of all DIAMONT partners consisted especially in:

- the provision of literature for identifying main trends,
- the weighting of the overall phenomena list.

The French partner CEMAGREF gave substantial comments on the indicator lists and provided estimations on data availability for the proposed indicators. The German partner ifuplan GbR supported the indicator selection and development for the main trends “Modernisation of agriculture in favoured areas” and “Increasing importance of energy from renewable sources”.

3 Links to the Alpine Convention and SOIA

Some objectives of the DIAMONT were developed in close co-operation with the steering bodies of the Alpine Convention with a view to giving a vital conceptual, methodological and structural impetus to SOIA, the System for Observation of and Information on the Alps.

As WP7 had to develop respectively select indicators, it will provide a crucial component to this input.

3.1 Alpine-wide indicator system for implementing the Alpine Convention

The indicator work of DIAMONT is fundamentally based on the results of the international Working Group (WG) on "Mountain-specific Environmental Quality Objectives", set up at the Vth Alpine Conference held in Bled in October 1998, and the WG on "Environmental Objectives and Indicators" (WG EOI), which directly took over the mission of the previous group in March 2003. The signatory states of Germany, France, Italy, Liechtenstein, Austria, Switzerland and Slovenia had sent representatives to these working groups. Non-governmental organisations had also participated. The results of the WGs, upon others,

- a systematisation of all the objectives formulated in the Alpine Convention and its Protocols,
- structuring an Alpine-wide indicator system,
- proposal of an Alpine-wide system of 95 indicators, following the evaluation of existing international and national indicator systems and comprehensive investigations including the ongoing activities of SOIA (cp. Section I:3.2),
- proposal for a harmonised documentation of indicators ("fact sheets").

These results were adopted by the Alpine Conferences in 2000, 2002 and 2004 and published in paper form (UBA 2000, BMU & UBA 2003) and on the internet (Bosch & Partner GmbH & ifuplan 2004, final report titled "Documenting the changes in the Alpine living environment").

The indicator system, as the basis for the RSA, is tailored to comply with the objectives of the Alpine Convention. Thus thematic fields not being subject of the Alpine Convention and its Protocols such as climate change or Alpine cities are not considered in the indicator system. According to their mandate, both WGs focussed on the state and development of the Alpine environment. Even though, beyond classic "environmental indicators" such as immission of nitrogen oxides and protected areas the system offers a large number of indicators to characterise forms of human activities (e.g. emissions relating to road traffic, energy consumption, traffic volume) and the socio-economic context (population density and age structure, gross domestic product per inhabitant, long-term unemployment), the Alpine-wide indicator system cannot and shall not be interpreted as an indicator system on sustainable development.

DIAMONT uses the results of both WGs, but has a stronger focus on sustainable regional development (cp. Section I:4.2). Moreover, it does not feel limited to the thematic context of

the Alpine Convention, so also fields not dealt with in the Protocols of the Alpine Convention are in view of DIAMONT. Nevertheless DIAMONT gains from the detailed research results on data availability and indicator formulation. The proposals for documenting the metadata on indicators are fully adopted by DIAMONT and further developed. The indicator fact sheets used for DIAMONT broadly overlap with those developed by the WG EOI. As a consequence, some information on indicators provided by the WG could be directly transferred to DIAMONT. The DIAMONT database, which contains both the indicators of the WG EOI and the DIAMONT indicators makes these overlaps transparent (cp. Section III:4).

3.2 SOIA

SOIA was established by the IIIrd Alpine Conference in Chambery (France, 1994) to provide comprehensive information for describing the state of the environment and the socio-economic situation in the Alps. To structure the further process, a Working Group was entrusted.

The WG on SOIA was organised in a decentralised form. National focal points were established to work out national contributions for establishing the system. The cross national co-ordination was situated at the Joint Research Centre of the European Commission (Ispra, Italy) until it was cancelled by the EU in 2000. 2002 the VIIth Alpine Conference decided to commit the responsibility of co-ordination to the newly established Permanent Secretariat of the Alpine Convention.

Limited financial capacities on part of the signatory states and legal problems concerning the use of databases established by national research institutions and organisations considerably complicated the development of SOIA. So far, the results of SOIA are rather selective and could not provide a comprehensive approach to a joint handling of Alpine-relevant data within a co-operation of all Alpine States.

In 2005, the Working Group “SOIA/RSA” was installed by the Permanent Committee to design the first Report on the State of the Alps (RSA). This WG merges the activities of SOIA and directly continues from the results of the WG “Environmental Objectives and Indicators” (cp. Section I:3.1). During the whole phase of elaborating WP7 there has been a close contact to the WG, so that impulses could be exchanged mutually.

The concrete contribution of WP7 for the impetus of DIAMONT to SOIA consists in:

- providing indicators for a set of main trends of regional development in the Alps, using the indicators proposed by the WG “Environmental Objectives and Indicators” and adopted by the Alpine Conference, and supplementing them by additional indicators following a consistent sustainability approach,
- further developing and testing the functionalities of the DIAMONT database (Section III:4) established for the well structured data documentation and exchange within SOIA,
- giving methodological input concerning the aggregation of indicators.

4 Definitions

4.1 Variable, indicators and indices

Following the definition provided by OECD (1993) an **indicator** is “a parameter [or variable], or a value derived from parameters, which points to, provides information about, describes the state of a phenomenon/environment/area, with a significance extending beyond that directly associated with a parameter [variable] value”. A **variable** is “a property that is measured or observed” (OECD 1993 and OECD 2002: 10).

According to the definition adopted by the WG “Mountain-specific Environmental Quality Objectives”, indicators can be measured, calculated or derived. In addition to describing the state of a system, they can also be formulated to characterise and evaluate its development (UBA 2000).

The boundary between indicators and **indices** is seldom drawn sharply. Nevertheless, indices are mostly interpreted as information condensed to a higher level of abstraction than most other indicators. OECD uses the term “index” only for “aggregated or composite numbers computed as a function of two or more parameters [variables], indicators or sub-indices clustered together to represent some system or phenomenon (e.g. air pollution or sustainable development). Such indices are often dimensionless, but sometimes a common, real metric is used (e.g. acidification equivalents or hectares).” (OECD 2002: 11).

4.2 Sustainable regional development

Sustainable regional development is a key term within the DIAMONT project: “DIAMONT integrates cultural, regional and local factors into the analysis and preparation of a sustainable regional development” (cp. DIAMONT application form, chap. 1.3 “Project abstract”).

All DIAMONT partners agreed that DIAMONT shall not only focus on economic development of the regions nor on regional policy issues – instead, the main focus is on **sustainable** regional development, meaning a holistic process integrating the three pillars economy, ecology and society/culture. Furthermore, DIAMONT shall not concentrate mainly on the regional disparities as foreseen in the classical understanding of regional development (cp. EC 1999: ESDP Part A, Chap. 1 (19), ÖROK 2001, BBR 2005, etc.).

This common understanding reflects in the following albeit rough definition which has been further discussed in the course of the project:

“Sustainable regional development will be viewed as a holistic process in which environmental, economic, social and cultural resources of a region are used and developed to an optimum equilibrium between these pillars for human well being. Therefore, sustainable regional development will thoroughly take into account the inherent and geographically different characteristics of an area.”

Section II: Conceptual framework

1 Starting points

1.1 Conceptual framework for the indicator selection and development

One of the central starting points for developing the conceptual framework of WP7 is the above cited understanding of the term “sustainable regional development” (Section I:4.2).

As sustainability is given high priority within the above definition, the sustainability concept was also of great importance for designing the indicator system. The overall objective of the DIAMONT indicator system is to propose an indicator set balanced in the best possible way in view of the three pillars of sustainability, at the same time considering regional development aspects. Really well balanced indicator systems as for example the Swiss MONET[1] and the indicators for the local Agenda 21 in Germany (DIEFENBACHER et al. 2005) are taken as good models.

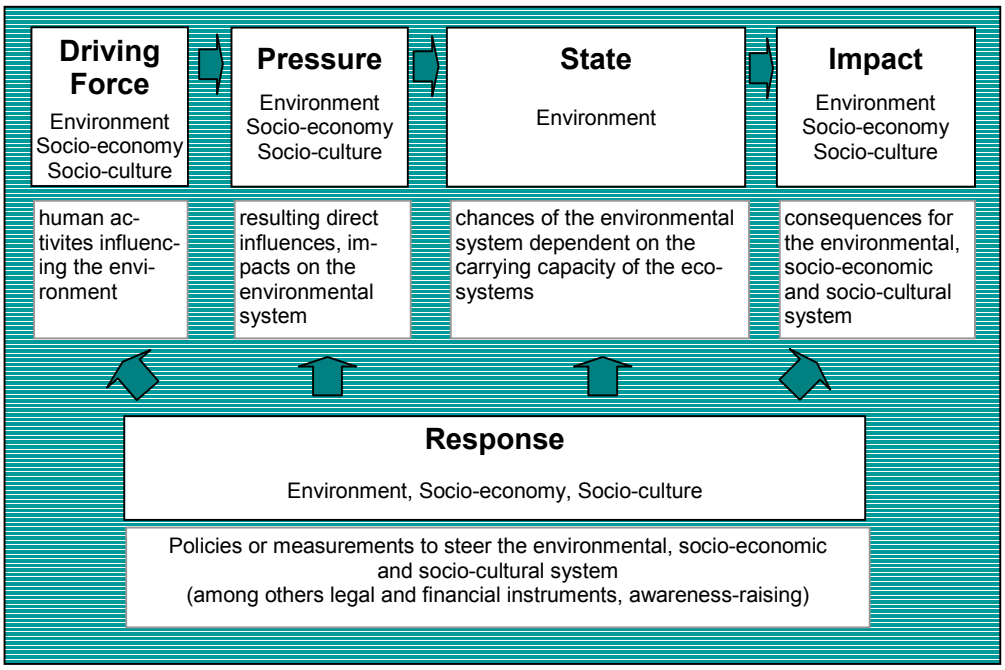


Fig. II-1: Conceptual approach for indicator structuring (BMU & UBA 2003)

Referring to the results of the WG “Environmental Objectives and Indicators” of the Alpine Convention (cp. Section I:3.1), it would have been close at hand to also use the DPSIR approach for the purposes of DIAMONT. DPSIR stands for Driving forces, Pressures, States, Impacts and Responses. It is a causal framework for organising information (e.g. indicators) about the state of the environment (EEA[2]) and to describe their interrelations and interactions. The idea of the framework was originally derived from social studies and only then widely applied internationally, in particular for organising systems of indicators in the context of environment and, later, sustainable development. Preliminary examples of causal frameworks are, among others, the PSR-framework used by the OECD (e.g. OECD 1994) or the DSR-framework used by the UNCSD (e.g. UNCSD 1996).

Nevertheless, the strong focus of the DPSIR-approach on the environmental sphere causes some difficulties having in mind a balanced selection of indicators in terms of sustainability. It always depends on the point of view, how single factors or indicators are categorised. Important driving forces influencing the environmental system can also be state factors characterising specific conditions of the socio-economic system. For instance, demographic factors are to be seen as important driving forces (category “D”) with respect to agriculture and land use, but at the same time they are also per se qualifying the social situation and development (category “S”). To avoid unfruitful discussions on indicator categorisation it has been decided for DIAMONT not to give the DPSIR concept so much structural and conceptual dominance for the indicator selection and development as it has in many systems of sustainability indicators.

The concept of DIAMONT as presented in the application form was structured along one “specific sensitive sector” of regional development (e.g. tourism). This specific sector had to be identified within WP6, using also the results of WP 5, and to be studied in detail in the subsequent WPs. On principle this concept was maintained and strengthened by WP7, orienting the indicator selection and development strongly towards so-called “main trends”. But the original concept of “sectors” was given up in favour of a more integrative view, analysing the state, development and interactions of different sectors with respect to a more comprehensive trend of regional development. Thus the central questions of indication are determined as:

- To which degree are the „main trends“ present in (which) individual parts of the Alps, be it municipalities or districts?
- Do these trends result in a sustainable regional development?

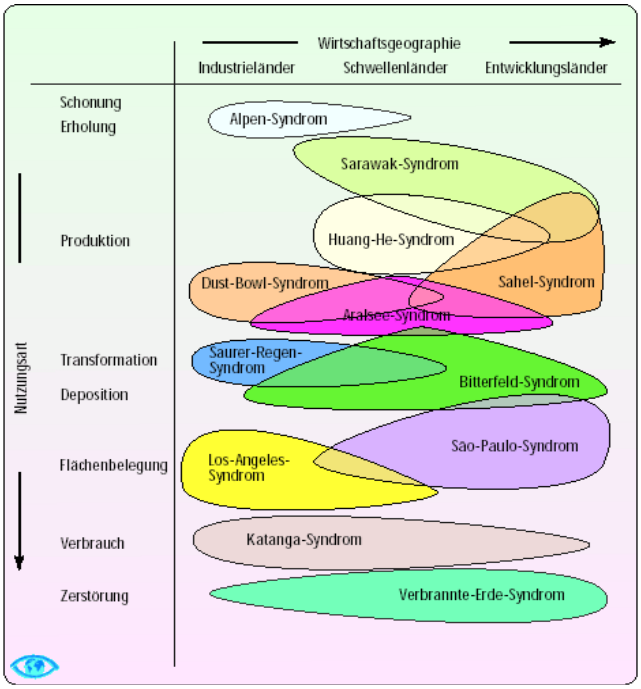
Concerning the focus on main trends, WP7 gave important impulses to WP6. Therefore, the third round of Delphi was structured along the main trends.

1.2 Stimuli for WP7

For elaborating the concept of main integrative trends, WP7 gained important stimuli by other projects and research activities and draws on their experiences. Four approaches shall be highlighted below.

1.2.1 Syndrome Concept

The “Syndrome Concept” was initially proposed by the WBGU (German Advisory Council on Global Change) in its Annual Reports (WBGU 1994, 1996), to enable an integrated description of global environment and development problems and their specific dynamics (cp. Fig. II-2). Afterwards it has been taken up and further developed by the PIK (Potsdam Institute for Climate Impact Research).



Huang-he Syndrome: Changes in the traditional use of land
Dust Bowl Syndrome: Soil degradation through mechanised farming
Sahel Syndrome: Excessive use of marginal land
Sarawak Syndrome: Conversion and/or over-exploitation of forests and other ecosystems
Aral Sea Syndrome: Misplanning of large-scale agricultural projects
Acid Rain Syndrome: Remote transport of nutrients and pollutants
Bitterfeld Syndrome: Local contamination, accumulation of waste and inherited pollution
São Paulo Syndrome: Uncontrolled urbanisation
Los-Angeles Syndrome: Overdevelopment and expansion of infrastructure
Katanga Syndrome: Mining and prospecting
Alps Syndrome: Soil and land degradation through tourism
Scorched Earth Syndrome: Land and soil degradation as a result of war and military action

Fig. II-2: Syndromes of human caused degradation of soils in different regions of the world (WBGU 1994: 154)

"Although the term 'syndrome' is borrowed from the medical field, where it relates to complex clinical profiles, in the analysis of the earth system it is used primarily to refer to interactions among multiple cofactors. Treatment of the latter requires an anamnesis, a diagnosis based on the examination and assessment of symptoms, and, finally, specific recommendations for therapy. The objective in each case is to ameliorate or eliminate the symptoms, or, even better, to avoid them entirely by means of preventive action." (WBGU[3])

A syndrome is defined as a typical pattern of civilization-nature interactions with an important contribution to the overall dynamic of global change, or a syndrome is a pattern of non-sustainable development (PETSCHEL-HELD et. al. 2001: 4). A certain syndrome is specified by the interaction of social, economic or political dynamics with natural regularities given by climate, functions of soils, vegetation or water balance. Therefore, the syndrome concept is a transdisciplinary approach.

The intention of the syndrome concept consists in the separation of the multiple phenomena of worldwide global change in a manageable set of patterns, which one can find worldwide in similar forming. It is obvious that these patterns change from region to region due to different natural and social conditions. Nevertheless, certain generalisation is possible (LÜDEKE & REUSSWIG 1999: 14). Syndrome analysis makes it possible to assess which regions of the world are particularly susceptible to specific syndromes in the present or future.

The syndrome approach is still undergoing development. The name given to each syndrome serves as a basic characterisation of something that is always much more complex and multi-layered than such a label can ever suggest.

In the WBGU Annual Report of 1994 the syndromes were oriented on different forms of human caused degradation of soils in different regions of the world (cp. Fig. II-2). The 1996 Annual Report of the WBGU (WBGU 1996, Challenges for the German Economy) follows a wider approach and describes 16 syndromes of global change.

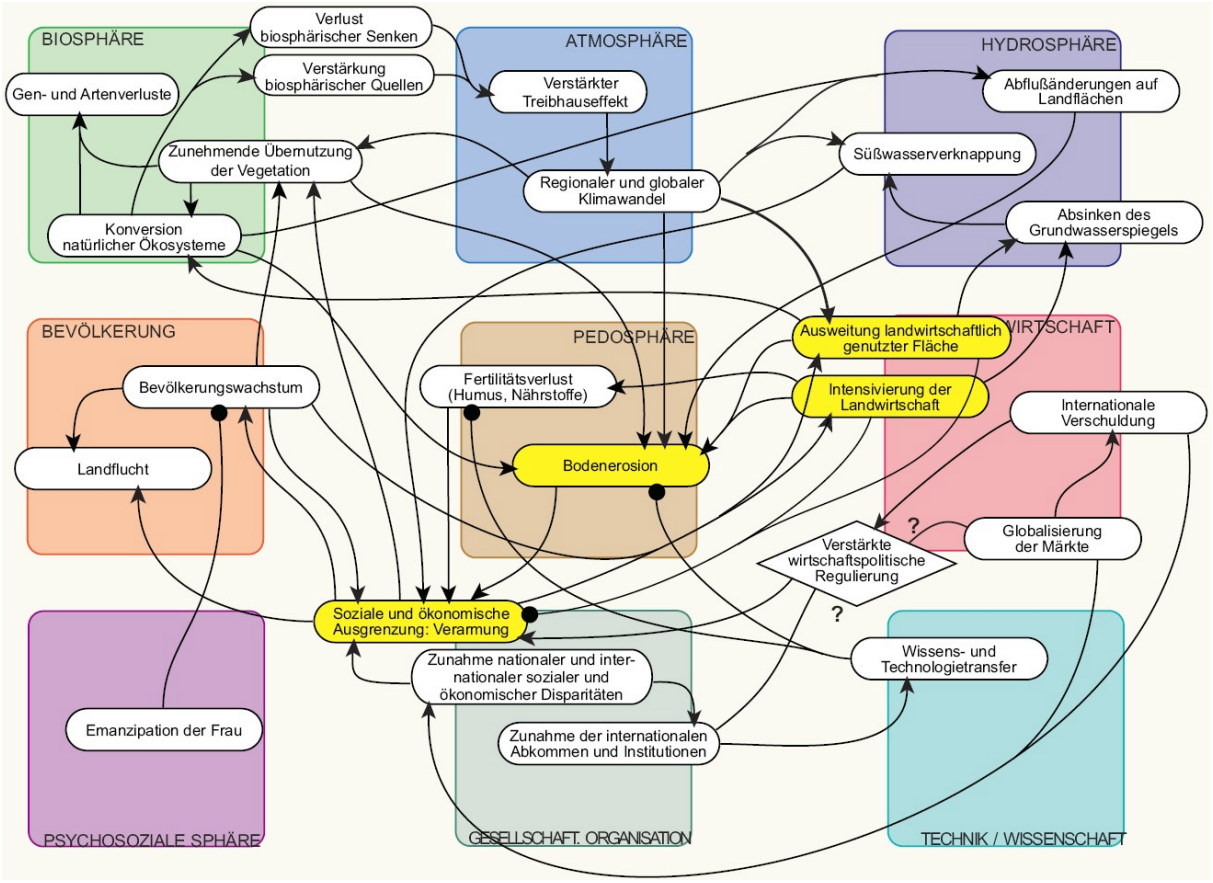


Fig. II-3: Network of interrelations for the Sahel-Syndrome-generating functional pattern (SCHELLNHUBER et al. 2002)

The further development of the syndrome concept by the PIK consisted particularly in the methodological procedures to identify, qualify and quantify the different influencing factors and their interactions for the respective syndrome (cp. Fig. II-3).

For DIAMONT the main attractiveness of the syndrome concept consists in its transdisciplinary approach. Grouping sub-trends (symptoms) with respect to different “spheres” as it is shown in Fig. II-3 gave impulses for the characterisation and description of the main trends and the grouping of phenomena (Section II:4) to dimensions (Section II:3) (SCHELLNHUBER et al. 2002).

Nevertheless one important difference between the syndrome concept and the DIAMONT approach should be mentioned here. In contrast to the syndromes the main trends of DIAMONT are not interpreted per se as patterns of non-sustainable development. But they can comprise unsustainable elements of regional development.

1.2.2 REGALP

The overall project objective of REGALP (Regional Development and cultural landscape change: the example of the alps. Evaluating and adjusting EU and national policies to manage a balanced change) was to investigate the interrelation between regional development and cultural (manmade) landscape change and to propose improvements and adjustments to policies on EU and national level.[4]

Within WP 2, the core work package of REGALP, main "regional development trends" were identified and analysed with regard to selected indicators for cultural landscape change (PFEFFERKORN & MUSOVIĆ 2003). The two main research questions concerning WP 2 were:

- Which types of regional development and cultural landscape change can be discerned?
- How are regional development and cultural landscape change interacting?

Between 1971 and today, REGALP could identify 6 main regional development trends, which could be specified by 9 sub-trends as follows: The most important development trend is the "centrally dominated development trend" (1) including 65-80% of the municipalities analysed. This trend is followed by the "balanced development trend" (2) including ca. 4-20% of the municipalities. The third trend is the "tourism-dominated development trend" (6) with 6-9%. The three other development trends (agriculture-(3), industry- (4) and service-dominated (5) trends) altogether include not more than 4-5% of the municipalities analysed (PFEFFERKORN & MUSOVIĆ 2003).

Characterising these main trends by a selection of cultural landscape indicators, REGALP could give input to DIAMONT which follows a similar methodological approach. The results of the variance analyses realised to statistically verify the interrelation between regional development and cultural landscape change were studied and considered for the indicator selection.

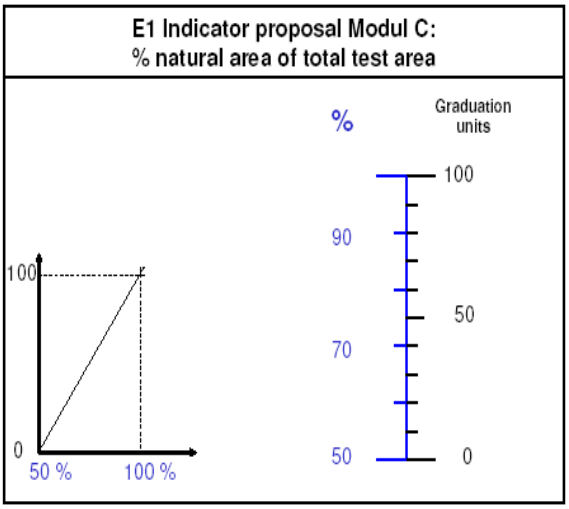
1.2.3 FUNalpin

FUNalpin (Virtual Future: New Types of Alpine Landscapes: Evaluating the resource bases of new economies for reshaping regional policy) was realised between 2003 and 2006 within the scope of the Swiss National Research Programme (NRP 48 Landscapes and Habitat of the Alps).

FUNalpin investigated "the effects of new economies and societal tendencies upon the socio-cultural value and the economic valuation of traditional Alpine landscapes. The change of social and economic value systems by globalisation and liberalisation calls for a shift of balance between market sector and regulation system. This will inevitably lead to new relations between extra-Alpine core regions and Alpine regions, but also the balance among Alpine regions themselves will be affected. Therefore, a reshaping of regional policy may well be imminent, with a strong tendency to differentiate between new emerging types of Alpine landscapes, especially qualified 'Label regions'." (BOESCH et al. 2004: 1)

The intended main result of FUNalpin consisted in regional policy recommendations, with the long-term objective of contributing to a sustainable development of the Alpine regions. Core element was outlining the concept of 'label regions', among other methodological steps by

setting up an adequate set of indicators for sustainable regional development and outlining an indicator-based certification procedure for label regions. The applicability and suitability of the concept were tested in several test regions.



Within working area 8 (certification) two indicator sets on sustainable and landscape development as well as the indicator system designed by FUNalpin itself were tested with regard to the certification system. Besides the results of the indicator discussion and the analyses on data availability for Switzerland, DIAMONT obtained important stimuli especially by the methodological approaches of FUNalpin regarding transformation (mathematical transformation of indicator values to uniform graduation units, cp. Fig. II-4) and aggregation of indicators.

Fig. II-4: Transformation of indicator values
(CARABIAS-HÜTTER et al. 2005)

1.2.4 SUSTALP

The goal of SUSTALP (Evaluation of the instruments of the European Union as regards their contribution to sustainable agriculture in the Alps, Fourth RTD Framework Programme, ENV 4-CT97-0442) was to study the effects of the Common Agricultural Policy (CAP) of the EU on the environment under differing social, cultural, economic and natural environmental aspects.

Besides a description and comparison of the EU and Swiss agricultural policy and the respective objectives, an empirical study was carried out analysing 5.558 municipalities of the whole Alpine range by 43 static and dynamic variables from the social, economic and environmental field and classifying the municipalities into eight agrarian structure region types by means of a clustering process (cp. Fig. II-5). In a second step, model regions in the agrarian structure region types were chosen. By means of interviews of farmers from the model regions, the question of the influence of the agricultural policy on economic strategies of farmers was investigated (TAPPEINER et al. 2003).

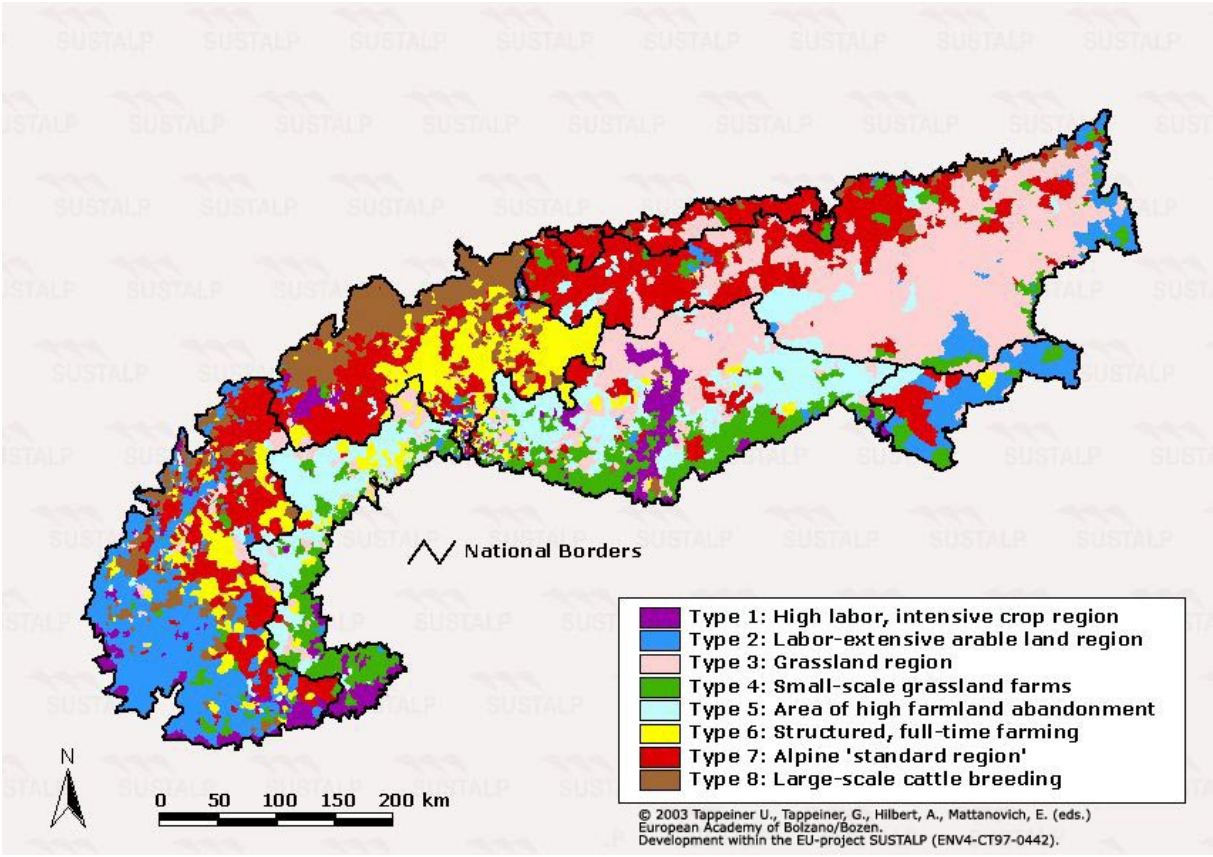


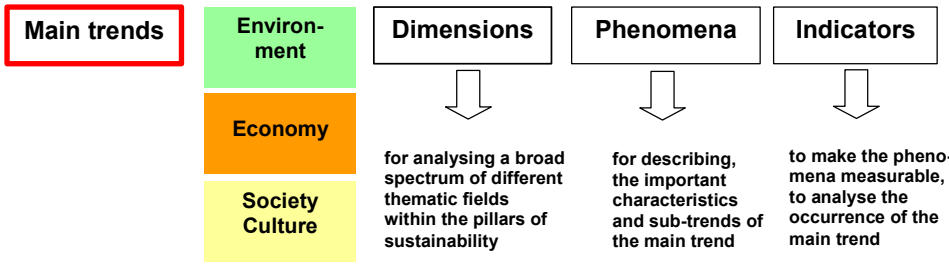
Fig. II-5: Eight agrarian structure region types as found in SUSTALP (TAPPEINER et al. 2003)

As DIAMONT aims to distinguish the occurrence of different main trends on a municipal level, there are important lessons to learn from the SUSTALP project. This refers on the one hand to the selection and development of a representative set of indicators with given data availability and bringing these indicators to life with comparable data collected and generated for all municipalities throughout the whole Alpine Arc. Moreover the method of creating a typology for the municipalities and the process of classifying them are of particular interest for interpreting the indicators in the context of the main trends.

2 Main trends

2.1 Identification of relevant main trends

One important starting point for WP7 was the selection and definition of main trends, which should be displayed by the indicators to be selected and developed.



2.1.1 Sources considered

WP7 based fundamentally on the preparatory work done in WP6. Therein important main trends of Alpine regional development were identified and discussed by experts in the course a Delphi survey (especially in the third round). After finalising WP6 further progress in defining and delimiting the main trends was achieved. Thus the main trends of WP6 do not correspond exactly to those of WP7. The results of WP5 also were expected to deliver inputs concerning the main fields of action on promoting sustainable regional development.

Additionally to the WP6 results literature was analysed to get an overview of the currently discussed problems and trends of regional development (with special focus on the Alpine space). Herewith it was not the objective to realise a comprehensive literature study, but only to focus on selected research such as political and planning documents on regional development. Tab. II-1 presents the list of documents analysed for this purpose.

Tab. II-1: Documents examined for identifying main trends of regional development

National Strategies and Reports on Spatial Planning and Development	• Austria: Österreichisches Raumentwicklungskonzept 2001 (ÖROK 2001) • France: Contrats de Plan Etat-Région for Rhône-Alpes region (CONSEIL REGIONAL ET PREFECTURE DE REGION RHONE-ALPES 2000) • France: Contrats de Plan for Provence-Alpes-Côte d'Azur region[1] (PREFECTURE DE REGION DE PROVENCE-ALPES-COTE D'AZUR & SECRETARIAT GENERAL POUR LES AFFAIRES REGIONALES 2000) • France: 'Environmental profile' for the region Rhône-Alpes[2] (working document) • Germany: Raumordnungsbericht 2005 (BBR 2005) • Slovenia: Spatial Development Strategy of Slovenia (SPRS) 2004 (MINISTRY OF THE ENVIRONMENT, SPATIAL PLANNING AND ENERGY 2004) • Switzerland: Raumentwicklungsbericht 2005 (ARE & UVEK 2005) • Europe: ESDP (European Spatial Development Perspective) (EC 1999, BBR 2000)

[1] The Contrats de Plan Etat-Région include specific objectives for mountain areas (e.g. pastoralism). Besides, since Rhône-Alpes include the metropolised Sillon Alpine area, also urban expansion or current economic development issues having a great significance for the French Alps were regarded.

[2] In the case of both French documents mentioned a check of the selected issues and phenomena was conducted after having proposed the first draft versions of main issues and phenomena.

National Strategies on Sustainable Development or comparable documents	• Austria: Die österreichische Strategie zur Nachhaltigen Entwicklung 2002 (ÖSTERREICHISCHE BUNDESREGIERUNG 2002) • France: National Sustainable Development Strategy 2003 (INTERMINISTERIAL COMMITTEE FOR SUSTAINABLE DEVELOPMENT 2003) • Germany: Perspektiven für Deutschland. Unsere Strategie für eine nachhaltige Entwicklung (DIE BUNDESREGIERUNG 2002) • Italy: Strategia d'azione ambientale per lo sviluppo sostenibile in Italia 2002 (MINAMBIENTE 2002) • Slovenia: Slovenia in the new decade: sustainability, competitiveness, membership in the EU - the strategy for the economic development of Slovenia 2001-2006 (ŠUŠTERŠIČ et al. 2001) • Slovenia: National Environmental Action Programme (MINISTRY OF THE ENVIRONMENT AND PHYSICAL PLANNING 1999) • Slovenia: Development Report 2005 (MURN & ŽAKELJ 2005) • Switzerland: Strategie Nachhaltige Entwicklung 2002 (SCHWEIZERISCHER BUNDESRAT 2002)
Social Reports	• Austria: Bericht über die soziale Lage 2003 - 2004 (BUNDESMINISTERIUM FÜR SOZIALE SICHERHEIT, GENERATIONEN UND KONSUMENTENSCHUTZ 2004) • Austria: Regionaler Armutsbericht für das Bundesland Salzburg 2002 (SCHOIBL 2002) • Austria: Sozialbedarfserhebung im Bundesland Tirol 2003 (SCHOIBL & DIMMEL 2003) • Austria: Bericht über die soziale Lage im Vorarlberg 2000 (AMT DER VORARLBERG LANDESREGIERUNG 2000) • Germany: Lebenslagen in Deutschland, Armuts- und Reichtumsbericht 2005 (BUNDESMINISTERIUM FÜR GESUNDHEIT UND SOZIALE SICHERUNG 2005) • Germany: Leben in Bayern – sozial, familienfreundlich, leistungsstark 2005 (BAYERISCHES STAATSMINISTERIUM FÜR ARBEIT UND SOZIALORDNUNG, FAMILIE UND FRAUEN 2005) • Italy: Sozialbericht 2002 für Südtirol (ABTEILUNG SOZIALWESEN & SYNERGIA 2002) • Switzerland: Sozialbericht Schweiz 2004 (SUTER et al. 2004) • Europe: Gemeinsamer Bericht über Sozialschutz und soziale Eingliederung (EC 2005c) • Europe: Advance Social Watch 2005 (SOCIAL WATCH 2005)
Research Projects	• RAUMALP: Raumstrukturelle Probleme im Alpenraum (www.oeaw.ac.at/isr/raumalp/intro.html) • REGALP: Regional Development and Cultural Landscape Change: The Example of the Alps (cp. Section II:1.2.2) (CASTIGLIONI et al. 2004) • NEWRUR: Urban Pressure on Rural Areas (http://newrur.grenoble.cemagref.fr/) • MARS: Monitoring the Alpine Region's Sustainability (BAK BASEL ECONOMICS 2005) • SUSTALP: Evaluation of instruments of the European Union as regards their contribution to sustainable agriculture in the Alps (Section II:1.2.4) (TAPPEINER et al. 2003)

Hardly one of the mentioned documents is focussed exclusively on the Alpine regions. National documents of Germany, Italy and France, where the Alps cover only a small share of the national territory, do not pick Alpine development issues out as a central theme. Nevertheless, the documents provide an insight into the national and partly regional discussion on the most important development issues and problems also present in the Alpine parts.

Concerning the research projects checked in the course of WP7, only the concepts of REGALP, SUSTALP and NEWRUR (Urban Pressure on Rural Areas) were using clearly delimited problem fields as research threads. Other projects as for example MARS based on the concept of sustainability without discussing specific development problems.

Furthermore WP7 considered:

- the results of the international Working Group on "Mountain Specific Environmental Objectives" and "Environmental Objectives and Indicators" set up by the Alpine Conference: The WG elaborated a conceptual model of cause-effect-relationships strongly oriented on

the DPSIR-approach of the EEA and referring thematically to the Protocols of the Alpine Convention (BMU & UBA 2003, Bosch & Partner & ifuplan 2004, cp. Section II:1.1),

- the syndromes defined and described by the "Syndrome Approach" (cp. Section II:1.2.1),
- the three topics of particular importance for the Alpine States, identified for the 4th Call for project proposals of the INTERREG III B Alpine Space Programme [5] and
- the territorial trends with significant and strong impact on the Alpine Space identified by the Alpine Space Prospective Study (BAUSCH et al. 2005, more details see below)

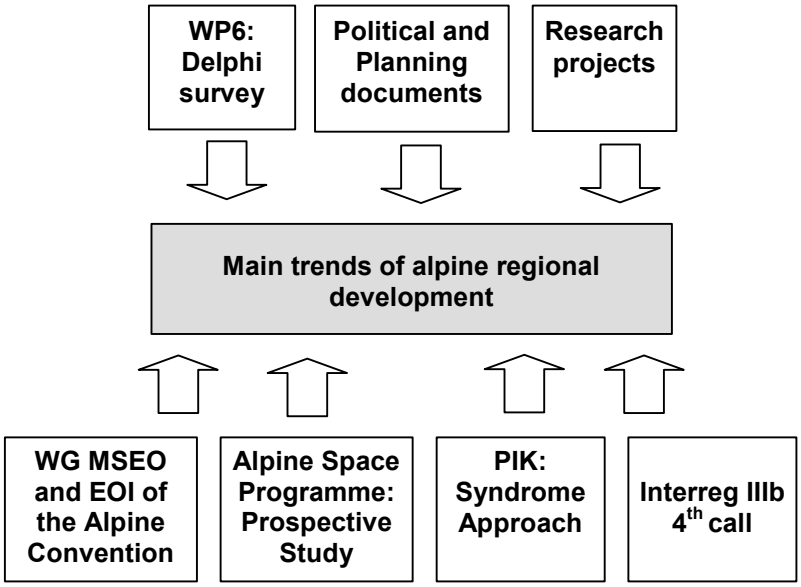


Fig. II-6 Inputs for the selection and description of main trends

2.1.2 Working procedure

During further steps of formulating phenomena (cp. Section II:4) and identifying suitable indicators (cp. Section III) additional changes of previous main trend formulations could be realised (cp. Fig. II-7 and Fig. II-12). The final version of main trends is presented in Tab. II-2 and Section II:2.2.

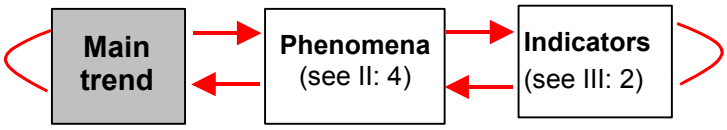


Fig. II-7: Back-coupling of main trend formulation and focussing

2.1.3 Check of comprehensiveness

The Tab. II-2 and Tab. II-3 contain a compilation and confrontation of the main trends selected by WP7 with those studied and defined in the context of other projects and programmes.

Tab. II-2: Main trends in different projects and programmes

WP7 DIAMONT	**WP6 DIAMONT** (BRIQUEL 2006)	**Syndrome-Approach** (WBGU 1996)	**REGALP – WP4** Most significant development trends (CASTIGLIONI et al. 2004)	**INTERREG III B 4th call**[6]
Urbanisation Local centres and fringes between	Urbanisation processes	Urban sprawl	Growth of urban areas and of their suburban and "dormitory" areas Increasing polarisation between as	Rural development including the urban connection

WP7 DIAMONT	**WP6 DIAMONT** (BRIQUEL 2006)	**Syndrome-Approach** (WBGU 1996)	**REGALP – WP4** Most significant development trends (CASTIGLIONI et al. 2004)	**INTERREG III B 4th call**[6]
competition and co-operation			well as within central and peripheral regions Suburbanisation Decrease of services or their concentration in the central areas	
			Metropolisation of the border Alpine regions	
Marginalisation of rural areas	Marginalisation of rural peripheral areas	Rural Exodus	Marginalisation and decline of peripheral areas Increasing polarisation between as well as within central and peripheral regions Decrease of services or their concentration in the central areas	Rural development including the urban connection
Congestion of transport system	Transport pressures		Increase of private motorisation	Traffic and transport
Innovation and competitiveness - Modernisation of agriculture in favoured areas	Innovation and competitive economic activities	Dust Bowl		
Innovation and competitiveness - Increasing importance of innovative technologies				
Tourism: Towards the Alpine Experience	Tourism sustainability	Mass Tourism Syndrome	Growth of main touristy areas at higher altitudes	
	Maintenance of Alpine forests			
		Contaminated Land Syndrome		
	Maintenance and development of natural and cultural resources			
Impacts of climate change	Climate change effects	Smokestack		Climate change
Increasing generation of renewable energy				

Two main trends identified within WP6 were not taken up in WP7. These are the “Maintenance of Alpine forests” and the “Maintenance and development of natural and cultural resources”,

- the first to get a better balance of the importance of the main trends – questions concerning the maintenance of Alpine forests are dealt within other main trends such as “Marginalisation of rural areas” or “Impacts of climate change”;
- the latter because the main trend could not be described and marked out in sufficient detail. The methodological approach of WP7 focussing on different dimensions of sustainability should guarantee that the most important aspects of the protection and the

sustainable development of natural and cultural resources are considered within the other main trends.

With respect to recent discussions on increasing use of renewable energy and in order to consider the prominent role of the Alps for providing energy from renewable sources (also considered by the Energy Protocol of the Alpine Convention), a new main trend on "Increasing generation of renewable energy" was included.

2004, the national co-ordinators of the Alpine Space INTERREG III B programme decided to propose to the Monitoring Committee to launch a study, so as to build a prospective vision of the Alpine area, which should be a basis to elaborate a possible co-operation programme after 2006 and to implement strategic projects. This so-called "Prospective Study" was elaborated by a transnational group of independent experts. The proposals for the programming in the new Structural funds period have been based on a comprehensive analysis of "main territorial trends".[3] For this analysis, a list of relevant sources has first been compiled, including

- general sources, such as statistical reports, general EU documents,
- results of SPESP and of ESPON studies,
- reports on studies by OECD, EEA and other EU agencies,
- research projects concerning the Alpine Space area.

The results of this literature screening have been synthesised into an initial set of trends, albeit mostly formulated in a general way. To determine the degree of territorial impacts of the identified trends, a web-based survey among experts was carried out (BAUSCH et al. 2005).

The results are compiled in Tab. II-3. The identified "top territorial trends" are marked in orange colour, "further important territorial trends" in yellow colour. As Tab. II-3 shows, all "top" and "further important" territorial trends identified in the "Prospective Study" are more or less touched by the main trends in DIAMONT.

Tab. II-3: Main trends identified in the Alpine Space Prospective Study (BAUSCH et al. 2005, modified)

Field of territorial development	**Short description of trend**[1)] (Territorial trends with significant and strong impact on the Alpine Space)	**Impact**[2)]	**DIAMONT: Main trends** (partly cited in short form)
Natural resources and biodiversity			
habitats and biodiversity	loss of habitats and biodiversity	1,45	nearly considered within all the main trends
air pollution and climate	increasing environmental damages by transport	1,45	Congestion of transport system

[3] …or "territorial trends in the focus of sustainable spatial development" respectively: "Even though [this] title includes the categories social, economic and territorial, we only speak about territorial trends in the text. This can be explained by the fact that we are speaking of the territorial dimension of trends, i. e. the territorial level or unit to which the trends pertain. Considered are trends in the three categories of sustainable development paradigm: natural resources and biodiversity, economy, as well as culture and social welfare. A fourth category, namely spatial development has been added in order to accommodate developments of a more narrowly defined territorial character." (BAUSCH et al. 2005: 17)

Field of territorial development	**Short description of trend**[1)] (Territorial trends with significant and strong impact on the Alpine Space)	**Impact**[2)]	**DIAMONT: Main trends** (partly cited in short form)
landscapes	variety of landscapes endangered	1,53	especially: Local centres and fringes, Marginalisation of rural areas
natural heritage	increasing pressure on natural resources and natural heritage		all main trends
natural hazards	dynamic increase of natural hazards	1,29	Impacts of climate change
nature protection	growing extent of protected areas in the EU	2,18	(Marginalisation of rural areas)
water resources	deterioration of water resource quality	1,79	Local centres and fringes
waste	increase of waste	2,09	Local centres and fringes
Economy			
accessibility	growing importance of accessibility to infrastructure and knowledge	1,53	Local centres and fringes, Marginalisation, Tourism: towards the Alpine experience, Increasing importance of innovative technologies
	knowledge economy and society are progressing	1,50	Increasing importance of innovative technologies, Marginalisation of rural areas
	economic restructuring is expected to accelerate	1,66	not considered
	increasing administration costs	2,47	not considered
transportation	increase of transportation volume, road growth, rail decline	1,45	Congestion of transport system
	growing impact of transportation on the environment		Congestion of transport system
energy	rising energy consumption	1,66	Congestion of transport system, Increasing generation of renewable energy, Tourism: towards the Alpine experience
state and society	declining State aid and funding	1,74	not considered
	continuing direct public support to SMEs	2,47	not considered
agriculture	growing competition in agriculture	1,70	Marginalisation of rural areas, Modernisation of agriculture in favoured areas
tourism	dynamic competition / concentration in the tourism sector	1,61	Tourism: towards the Alpine experience
	growth of city and cultural tourism	1,89	Tourism: towards the Alpine experience
Cultural and social welfare			
Cultural heritage	*New meanings and weight of cultural heritage due to EU enlargement*	2,00	not considered
population	overaging population	1,39	Marginalisation of rural areas
	depopulation	1,98	Marginalisation of rural areas
	decline of working age population	1,99	Marginalisation of rural areas
	growth in immigration (here: outmigration from metropolitans to core)	1,81	Local centres and fringes
state and society	increasing social protection expenditure and administration costs	1,98	not considered
	declining public expenditure across the EU	2,07	not considered
science, technology and education	*growing interest in higher education, but also stronger competition between universities*	1,40	partly: Local centres and fringes
	emerging opportunities for European cities as R&D locations	1,82	partly: Local centres and fringes

Field of territorial development	**Short description of trend**[1)] (Territorial trends with significant and strong impact on the Alpine Space)	**Impact**[2)]	**DIAMONT: Main trends** (partly cited in short form)
	societal preconditions and priorities for R&D are in transformation	2,06	not considered
Spatial development			
economic concentration	economic concentration in the EU / growing disparities	1,62	Local centres and fringes, Marginalisation of rural areas
	spreading of economic power	1,80	not considered
spatial disparities	increasing regional differences of job opportunities / unemployment	1,80	Local centres and fringes, Marginalisation of rural areas
urbanization	urbanisation and counter- urbanisation processes are taking place	1,70	Local centres and fringes, Marginalisation of rural areas

1) Because of the survey design of the Prosperity Study a detail analysis of later introduced territorial trends (marked by italics) was not possible any more. Further information on the intention of these trends are not available. Therefore a precise assignment to the main trends of DIAMONT was not possible in all cases.

2) average impact = average voting of the categories “territorial impact to the Alpine space”, “dynamic of the trend” and “duration of the trend” (by the given ordinal scales a value near 1,0 means that most of the experts consider a trend to be of a strong impact or respectively of a strong dynamic or respectively of a long lasting duration, values near 2 means medium impact, near 3 weak impact).

2.2 Description of the main trends

In the following sub-chapters the main trends are described:

- Local centres and fringes between competition and co-operation,
- Marginalisation of rural areas,
- Congestion of transport system,
- Tourism: towards the Alpine experience
- Innovation and competitiveness:
  - Modernisation of agriculture in favoured areas,
  - Increasing importance of innovative technologies,
- Impacts of climate change,
- Increasing importance of energy from renewable sources.

In the case of the main trends chosen for indicator selection and development (cp. Section II:2.3), some key questions for indication were formulated at the end of the sub-chapters for giving a first orientation concerning the focus of the indicator selection and development.

The main trend “Local centres and fringes between competition and co-operation” was selected to be studied with more detail in the subsequent work packages (cp. Section II:2.3). Therefore this main trend is presented and discussed with more detail in the following sub-chapter.

There is a broad consensus that the main trends are not characteristic exclusively for the Alps but for the whole European region even if the form of their occurrence may differ. Nevertheless, the natural, economic and social conditions in the Alps are in some ways different from those in the lowlands. Thus some trends occur in a more pronounced way and / or are associated with other problems or potentialities. For this reason a short analysis of the specific conditions in the Alps influencing the main trends is added.

2.2.1 Local centres and fringes between competition and co-operation

On European level, one can see the increased significance of cities and urban structures, lifestyle and culture. Public discourse and policies favour cities and agglomerations, especially the metropolitan ones. Both, economic process and public discourse currently run into a spatial and, in consequence, also into a social polarisation of functions and future chances.

The REGALP project (cp. Section II:1.2.2) demonstrated that the Alps are facing a significant polarisation of spatial development, too. Urban centres and suburban areas in the valley floors are growing whereas unfavourable areas are increasingly marginalised. In 1991, 57% of the population and more than 70% of all workplaces were concentrated in these booming regions, representing only 23% of the total Alpine area. Consequently land-use conflicts flare up as residential and commercial areas, traffic infrastructure, agricultural production as well as recreation and landscape protection compete for the limited spatial resources.

The urban sprawl along the main valleys results from “post-suburbanisation” processes which are characterised by the movement of former high-standing functions, like business related services, retail trade or logistics, to the suburbs and former rural areas, inverting the old models of centrality. This was driven by new forms of production and distribution but also based on national tax policies. Malls, shopping centres and shopping agglomerations, business and technology parks, service centres, (private) universities and high-schools, leisure and wellness parks, residential areas of town-leaving families and much more were located in a former rural environment. A new patchwork of “rurban” structures can be seen in many Alpine areas. Even in some touristy locations a similar sprawl is to be observed. However, this process of “post-suburbanisation” is not spread out all over the Alps. There are regions, like the Austrian or German Alps, where this process is going on rapidly, whereas other countries as Italy or Switzerland are less subject to the stress of post-suburbanisation. Besides, this process is rather selective, since it excludes ‘remote’ areas lacking not only infrastructure, but also, and above all, inhabitants (PERLIK & BORSDORF 2006).

Within the Alpine area, where larger metropolises[4] are mostly missing, small and medium sized towns are the cores of urbanisation and focal points of regional development processes. Unlike comparable towns outside the Alps, such towns took on essential supply functions in the past due to topographical and climatic conditions. Today they are often strongly linked with their neighbouring (sub- and periurban) municipalities and form units stretching across several communities, the so called urban areas (PERLIK 2001).

The main trend concentrates on local centres and their fringes, i.e. their urban areas, within the perimeter of the Alpine Convention[5]. The definition of local or small centres respectively follows considerations of the ESPON project (ÖIR 2006), which works on a pan-European

[4] Metropolitan areas comprising the core city with its periurban municipalities and post-suburban subcentres generally have about a million inhabitants and are orientated on a global level.

[5] The “Prospective Study” of the Alpine Space INTERREG IIIB Programme stressed the importance of investigations on the interrelation between those MEGAs (Metropolitan European Growth Areas) outside the Alps and the urban centres within the Alps. Nevertheless it has been decided to concentrate the DIAMONT activities exclusively on the Alpine Convention perimeter, among other reasons due to the limited capacities in the project to collect and handle peri-Alpine data.

level. Accordingly, in the framework of DIAMONT, “small centres” are defined as entities with less than 20.000 inhabitants within a continuous built-up area, a typical urban architecture, a good access to a wide array of networks and the proximity with specific functions, this means by structural and functional characteristics.

On the one hand, the main trend deals with the different development paths of the local centres and their fringes. Their past and recent developments are dependent from the natural conditions, their historic background, the characteristics of their labour market and last but not least from their surroundings. Some gain in importance as they are able to develop supra-regional functions (e.g. for international tourism or other new specialisations) or are embedded in bigger and expanding urban areas (dynamic development types). Others, mainly small towns, which are relatively isolated in low populated regions (e.g. Digne-les-Bains in France), still fulfil traditional supply functions. They may keep their functional significance but cannot compete with more important towns to fulfil other functions (e.g. high education). A third group is characterised by the decline of former key economic sectors which got meaningless in the national or global market. This group can be divided in either regions with no positive impulses at all or those with innovative initiatives as “starting points” for slowing or even turning the decline (cp. Fig. II-8).

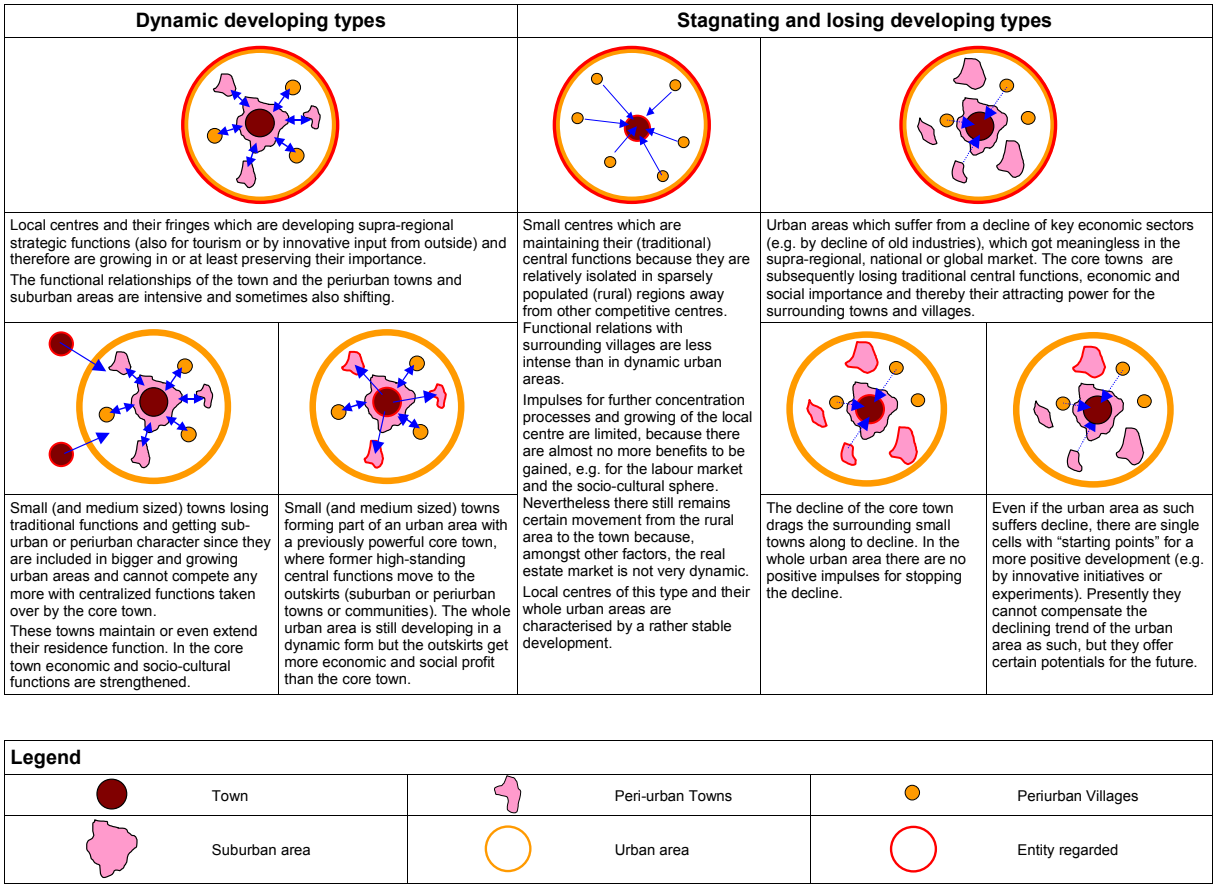


Fig. II-8: Development trends of urban areas

On the other hand, the main trend treats the functional relations between the local centres and their fringes as well as within these areas. The special (mostly linear) structure of the urban fabric in Alpine valleys and the scarcity of land available for development would re-

quire a fruitful co-operation between the Alpine municipalities to realise a wise spatial division of regional functions and services. This could reduce existing (social, ecological and economic) problems, avoiding harmful developments and fostering a sustainable development. In contrast, competition between the core cities and their emerging fringes or within these (suburban, peri-urban and post-suburban) areas results in an ineffective use of financial resources for investments and infrastructure, an impairment of natural resources (soil sealing, air pollution, loss of landscape aesthetics and natural habitats, etc.) or an increase of traffic (by commuters and for daily life needs) which may cause additional environmental impacts and changes of social structure and life quality.

Special situation in the Alps:

Even if urbanisation processes in the Alps form part of an Europe-wide urbanisation trend, there are some differences which make Alpine regions to a place with a particular form of urbanisation. Historical development led the Alps to thin settled regions, compared to urban areas outside the Alps (and to dense settled regions compared with other mountain ranges). Small population densities stand for generally low potential for urbanity and interactions between actors. The historic development of labour recently leads towards a specialisation which makes the Alps more a place of residence and recreation than of worldwide creation of goods or non-tourist services.

Last but not least the scarcity of sites for construction already mentioned above results in special conditions of competition and co-operation.

Important fields of indication:

Identification of local centres and their fringes:

- Which are the core towns and their respective urban areas to be observed in the framework of DIAMONT?

The indicator-based delimitation of urban areas strongly refers to the work of PERLIK (2001) on urban areas in the Alpine space. He aimed at cross-boarder comparability and completeness. Existing national definitions of agglomerations or urban areas could not be used, as they differ to a large extent and have not been developed regarding the specifics of the Alpine space. Thus it was necessary to use an own method of delineating the urban areas, which could be based on only a few indicators. The French method of CNRS and EQUIPE P.A.R.I.S. (1996 cit. in PERLIK 2001: 68) complied with the necessities, as it allowed to only use the indicators ‘Resident population’ and ‘Commuter relations’.

For the Alpine space, a two-step procedure based on this French method was conducted. It is only based on functional aspects and does not consider settlement structures. The basic unit of the delineation are municipalities (LAU2).

1. Definition of core cities of urban areas: core cities were defined as towns above a threshold of 10.000 inhabitants respectively above 5.000 jobs.
2. Delineation of the urban areas of the core cities:
    a. The inner periurban zone comprises municipalities, where the percentage of out-commuters to the core city exceeds a threshold of 30%. Mu-

nicipalities defined as core cities according to 1) but having more than 30% of out-commuters to a neighbouring larger town are also treated as periurban municipalities.

b. All municipalities, whose out-commuting rate to the core city and the inner periurban belt exceeds 30%, are part of the outer periurban zone. Next, all municipalities are added, whose out-commuting rate is split to two or more core cities with adjacent urban areas. These urban areas form the so called polycentric periurban zones.

Towns without periurban municipalities are treated as discrete urban areas. Two adjacent core cities are treated as one urban area, whereas the political centre is treated as core city of this urban area.

Problems of delineating urban areas arose in particular at the edge of the Alpine space, where Alpine municipalities are part of the catchments of metropolitan areas such as Munich, Turin, Milan, where different functional spatial units widely overlap. Nevertheless, approximately 190 urban areas have been delineated within the Alpine space (cp. Fig. II-9).

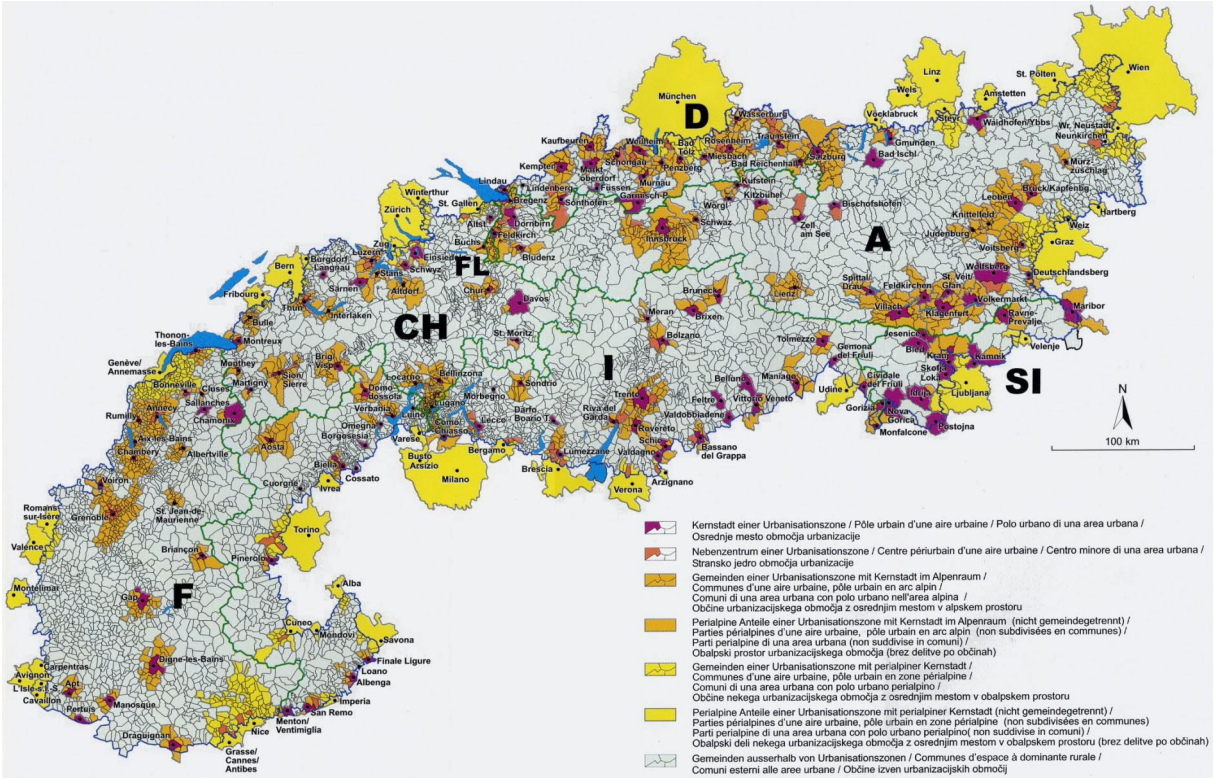


Fig. II-9: Delineation of urban areas within the Alpine Region (PERLIK 2001)

Characterisation of the development of local centres and their fringes:

- How can the dynamic development type be distinguished from the stagnating and losing development type?
- Which are the specific structural and functional characteristics of the urbanisation processes?
- Which are important preconditions for a dynamic development?

Co-operation and competition:

- Which are the mutual dependencies between the respective core towns and their surroundings?

Impacts of urbanisation:

- Does the urban area suffer ecological impairments or damages?
- Does the urbanisation process go along with an impairment of human health?
- Does the development foster sustainable social structures (e.g. equal access to goods and services, equal participation in the labour market)?
- Does the division of regional functions foster sustainability?

2.2.2 Marginalisation of rural areas

Rural areas in the Alps currently develop in very different ways. In the catchments of urban regions and agglomerations some of them are undergoing suburbanisation processes. Others do capitalise on touristy development. Today, an easy and pithy differentiation between urban and rural areas is not possible any more (SCHULER et al. 2004). The main trend "Marginalisation of rural areas" focuses only on such rural areas which are not comprised neither in suburbanisation processes nor in touristy development.

The peripheral rural areas are characterised by activities related to the primary sector, but in the same time by an abandonment of traditional agriculture resulting in notable landscape changes (CONTI & FAGARAZZI n.d.). Other characteristics are the low population density as well as population decline and aging due to emigration of young people. Lacking touristy potentials, difficult accessibility or simply political decisions cause that tourism is no suitable alternative for fostering economic development. In general the peripheral rural areas are poorly integrated into economic, social and political processes.

Nevertheless, these unfavourable conditions create new opportunities and rural areas can play a role in the coming knowledge-based economy. Structural changes and modern communication technologies such as the new and developing technologies of telework create new economic and social perspectives (VIRKKALA 2006 and "Periphera project"[7]). The abandonment of agriculture is also the chance of developing and expanding more natural habitats and new wilderness (CONTI & FAGARAZZI n.d.).

Special situation in the Alps:

Even if marginalisation of peripheral areas is occurring in the whole Europe and similar factors are steering these processes, in the Alps marginalisation happens upon special spatial and natural conditions. Due to the topographic situation, areas situated on mountain slopes or in side valleys can suffer bad accessibility and can spatially get caught in isolation, although their geographical distance to neighbouring agglomerations is not so high. As traditional agriculture is very often an important economic pillar for the rural economy, the competitiveness of agriculture (on the local, regional, national or even global scale) can be decisive for the economic and social surviving of the rural municipalities. The Alpine-typical natural conditions as steep slopes and short vegetation periods can complicate agricultural use, nevertheless, these premises may not always be disadvantageous (cp. Section II:2.2.4).

2.2.3 Congestion of transport system

Contrary to the objectives of the 6th Environmental Action Programme of the EU, the development of transport volumes and capacities is often regarded as a backbone of economic growth within Europe. As transport costs of road transport are only partly internalised and the rail transport tends to be remarkably slower due to differing technical systems, the growth of freight transport mainly occurs on the road system.

Also individual mobility is increasing. Recent trends show e.g. tendencies to shorter but more frequent vacations in destinations far away, which result in larger distances travelled. About 60% of passenger-km are already travelled for leisure purposes, mostly by car (HAUBNER 2003).

Due to the position in the centre of Europe, these developments also affect the Alps to a large extent. So a significant transport growth is expected for the Alpine region, e.g. up to 70% in freight transport and up to 80% in passenger transport to the year 2030 (Business as usual scenario of the study Environmentally Sustainable Transport (BMUJF n.d.)). Inner-Alpine traffic, tourism and transit transport will all contribute to these increments which will mainly account for road transport. As road traffic infrastructures are well developed especially on the transit corridors, the different types of traffic overlap on these parts of the road network. As a consequence, population and environment in these regions suffer strongly from the impacts caused by the high traffic densities.

The main trend “Congestion of Transport System” focuses on those municipalities or regions being the most influenced ones by presently high or increasing traffic loads. These can be municipalities or regions along or in the vicinity of important transit routes or passes, or those being strongly affected by touristy traffic or commuter traffic. To identify them, the proposed indicators do not describe only the development of passenger and freight transport on the Alpine transport network but also its possible impacts on the environment (especially noise and air pollution), economy (establishment of enterprises along the corridors) and society. It is obvious that some municipalities or regions benefit from their function as important transport corridors. Their excellent accessibility causes population growth and enhances the establishment of big enterprises having positive impacts on the local or regional economic development (for instance concerning the labour market, and the provision of private and public services). Others are isolated from these benefits and only suffer the negative effects as for example the loss of environmental quality and attractiveness for leisure and tourism.

Special situation in the Alps:

Municipalities and regions being strongly influenced by traffic and its impacts exist within and outside the Alps. Likewise within and outside the Alps these impacts can have positive or negative effects on their development (considering environmental, economic and social conditions). The special situation in the Alps is characterised by

- high concentration of traffic on a few corridors due to the topographic situation and the limited area for permanent infrastructure and settlement,
- the special conditions of pollutant dispersal and noise propagation in mountainous areas which differ strongly from the lowlands.

Important fields of indication:

Infrastructure conditions:

- Do the infrastructure characteristics (e.g. type of road, course of road, transit corridors within or in the direct vicinity of settlements) imply a strong influence of traffic on the municipality or region?

Traffic loads:

- Are the roads and railways in the area of the municipality or region heavily loaded by traffic?
- Does the respective modal split enhance the risk of negative impacts on the environment and human health?

Impacts on the environment and human health:

- Is the municipality or region affected by air pollution and noise?
- Is the landscape scenery damaged by road and rail infrastructure?

Economic and social impacts:

- Does the municipality or region benefit from traffic (population growth, labour market, GDP, private and public service provision)?

2.2.4 Innovation and competitiveness

This main trend focuses on the overall development of old and new economic sectors (except tourism) in the Alps, its dependence on social, environmental, technical, infrastructure and political conditions in the regional and national context, and on the question, to which extent the Alps develop to a more self-sustaining economic area.

- **Modernisation of agriculture in favoured areas:**

In some valleys and basins the Alpine agriculture meets favourable conditions of production similar to those outside the Alps. To remain competitive with extra-Alpine regions and food production in a globalised world, Alpine agriculture needs to be modernised. This modernisation may occur in different pathways. One option is the process of intensification, which is characterised by capitalisation and mechanisation of the production with a rising level of specialisation, increased input (e.g. of fertilizers), adoption of new agricultural technologies, high employment of capital, very often a decrease of employment and an enlargement of the production capacity. The other possibility is the production of high quality products which achieve higher market prices than mass products. Strategies include the production and labelling of organic products, labelling the origin of products, or focussing on niche products.

Special situation in the Alps:

In mountainous areas natural conditions for agriculture generally differ from flatlands in most locations. Farmers have to deal with varying conditions for growth sometimes changing from plot to plot (slopes of different steepness, different expositions, different soils, different elevations, etc.). These premises are not always disadvantageous, e.g. some cultures like wine-growing benefit from these conditions and in some valleys the naturally given factors are as

favourable as in flatlands. Still some conditions, such as slopes which are not easy accessible and not suitable for mechanised cultivation pose a clear disadvantage.

Another important difference to flatlands is that Alpine agriculture in favoured areas – mainly valley bottoms and basins – has to face a strong spatial competition with other land uses, especially with infrastructure, housing, industry and trade.

Concerning its environmental, economic and social impacts, modern agriculture in the Alps does not differ from extra-Alpine agriculture in principle, apart from minor regional characteristics (e.g. higher share of organic farming).

Important fields of indication:

Characteristics of modern agriculture:

- Are there common characteristics of modernised agriculture (e.g. full- or part-time farming, multifunctionality, necessary inputs)?
- Where is modern agriculture in the Alps located?

Economic importance of agriculture:

- Which importance does agriculture have for the municipal labour market?
- Are the modern farms profitable in economic terms?

Impacts of modernised agriculture:

- Do the municipalities, where modernised agriculture is establishing, suffer ecological disadvantages e.g. due to high water consumption by agriculture, worsening conditions for drinking water supply, losing biological diversity?
- Does the modernisation of agriculture also support social modernisation processes such as a higher participation of women on the management of the farms, a better professional training of the farmers or a higher part of younger farm holders?

- **Increasing importance of innovative technologies**

Historically, industry played a prominent role in the economic development of the Alps. During the 19th and 20th century nearly all large and easily accessible longitudinal valleys in the Alps have been industrially developed. Despite this tradition, in the 1980ies and 90ies, many industrial locations which were branches of industries located in non-Alpine agglomerations, have been closed down due to competition reasons (BÄTZING 1998). Former advantages (like labour surplus, direct access to hydropower and mineral resources) are no decisive location factors for modern enterprises any more. Regardless of these changes, trade and industry remained an important and often underestimated part of the Alpine economy. Furthermore, developing local innovation centres or higher education facilities today is often seen as a means to foster development in Alpine urban regions. Due to this economic importance, crises in industrial development have serious consequences for the economic stability of Alpine regions.

Otherwise there also exist new perspectives for entrepreneurial evolution. Thanks to an increasing independence of modern enterprises from distances and material transport also relatively remote locations can gain attractiveness (VIRKKALA 2006) e.g. for consulting and service enterprises as much as highly specialised component suppliers. Moreover, small-

and medium-sized enterprises are often more flexible and competitive than larger ones if they use chances of networking and modern telecommunication (BÄTZING 1998, CIPRA 2006). Developing these perspectives primarily depends on the innovative potential in the Alpine regions, and on the capacity of Alpine firms to catch new development opportunities in line with global market orientations.

Special situation in the Alps:

The globalising economy and the changing markets set the general conditions for enterprises within and outside the Alpine space. For Alpine industries, the dependencies on non-Alpine enterprises are said to be growing due to regional and international labour division and a demand concentrating on few Alpine key resources (tourism, transit, etc.). Nevertheless, the following specifics can foster innovation and innovative capacities in the Alpine space:

- the specific natural and topographic conditions require innovation e.g. in the field of engineering sciences (construction of tunnels, utilisation of water power, prevention of natural hazards as floodings etc.),
- specific resources (e.g. wood species, materials) require specific working techniques,
- changes of environmental conditions as climate occur earlier and to a larger extent, so there is a higher need of developing innovative strategies to adopt to the changing situation.

2.2.5 Tourism: towards the Alpine experience

The Alps are (behind the Mediterranean coasts) the second most favoured tourist destination in Europe considering tourism arrivals and overnight stays. Although the economic importance of tourism in the Alps is sometimes overestimated, it is a key branch for many Alpine areas, as tourism intensity is considered medium for app. 40% and high for app. 20% of the Alpine municipalities (EEA 2003). About 10% of the Alpine municipalities are economically monostructured (BÄTZING 2003). Based on good natural and infrastructure conditions (i.e. concerning sufficient snow cover), here tourism dominates the whole local or regional economy.

In recent years, tourism demands and travel patterns are changing. Tourists are travelling more often, for shorter stays and further from home and are often looking for destinations offering manifold opportunities and amenities (EEA 2003). These changing demands and the growing mobility put high pressure on the tourism sector in the Alps. Both, competition on the international as much as on the inner-Alpine level contribute to this pressure.

These developments can result in different effects and adaptation strategies respectively. In some former intensively developed tourism destination, which cannot compete, existing tourism infrastructures are abandoned. Other tourist destinations are developing strategies of a moderate non-mainstream tourism, specialising on providing high quality tourism or ecotourism in decentralised locations.

This main trend however concentrates on tourism destinations, where processes of concentration and intensification of tourism supply are occurring. Joined skiing areas, diverse events and concerted marketing strategies are only some means to face the regional competition and to enable tourism locations to follow the permanently changing and fastidious tourist and

leisure demands. This may positively affect economic investment power and induce higher utilization rates. But it also leads to serious disadvantages such as ecological and social impacts, as (over-) development tends to overstrain the existing structures and the financial resources of those communities, often resulting in a significant public debt.

Special situation in the Alps:

Changes in the touristy demand behaviour and the growing international competition of a globalising tourism sector affect both Alpine and non-Alpine tourism destinations. On the one hand, the Alps – in contrast to non-Alpine destinations – are outstanding, as the natural and topographic conditions facilitate a specific manifold of tourism and recreational (outdoor) activities making them an attractive tourism destination both in winter and summer season. On the other hand, some Alpine destinations are faced with the problem of seasonality, because they have only one or two seasons, resulting in insufficient utilization rates of the hotel industry. At the same time, the Alps are often described as a region highly sensitive against ecological impacts.

2.2.6 Impacts of climate change

Climate change is already happening. Observations show a global warming, the snow and ice cover decreased during the 20th century, precipitation – like temperature – increased, but the changes varied regionally. While global warming in the last 100 years amounts in the mean 0,8°C, in the northern part of the Alps mean temperature increased in the last 30 years up to 1,6°C. Even more important is the seasonal shift of precipitation and the expected increase of extreme meteorological events (SEILER 2006 and REMO[8]).

This main trend on "Climate Change" focuses on the possible impacts of climate change to men and Alpine cryo-, hydro- and biosphere. That means, not the often discussed details of the predicted changes of temperature and precipitation regime are of main interest, but the ecological, economic and partly also the social consequences of these changes.

A higher frequency and intensity of extreme meteorological events will increase natural hazards with strong impacts e.g. on the economy. The less obvious, long-term but lagging changes of natural conditions may influence the economy in an even more serious way. For example a shift in the snow-line, shorter periods of snow cover, melting glaciers and a declining stability of soils due to changes in the permafrost have serious implications for winter tourism. Drier conditions especially in summer would undermine energy and water supplies as well as agriculture and forestry. A shift of the permafrost-line would make some ground less firm and lead to difficulties for existing transport infrastructure, tourism areas and settlements.

The need for the development of several adaptation strategies for different public and private sectors (agriculture, forestry, land use planning, infrastructure etc.) and economic branches (tourism, energy supply, water supply and distribution etc.) is obvious.

Special situation in the Alps:

The intricate topography of mountain environments complicates weather patterns and confuses climate models, making it more difficult to project the specific impacts of climate change on these regions. Nevertheless, it is clear that climate change will add to the current

stress factors on the Alps and its impacts will partly differ from those outside the Alps due to the specific conditions of Alpine environment and economy[6].

2.2.7 Increasing generation of energy from renewable sources

For meeting the objectives of international climate policies as fixed in the Kyoto Protocol, the tapping of the full potential of all renewable energy sources will be required. In the face of the EU member states failing to meet their 2010 national goals for renewable energy production as laid down in Directive 2001/77/EC, experts expect that political support for renewable energy sources is likely to increase rather than diminish after an assessment of national renewable energy policies in view of the 2020 goals in 2007 (EC 2005b, LAUBER 2005).

From a technological perspective and considering global price increases for fossil fuels, the difference between generation costs and market value of renewable energy is predicted to approach 0 ct/kWh around the year 2020 (NITSCH et al. 2005). Reaching this break-even point would imply a huge future economic potential for energy production from renewable sources in the Alps. The lessons of recent hot summers with nuclear power plants having to reduce their capability due to cooling water limitations have furthermore illustrated the limited capacity of nuclear power as permanently available energy source and once again stressed the need to develop a strong power supply base from renewable energy sources.

The controversial discussion about the extension or construction of hydropower plants has gained a new momentum in recent times. The uncertainties of the liberalisation of the European energy market (BÄTZING 2003) seem at least partly overcome and there is a growing interest in increasing the installed capacities of hydropower plants.

Special situation in the Alps:

Due to their geographical position in the centre of Europe, the Alps are of great importance for power generation, transmission and the trading of electric energy. The Alps are also unique in their considerable share of energy generated from regenerative sources. This is mainly a result of the ample supply of water and the topographic situation, which offer ideal preconditions for an extensive generation of hydropower. On a global scale, the Alps feature one of the most extensive networks of hydro-power plants, power supply lines and power consumers, both commercial and private, of all mountain regions.

Nowadays, hydropower contributes some 55% to 70% to the overall electricity generation in some Alpine States such as Austria (EC 2001d) and Switzerland (BFE 2006). It is not only the amount but also the “quality” which makes hydropower a valuable resource in the Alps: Due to their topography, the Alps offer the opportunity to produce expensive surge current in pump storage power plants and to provide it to the European energy market. In the future

[6] REMO (regional scale model on climate change), recently developed by the German Umweltbundesamt and the Max Planck Institute for Meteorology, provides detailed data on future climate changes also in the Alps (including all Alpine countries). Based on the simulation a temperature increase in winter of more than 4°C until 2100 has been predicted in comparison to the time period between 1961 and 1990. http://www.umweltbundesamt.de/uba-info-presse/hintergrund/Klimaaenderungsworkshop.pdf (loaded: 07.07.2006)

context of a substantial trend towards using renewable energy sources across Europe, the Alpine pump storage power plants might serve as crucial storage facilities for wind and solar power, thus providing a constant supply of renewable energy for Western and Central Europe (ERLACHER 2005 and POLDERVAART 2005). Due to the current Alpine precipitation regime, river power plants have limited power generation potential during winter months, which on the other hand are the months with the highest power demand. Climate research however suggests that the Alpine precipitation regime is likely to produce more wintertime run-off in the process of climate change, as more precipitation is predicted to fall as rain and will no longer be held back in glaciers and snowfields. This trend would increase the power generation potential of river power plants and thus their competitiveness in the energy market.

Although hydropower is a clean energy in terms of GHG and air pollutant emission, its ecological impact on landscape, water balance and biodiversity needs to be borne in mind.

Compared to hydropower, other forms of energy generation from renewable sources play a minor role in the Alps. Yet, there is a relevant potential for the use of decentralised energy sources such as biomass, geothermic, wind or solar energy.

Important fields of indication:

Characteristics of renewable energy generation in the Alps:

- Is the increasing generation of renewable energies a significant trend in the Alpine region?
- How are capacities for the generation of renewable energy distributed across the Alps?
- What is the modal split between renewable energy sources and are there regional differences?
- How does the generation of renewable energies modify the Alpine landscape?

Socio-economic characteristics:

- How relevant is the Alpine renewable energy sector in terms of employment and economic development? Does the increasing demand for biomass residue open up new opportunities in the forest sector?
- How are revenues distributed?

Impacts of renewable energy generation on the Alpine environment:

- Is there a trend towards reducing the negative effects of hydropower on landscapes, habitats and species?
- To what extent do wind turbines and photovoltaic installations change the Alpine scenery?
- What further ecological impacts are related to the generation of renewable energy?

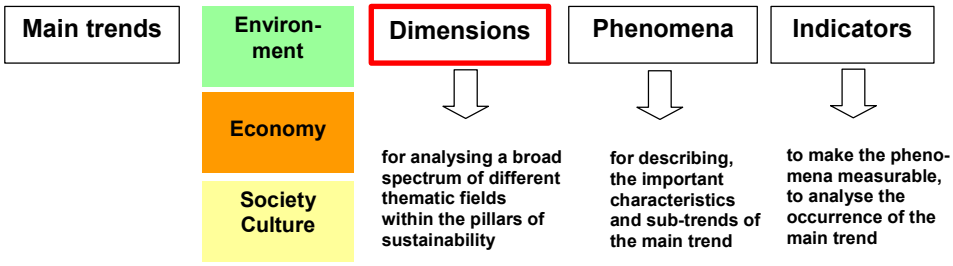
2.3 Main trend to be studied in detail

During the final discussion of WP6 results in March 2006, the main trend “Local centres and fringes between competition and co-operation - Steering towards sustainability” had been selected to be studied with more detail in the subsequent work packages. The preliminary

version on the formulation of the main trend has been provided by the Austrian Leadpartner in June 2006. Based on this version the indicator work was strongly focussed on this main trend (cp. Fig. II-8 and Section III:5.1). Additionally, three other main trends were selected to discuss and provide indicator ideas for:

1. Congestion of transport system (cp. Section II:2.2.3 and Section III:5.2),
2. Innovation and Competitiveness - Modernisation of agriculture in favoured areas (cp. Section II:2.2.4 and Section III:5.3),
3. Increasing generation of energy from renewable sources (cp. Section II:2.2.7 and Section III:5.4).

3 Dimensions



The formulation and detailed indicator based description of the main trends against the background of sustainability requires an integrative view on regional development within the Alps[7]. For this reason the ecological, social and economic pillar need a sufficient differentiation to clarify their respective contents. Within the methodological concept of WP7, the so-called "dimensions" take this function of further differentiating the three pillars of sustainability.

In contrast to the main trends and phenomena (cp. Section II:4), the "dimensions" themselves are not subject of indication. They solely act as structuring elements in order to orient the formulation of phenomena and the selection and development of indicators towards a broad spectrum of aspects to be considered under the umbrella of sustainable development (cp Fig. II-10).

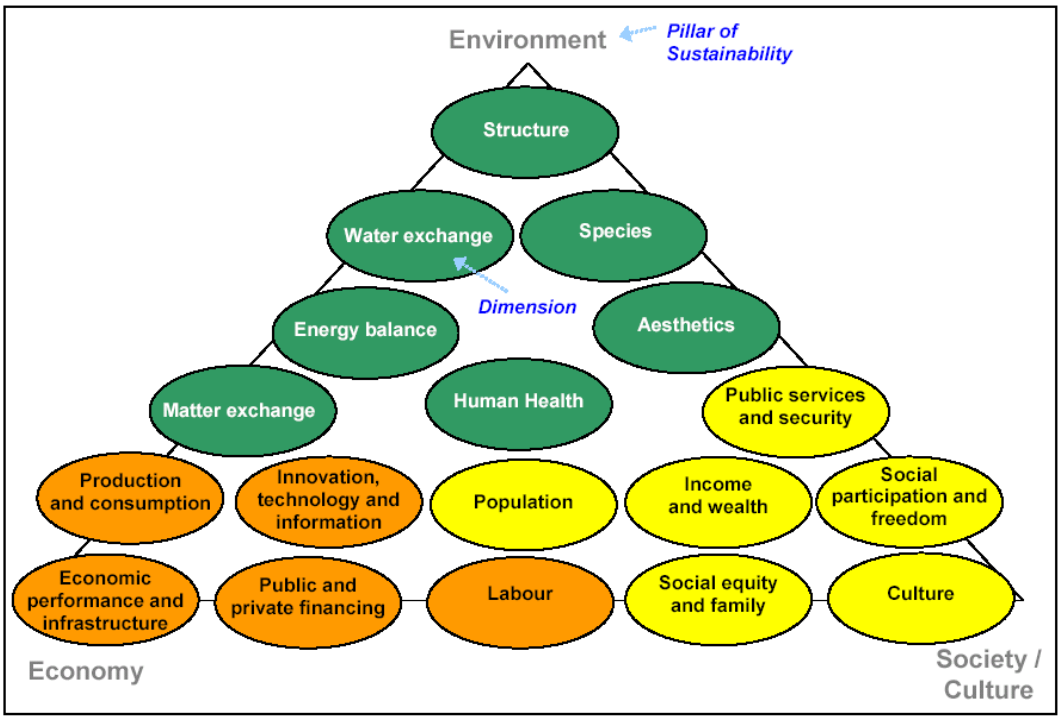


Fig. II-10: Dimensions in the DIAMONT concept

[7] The concept of sustainable development aims at fairness within and between the generations and is therefore an interrelated system of different domains which can be summarised in three pillars: economy, environment and society (OECD 2004 cited in BAK BASEL ECONOMICS 2005).

In accordance with the DIAMONT partners, the structure sticks to the original three-pillar-concept of sustainability. Cultural aspects are assigned to the social pillar, consciously leaving aside the insight that culture is often interpreted to play an important role for the implementation of sustainable development. Sometimes this is reflected by the definition of a fourth cultural pillar of sustainability, encompassing the fields of governance (governance structures and processes) and administration (cp. e. g. HAWKES 2001, but cp. also discussion in Section II:3.3 based on the results of WP5).

The definition of contents of the pillars of sustainability already has been undertaken in a number of different projects, which serve as a basis for the definition of dimensions in the current context. Tab. II-4 presents an overview of the assignment and contains some keywords for a better understanding of the dimensions. The following chapters will give a more detailed insight into the definition of the dimensions.

It should be mentioned that a straightforward assignment of certain dimensions to one single pillar is hardly possible and allocations might be disputable, as dimensions can encompass aspects of the social as much as of the economic pillar. This refers e. g. to the dimensions of "population" or "labour", which one could assign to both pillars named.

Tab. II-4: Dimensions and respective keywords

Dimension	Keywords - examples	Dimension	Keywords - examples
Environment			
Structure	• Distribution of ecosystems and landscape elements • Distribution of habitats • Fragmentation of ecosystems and habitats • (Intrinsic) structure of ecosystems • Structure of soils, soil sealing	Water exchange	• Change of water regime: precipitation regime, snow cover, melting water, development of glaciers • Change of flooding area, flooding
		Energy balance	• Emission and immission of radiation • Emission and immission of noise • Change of temperature regime
Species	• Change of species composition • Species biodiversity	Aesthetics	• Alpine scenery • Landscape biodiversity
Matter exchange	• Emission and immission of air pollutants • Emission and immission of water pollutants • Emission and immission of soil pollutants	Human health	• Impairment of human health by air pollution • Impairment of human health by water pollution • Impairment of human health by noise
Economy			
Economic performance and infrastructure	• Value added • Relevance of the economic sectors and branches • Competitiveness • Structure of enterprises (number and size) • Provision of infrastructure (buildings, transport infrastructure etc.)	Public and private financing	• Investment • Subsidies • Social welfare • Taxes • Insurances • Prices and costs, inflation, indebtedness • Credits, saving and interests

Dimension	Keywords - examples	Dimension	Keywords - examples
Economic performance and infrastructure (continuation)	• public utilities like electricity, natural gas, coal delivery, water supply, sewers, radio and television bandwidth allocation, cable television service, etc.)	Labour	• Demand and supply of working places • Jobs in the different economic sectors • Employment and unemployment
Production and consumption	• Consumption of material and resources • Buying / spending power • Consumption of energy • Waste management • Transport performance	Innovation, technology and information	• Science • Technical progress • Research by enterprises • Access to communication, communication infrastructure • Innovative potential, activities and obstructions
Society / Culture			
Population	• Spatial distribution of population • Seasonal distribution of population • Increase and decrease of population (migration and birth and mortality rates) • Age pyramid	Public services and security	• Services provided to the citizens (by the public sector or the private sector): access to education, health care, (public) transport, information, • Personal safety (accidents, delinquency) • Safety against (natural) disasters
Social equity and family	• Good social relations, social cohesion • Equity of gender, migrants, handicapped people, ethnic minorities • Childcare	Social participation and freedom	• Democratic participation • Social self-organising • Solidarity • Freedom and choice of action
Income and wealth	• Access to basic material for good life: nutrition, shelter • Personal income (sources)	Culture	• Maintenance of cultural tradition • Cultural identity

3.1 Environmental pillar

Several principles for structuring the environmental pillar are already in use for the purposes of environmental or sustainability reports and indicator systems. Three of these principles shall be highlighted because they are often used:

- using the environmental media (such as air, atmosphere, water, soil, fauna and flora, landscape) as an underlying structure (e.g. BUWAL 2002, EEA 2005, GOVERNMENT OF THE REPUBLIC OF SLOVENIA 2002, StaBa & UBA 2002, UNCSD[9]) facilitating a comprehensive presentation of the state and development of the single media;
- structuring according to environmental problems such as air pollution, ozone depletion, water pollution, climate change, chemicals , waste, and soil degradation (e.g. EEA 2001, EEA 2003);
- finally a more innovative and integrative approach, carried out in the framework of the "Millennium Assessment – Constituents of well-being" (Millennium Assessment 2005a and b), which is trying to allocate causes and effects to the following "ecosystem services":
    - Supporting (nutrient cycling, soil formation, primary production, etc.),
    - provisioning (food, fresh water, wood and fiber, fuel, etc.),

- regulating (climate regulation, flood regulation, disease regulation, water purification, etc.),
- cultural (aesthetic, spiritual, educational, recreational, etc.).

All approaches being analysed have advantages and disadvantages. The media focussed consideration of the ecological pillar fosters a simplified sectoral treatment of complex issues detached from possibly interconnected causes and effects. Difficulties to use the “ecosystem services” as structure of an indicator system in the context of DIAMONT arose from problems in a straightforward assignment of observed (sub-)trends and their effects to one single ecosystem function. Rather commonly, changes in the environment e.g. changes of the landscape (increase of wooded areas) touch several ecosystem services (provisioning, regulating, cultural).

Checking different approaches for structuring the ecological pillar, it became evident that overlapping and problems of assignment cannot be completely avoided. Therefore, an attempt was undertaken to find an underlying structure facilitating a media spanning vista and at the same time avoiding too many assignment problems. The approach bases on the idea of the ecological balance of a region and different sub-balances (cp. Tab. II-4).

To evaluate to a certain extent, whether this structure was feasible and useful, the sub-balances are confronted with the dimensions used in other projects and reports (cp. annex 1.1).

3.2 Economic pillar

Although only a rather limited selection of literature had been analysed for the field of economy, the impression arose that economic terminology is more standardised than terminology used in the environmental sector (cp. Section II:3.1). Even if some assignments are disputable, a set of five terms could be defined. Shortcomings of the proposed structure are e.g. the scarce treatment of the field of entrepreneurship, which is only partly covered by the dimensions “Economic performance and infrastructure” or “Innovation, technology and information”. The contents of the field of economic structure often are similar to those of the dimension “Economic performance and infrastructure” and thus were left aside.

Also a dimension “Economic stability” was consciously renounced, as this complex term often comprises all or a lot of objectives of the magic square of economic policy (price stability, a high level of employment, balance of payments equilibrium, as well as steady and adequate economic growth) and thus is not suitable for a differentiation of the economic pillar.

Annex 1.2 gives an overview of the terms found in literature and the assignment to DIAMONT dimensions defined.

3.3 Social pillar

As for the other pillars, a series of reports already differentiates the social pillar into various aspects or dimensions. By grouping these aspects the following proposal was elaborated as headlines of a structure for the social pillar.

The dimensions:

- "Population",
- "Social equity and family",
- "Income and wealth",
- "Public services and security",
- „Social participation and freedom",
- "Culture" limited on considerations on cultural traditions and cultural identity.

As already mentioned in Section II:3 the DIAMONT partnership agreed to stick to the original three-pillar-concept of sustainability leaving aside the often expressed interpretation that culture plays an important role for the implementation of sustainable development (e. g. HAWKES 2001[8]). Not to conceptualise an independent cultural pillar is primarily caused by the results of DIAMONT WP5 (BOESCH 2006) which stated that:

> "*in a time of sharply increasing influences of modernization and globalization processes in social, economic and also ecological matters, there is growing evidence of a common development strategy of all relevant actors, whereas the original regional differences (partly of cultural, historical and political causes, partly because of diverse location qualities) are diminishing as decisive factors of regional development. […] This in turn is a clear signal to DIAMONT: For monitoring regional development in the Alpine Convention context we must not spend to much efforts on indicators based in traditional cultural differences, but more on indicators measuring sustainable progress in a globalising world." (DIAMONT, WP 5: 6-7). "In general, the cultural aspects that were conventionally deeply intertwined with the Alps, won't play an important role in regional policy*" (DIAMONT, WP 5: 72).

Referring to a broad understanding of culture the term encompasses both action and structure. According to WP5 "culture" means "the attitudes, visions and behaviour of humans, social groups, regional populations, even nations, etc. to handle their life, to shape their environment, and to making sense of their very existence; but 'culture' means also the results of such actions, manifest in (cultural) objects (i.e. artefacts)" (DIAMONT, WP 5: p 9). Following this definition a lot of forms of cultural expression do furthermore manifest in other dimensions considered in the DIAMONT indicator structure. Therefore the "cultural dimension" within the social pillar has been limited on cultural traditions and cultural identities. Especially the first mentioned are still going to play an important role in the tourism industry (DIAMONT, WP 5: 72)[9].

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[8] „'The Fourth Pillar' provides a clear definition of culture, analyses its function within the emerging new planning paradigms and proposes practical measures for the integration of a cultural perspective into the public sphere. Its key conclusion is that a whole-of-government cultural framework, operating in parallel with social, environmental and economic frameworks, is essential for the achievement of a sustainable and healthy society." (HAWKES 2001)

[9] In other indicator systems the "cultural" dimension is considered only in a very limited form. For instance the key indicators on sustainability of cities and Swiss cantons (Ernst Basler + Partner AG & novatlantis 2003) provide only one indicator on culture namely the public expenditure for libraries, museums, galleries, theaters, concerts, preservation of historical monuments, mass media, etc..

Governance as well as administrative and institutional structures – also being part of a broader concept of culture and having (partly!) strong influences on conceptualising instruments and implementing measures for steering regional development – will be discussed in the context of WP9.

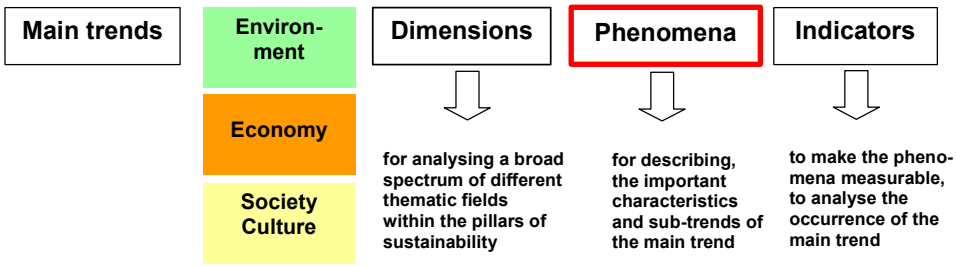
The dimension of "Human health" has been included in the environmental pillar, even if this categorisation is not completely consistent. Health related aspects are often discussed in the social context because following the WHO definition human health has to be interpreted in a broader sense: "Health is a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity"[10]. Important aspects of the social well-being have been included especially in the social dimensions of "Social equity and family" and "Public services and security". Within the ecological pillar health aspects are limited on physical well-being.

The dimensions of the social pillar also consider some – although not all – thematic aspects presently being in discussion in the context of a declaration of „Population and Culture" of the Alpine Convention. The three thematic fields to be dealt with in the future Declaration have been accorded during the VIII. Alpine Conference. They are described as "social awareness and co-operation" (collective awareness, encompassing Alpine and extra-Alpine co-operation), "cultural diversity" (encompassing material and immaterial cultural heritage, diversity of languages, artistic creativity) as well as "quality of life and equal opportunities" (encompassing settlement structures, basic supply, education, leisure activities, communication and information, community life)[11]. Especially the third thematic field has been reflected in DIAMONT.

Annex 1.3 provides a selective overview on different aspects of the social dimensions discussed and analysed in other documents on research and reporting.

4 Phenomena

4.1 Idea of the phenomena



As a preliminary step for selecting indicators so-called phenomena have been formulated. They describe important peculiarities and sub-trends intertwined to form the respective main trend. According to the entire structural concept, the phenomena are assigned to the dimensions and will focus the indicator selection and development. Furthermore, they play an important role for supporting the indicator interpretation. As the indicators are formulated in a neutral way (e.g. population change) and can be also assigned to different main trends, the phenomena clarify which specific indicator manifestations are characteristic for the respective main trend (e.g. population growth is a typical phenomenon of strong urbanisation processes, whereas population decrease characterises marginalisation processes, cp. also more detailed explanations in phenomena formulation in Section III:1.2 and Section III:1.3).

Tab. II-5: Derivation of phenomena from literature studies - extract

		Raumentwicklungsbericht 2005 (CH)	ÖREK 2001 (AT)	Raumordnungsbericht 2005 (DE)	Sustainable Spatial Development in Slovenia 2004	SDSS 2004 (SLO) Spatial Development Strategy of Slovenia	SEDS: Strategy for the economic Development of Slovenia 2001-2006
	Phenomena / important trends						
Agglomerations, urban regions	Increasing importance of agglomerations /metropolis	x	x	x			x
	Growing together of city and suburb forming a strong functional unit, development of urban regions		x	x	x		x
	Development of functional islands within agglomerations		x		x		
	Separation of living, working and leisure	x	x				
	Expansion of urban regions	x	x				x
	Dispersed growth of urban regions						x
	Intensification of commuter connections between core cities and suburbs	x	x	x			x
	Decrease of relations within walking distance		x				
	Concentration of population in urban areas	x	x			x	
	Concentration of political decision and control in agglomerations			x		x	
	Concentration of economic power in agglomerations	x	x			x	
	Concentration of entrepreneurial decision and control in metropolitans		x	x			
	Concentration of capital market oriented decision and control in metropolitans			x			
	Generating technical and scientifical innovations in metropolitans		x	x			
	Generating social and cultural innovations in metropolitans			x			
	Gateway-Function: Access to people (options for face-to-face-contacts, traffic relations) in metropolitans		x	x			
	Gateway-Function: Access to market (trade fair centres) in metropolitans		x	x			
	Concentration of jobs in agglomerations	x					
	Concentration of jobs in the tertiary sector in agglomerations	x					
	Lower decline of persons employed in metropolitan areas in comparison to rural and other urban areas	x					
	High contribution of agglomerations to the entire emissions		x				

The idea of formulating phenomena has been inspired by the "Syndrome Concept" (cp. Section II:1.2.1 and Fig. II-3), where a similar approach for characterising the complex "Syndromes" by "symptoms" has been chosen. The phenomena lists established for all main trends result from literature studies (cp. Tab. II-1), realised in the context of the identification of the main trends (cp. Tab. II-5), and from the Delphi surveys of WP6 (cp. Tab. II-6).

Tab. II-6: Derivation of phenomena from the Delphi survey realised in WP6 (three rounds) - extract

Urbanisation

Pillar of SD	Dimension	Phenomenon	WP 6		
			results of the 1st round	results of the 2nd round	contents of the 3rd round
Environment	Structure	Soil sealing in areas, where open spaces are already rare	x		
Environment	Water exchange	Loss of water absorbing capacity by soil sealing	x		
Environment	Water exchange	Loss of retention area and flooding area for rivers by infrastructural development and soil sealing			
Environment	Structure	Fragmentation of natural biotopes by construction	x	x	
Environment	Species	Loss of species adapted to extensive non-fragmented areas			
Environment	Structure	Loss of green corridors and open space			
Environment	Structure	Loss of typical natural biotopes of Alpine valleys due to high competition of nature protection and agriculture with urban uses	(x)		
Environment	Structure	Loss of fertile soils of Alpine valleys due to high competition of agriculture with urban uses	(x)		x
Environment	Matter exchange	High contribution of agglomerations to the entire air emissions		(x)	
Economy	Economic performance and infrastructure	Expansion of urban regions	x		
Economy	Economic performance and infrastructure	Expansion of areas used for settlements (especially one-familiy houses) and infrastructure in suburban areas	x		
Economy	Economic performance and infrastructure	Expansion of areas used for settlements and infrastructure in suburban areas disproportionate to population growth	(x)		
Economy	Economic performance and infrastructure	Coalescence of traditional villages into suburban areas			x
Economy	Economic performance and infrastructure	Usage of hazardous zones (like valleys slopes, flood expansion fields, etc.) for construction	x		x
Economy	Economic performance and infrastructure	Development of high tech business parks (industrial and commercial areas, also combining of shopping and leisure activities) in urban areas			x
Economy	Public and private financing	Loss of buying power and income taxes in core cities in favour of the suburban areas			
Economy	Public and private financing	High costs for construction due to increasing costs for safety and security standards	x		
Economy	Public and private financing	High real estate prices due to high competitiveness of land use			
Society / Culture	Population	High part of the Alpine population living in towns	x	x	
Society / Culture	Population	High density of population in urban areas	x		
Society / Culture	Population	Immigration of extra-Alpine population due to high attractiveness of the Alpine agglomerations (e.g. due to their attractive landscape)		x	x
Society / Culture	Public services and security	Concentration of public and private service provision in agglomerations	x		
Society / Culture	Public services and security	Development of new services activities polarizing in cities peripheries			x

x Phenomenon identified by WP6
(x) Phenomenon identified by WP6 but with slightly modified formulation and / or thematic focusing

The analyses of political and partly also of scientific documents dealing with problems of sustainable regional development in the Alps as well as the special focus of WP 6 resulted in a certain imbalance concerning the representation of the three pillars of sustainability. Therefore a selective (experience-based) supplementation especially within the ecological pillar was necessary.

Within WP7 we refrained from adding further phenomena which describe measurements and actions taken. This is why some activity-oriented phenomena identified and discussed in

WP6 have not been taken over in the phenomena lists. Further related activities will be taken in the course of WP9.

During the work progress, the phenomena lists have been continuously updated in accordance to new main trend re-formulations and their thematic focussing (cp. Fig. II-7).

As the main trends themselves are not exclusively specific for the Alps (cp. Section II:2.2) the phenomena are neither. Nevertheless, their individual occurrence and interconnections to other phenomena express the characteristic and specific conditions in the Alps (cp. Section III:3.4.2).

4.2 Phenomena lists and results of weighting

The results of the above described steps (literature studies and interpretation of the results of the Delphi survey) lead to comprehensive phenomena lists for all the identified main trends. These lists are documented in annex 2.

To focus the work on indicator selection and development a prioritisation of the phenomena has been conducted

- by weighting the phenomena according to their relevance for the Alps in the respective country using five ranks (very high: 5, rather high: 4, rather low: 3, very low: 2, irrelevant: 1, no opinion: 0); this ranking was carried out by all project partners of DIAMONT (except the Swiss one);
- by considering the ranking results of the third round of Delphi realised for only some selected phenomena in WP6 (four ranks were defined: very high: 4, rather high: 3, rather low: 2, very low: 1, no opinion: 0).

Interpreting the weighting results of the DIAMONT partners, the following problems arose:

- Not all partners carried out the weighting exclusively considering the phenomena of one main trend at a time but considered the phenomena of all the main trends simultaneously.
- It became obvious that some main trends had not been focussed sufficiently and were including contradictory sub-trends; thus a well-defined weighting was not possible.
- The formulation of some phenomena provoked misunderstanding.
- The different partners weighted on different levels, some using generally higher, other generally lower scores.

The overall weighting result is consciously not based on an average value of all scores to respect the different conditions in the Alps. These can evoke significant differences in the importance of certain phenomena from one country to the other. Furthermore the estimations delivered by the different partners for their countries were not comparable as such. Whereas the other partners delivered one result for one country, there were differing estimations on the importance of the phenomena from the Italian side as two partners were participating and EURAC delivered the estimations of several people.

In annex 2 the methods of interpreting as well as the weighting results are summarised. These tables served as the basis for the further steps on indicator selection and development

(cp. Fig. II-11). Due to the above mentioned problems or limitations concerning the interpretation of the weighting results it has been decided,

- to use the weighting results only as an orientation for the selection of phenomena, and
- to continue the formulation and further focussing of the main trends.

Urbanisation			Results of the 3rd round of Delphi (WP6)						Results of the weighting by DIAMONT partners (WP7)						
Pillar of SD	Dimension	Phenomenon	Appreciation present (%)	Average present	highest value present	Appreciation future (%)	Average future	Highest Value future	Relevance for the Alps in your country						Total
									AMGI	UIBK	EURAC	UNCEM	ifuplan	CEMA-GREF	
Environment	Structure	Soil sealing in areas, where open spaces are already rare							1,0	5,0	3,7	-	3,0	5,0	17,7
Environment	Water exchange	Loss of water absorbing capacity by soil sealing							2,0	4,0	3,3	3,0	3,0	5,0	20,3
Environment	Water exchange	Loss of retention area and flooding area for rivers by infrastructural development and soil sealing	62	2,98	3,8	79	3,3	3,88	4,0	5,0	4,0	2,0	4,0	4,0	23,0
Environment	Structure	Fragmentation of natural biotopes by construction							4,0	5,0	3,3	2,0	3,0	4,0	21,3
Environment	Species	Loss of species adapted to extensive non-fragmented areas							3,0	4,0	3,0	3,0	-	-	13,0
Environment	Structure	Loss of green corridors and open space	62	2,98	3,8	79	3,3	3,88	4,0	4,0	3,3	3,0	3,0	5,0	22,3
Environment	Structure	Loss of typical natural biotopes of Alpine valleys due to high competition of nature protection and agriculture with urban uses	62	2,98	3,8	79	3,3	3,88	2,0	4,0	4,0	3,0	3,0	4,0	20,0
Environment	Structure	Loss of fertile soils of Alpine valleys due to high competition of agriculture with urban uses	60	2,86	3,33	66	2,98	3,63	4,0	4,0	3,7	4,0	3,0	5,0	23,7
Environment	Structure	Layouts regulating space consumption	53	2,77	3,17	77	3,2	3,83	5,0	-	-	-	-	4,0	9,0
Environment	Matter exchange	High contribution of agglomerations to the entire air emissions							3,0	4,0	4,3	3,0	4,0	4,0	22,3
Environment	Energy balance	Emissions of noise							3,0	4,0	3,7	3,0	3,0	2,0	18,7
Environment	Matter exchange	Air pollution in agglomeration, especially in valleys and basins							3,0	4,0	4,3	3,0	1,0	5,0	20,3
Environment	Matter exchange	Pollution of groundwater caused by insufficient technical infrastructures and increasing traffic							4,0	3,0	3,3	2,0	2,0	4,0	18,3
Environment	Matter exchange	Pollution of rivers by insufficient waste water treatment							4,0	3,0	2,3	2,0	1,0	5,0	17,3
Environment	Water exchange	Excessive exploitation of drinking water in the vicinity of agglomerations							3,0	3,0	3,7	1,0	2,0	4,0	16,7
Environment	Human health	Impairment of human health by air pollution							3,0	4,0	4,0	2,0	3,0	4,0	20,0
Environment	Human health	Impairment of human health by noise							3,0	5,0	3,3	2,0	3,0	2,0	18,3
Environment	Aesthetics	Damages of Alpine scenery due to uncontrolled urban sprawl	74	3,07	3,56	68	3,09	3,67	3,0	5,0	4,0	3,0	3,0	5,0	23,0
Environment		In the suburb loss of environmental quality as a former rural quality							4,0	4,0	3,5	2,0	2,0	4,0	19,5
Economy	Economic performance and infrastructure	Expansion of urban regions							4,0	5,0	3,0	3,0	3,0	5,0	23,0
Economy	Economic performance and infrastructure	Growing together of city and suburb							3,0	5,0	3,7	3,0	1,0	4,0	19,7
Economy	Economic performance and infrastructure	Expansion of areas used for settlements (especially one-familiy houses) and infrastructure in suburban areas							4,0	4,0	3,3	-	4,0	5,0	20,3
Economy	Economic performance and infrastructure	Expansion of areas used for settlements and infrastructure in suburban areas disproportionate to population growth							3,0	3,0	2,7	-	-	4,0	12,7
Economy	Economic performance and infrastructure	Coalescence of traditional villages into suburban areas	53	2,73	3	62	2,91	3,25	4,0	5,0	4,0	2,0	2,0	4,0	21,0
Economy	Economic performance and infrastructure	Usage of hazardous zones (like valleys slopes, flood expansion fields, etc.) for construction							4,0	5,0	3,5	2,0	3,0	4,0	21,5
Economy	Economic performance and infrastructure	Development of high tech business parks (industrial and commercial areas, also combining of shopping and leisure activities) in urban areas	36	2,4	3,13	57	2,78	3,29	3,0	4,0	3,0	2,0	4,0	5,0	21,0
Economy	Economic performance and infrastructure	Abandonment of previous industrial and warehouse sites in inner cities							2,0	3,0	2,0	3,0	2,0	4,0	16,0
Economy	Economic performance and infrastructure	Retreat of agriculture in urban and suburban areas							3,0	3,0	3,5	2,0	3,0	4,0	18,5
Economy	Economic performance and infrastructure	Concentration of economic power and entrepreneurial oriented decisions in agglomerations							3,0	4,0	4,3	3,0	3,0	3,0	20,3
Economy	Public and private financing	Concentration of capital market oriented decisions in agglomerations							3,0	4,0	4,0	3,0	-	2,0	16,0
Economy	Public and private financing	Budget imbalances between core cities and sub-urbs (core cities offer extensive services for the whole agglomeration)							2,0	-	2,0	3,0	1,0	4,0	12,0

Economy	Production and consumption	Intensive commuter connections between core cities and suburbs	34	2,26	3,5	61	2,85	3,5	3,0	5,0	4,7	2,0	3,0	5,0	22,7
Economy	Production and consumption	High quantity of waste accumulation							3,0	3,0	3,3	2,0	1,0	4,0	16,3
Economy	Production and consumption	High quantity of waste water accumulation							3,0	3,0	3,3	2,0	1,0	4,0	16,3
Economy	Innovation, technology and information	Generating technical and scientifical innovations in metropolitans							3,0	3,0	3,7	3,0	3,0	5,0	20,7
Economy	Innovation, technology and information	Generating social and cultural innovations in metropolitans							3,0	4,0	3,3	3,0	1,0	4,0	18,3
Society / Culture	Population	High part of the Alpine population living in towns							2,0	3,0	3,7	3,0	-	4,0	15,7
Society / Culture	Population	High density of population in urban areas							2,0	5,0	4,3	3,0	-	4,0	18,3
Society / Culture	Population	Immigration of extra-Alpine population due to high attractiveness of the Alpine agglomerations (e.g. due to their attractive landscape)	57	2,67	3,22	66	2,91	3,57	2,0	3,0	3,0	3,0	3,0	4,0	18,0
Society / Culture	Population	Immigration out of peripheral rural areas due to high attractiveness of the agglomerations for the population searching for a more urban lifestyle							2,0	5,0	3,0	3,0	3,0	3,0	19,0
Society / Culture	Population	Selective migration from the core cities to the agglomeration communities							2,0	2,0	2,7	2,0	1,0	4,0	13,7
Society / Culture	Social equity and family	Concentration of deprived people in the core cities, concentration of the middle and upper class in the communities in suburban areas							3,0	2,0	2,3	3,0	1,0	4,0	15,3
Society / Culture	Social equity and family	Loss of social cohesion as a former rural quality in the suburb	36	2,44	2,78	51	2,59	3,13	3,0	3,0	2,3	3,0	1,0	4,0	16,3
Society / Culture	Income and wealth	Increase of households with an income higer than the average in the suburban areas							3,0	-	3,7	2,0	1,0	4,0	13,7
Society / Culture	Public services and security	Concentration of public and private service provision in agglomerations							3,0	5,0	3,7	3,0	3,0	4,0	21,7
Society / Culture	Public services and security	Development of new services activities polarizing in cities peripheries	40	2,7	2,86	47	2,92	3,86	2,0	3,0	1,0	3,0	-	4,0	13,0
Society / Culture	Human health	Increasing interest paid to wooded areas in densely populated valleys for citizens oxygenation	32	2,18	2,63	53	2,64	3,29	3,0	2,0	3,3	1,0	2,0	3,0	14,3
Society / Culture	Social participation and freedom	Concentration of political decisions and control in agglomerations							3,0	3,0	3,7	4,0	-	3,0	16,7
Society / Culture	Culture	In the suburban area loss of cultural traditions as a former quality of rural areas							3,0	3,0	3,3	4,0	-	3,0	16,3
Society / Culture	Culture	Loss of identity caused by transformation of the cultural landscape and the coalescence of traditional villages and suburban areas							4,0	3,0	2,0	2,0	-	4,0	15,0
	not yet assigned	Marginalisation of small and medium-size cities							3,0	-	-	-	-	5,0	8,0
	not yet assigned	Setting up planning documents including cities peripheries	66	2,98	3,8	79	3,3	3,88	3,0	-	-	-	-	4,0	7,0
	not yet assigned	Inclusion into metropolises commuters catchment areas							3,0	-	-	-	-	4,0	7,0
	not yet assigned	Revitalisation of city centres							4,0	-	-	-	-	4,0	8,0
please add:		**Additional phenomena**													
		Urban decline, shrinking								x					
		Vaccum of urban development strategies after the collapse of central city theory								x					
		Globalised architecture								x					
		Recycling of urban materia								x					
		Number of results							61,0	53,0	55,0	53,0	43,0	60,0	61,0
		Sum of all scores							188,0	203,0	184,3	136,0	102,0	237,0	1050,3
		Average of all scores							3,1	3,8	3,4	2,6	2,4	4,0	17,2
		Phenomenon of minor importance (weighting results)													
		Phenomenon controversially weighted (weighting by partners)													
		Phenomenon of future importance (weighting 3rd round)													
		Phenomenon of high importance (weighting results)													

Fig. II-11: Summarised weighting results – extract of annex 2

4.3 From phenomena to indicators

While further focussing the four main trends chosen for elaborating indicators (cp. Section II:2.3) and while discussing suitable indicators (Section III:1.2 and Section III:1.3) the weighted phenomena lists were critically reflected and further delimited. Phenomena not fitting to the reformulated main trends any more were dropped and new suitable phenomena described. Thus a compilation of phenomena was obtained for which indicators had to be proposed. To make this process transparent the following criteria were defined. The phenomena chosen do not need to apply to all of these criteria.

- The phenomenon should have a close relation to the reformulated main trend: Due to the reformulation and focussing of some main trends, some phenomena evaluated as highly important by the Delphi and DIAMONT experts, do not seem to be relevant any more.
- The phenomenon is appropriate to identify differences on the level of municipalities (or at least regions): Some phenomena evaluated as being of high importance refer to the national or even global level.
- The reformulated main trend requires additional phenomena.
- The phenomenon was weighted to be important by the Delphi experts and DIAMONT partners.
- The phenomenon, even if weighted low, contributes to complete the spectrum of the dimensions of sustainability, which should be considered in the context of the main trend.

Fig. II-13 provides one extract of this review process. Complete tables for the main trends studied with more detail are presented in annex 3.

Finally the phenomena were selected and formulated by combining a top down and bottom up approach as it is shown in Fig. II-12. This revision process also lead to slight reformulations of the main trends (cp. Fig. II-7), which are already considered in the respective chapters presenting the main trends (Section II:2.2.1, Section II:2.2.3, Section II:2.2.4 Section II:2.2.7).

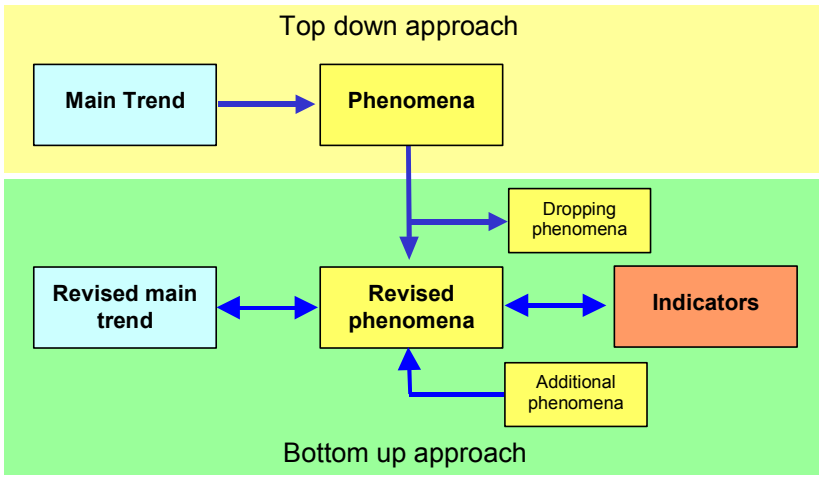


Fig. II-12: Top down and bottom up approach to select and formulate phenomena ((ifuplan)

Pillar of SD	Dimension	Phenomenon	Indicator development
Environment	Structure	Soil sealing by construction of infrastructure	Substituted by the phenomenon “Increasing land take for infrastructure and settlement”; indicator(s) to be discussed
Environment	Structure	Loss of fertile soils of Alpine valleys by construction of infrastructure	Not evaluated as being of high importance by experts and DIAMONT partners
Environment	Matter exchange	Pollution of soil nearby the streets (e.g. by safety salt, mineral oils)	Indicator(s) to be discussed
Environment	Matter exchange	Immission of transport specific air pollutants (eutrophying, acidifying and toxic substances)	Indicator(s) to be discussed
Environment	Human health	Impairment of human health by air pollution	Indicator(s) to be discussed
Environment	Energy balance	Emission of noise	Only discussed in the context of the phenomenon “Impairment of human heath by noise”
Economy	Economic performance and infrastructure	Modernisation of railway transport network (high speed connections)	Not evaluated as being of high importance by experts and DIAMONT partners, not any more linked strongly enough with the reformulated main trend
Economy	Economic performance and infrastructure	High competition of infrastructural demands of transport with other space demands (in particular in regions of highly dynamic development)	Substituted by the phenomenon “Increasing competition of land use”; Indicator(s) to be discussed
Economy	Economic performance and infrastructure	Economic prosperity in the vicinity of supra-regional transit corridors (activity and prosperity)	Indicator(s) to be discussed
Economy	Production and consumption	Changes of modal split of travel to work displacements in favour of public transport	Not evaluated as being of high importance by experts and DIAMONT partners, not any more linked strongly enough with the reformulated main trend
Economy	Production and consumption	Strong concentration of traffic on a few high-ranked corridors	Substituted by the phenomenon “Congestion of transport system”; Indicator(s) to be discussed
Society / Culture	Population	Concentration of population in the vicinity of supra-regional transit corridors	Substituted by the phenomenon “Low attractiveness as space of living”; Indicator(s) to be discussed
Society / Culture	Social equity and family	Increasing social differences in mobility	Not evaluated as being of high importance by experts and DIAMONT partners, not any more linked strongly enough with the reformulated main trend
Society / Culture	Public services and security	Traffic accidents	There is no direct relationship between congestion of infrastructure and frequency of accident; not evaluated as being of high importance by experts and DIAMONT partners

Phenomenon of minor importance (weighting results)
Phenomenon of high importance (weighting results)

Fig. II-13: Selection of phenomena to be indicated (extract of annex 3.2)

Section III: Indicators

1 Context

1.1 The DIAMONT indicator system in the context of other indicator systems - what is new?

One can start with the justified question why another system is needed at all, given the wealth of existing indicator systems. In their preliminary work before the start of the DIAMONT project, Bosch & Partner carried out extensive research on regional, national and international indicator systems in the course of other projects. It emerged that

- the Alpine space is indeed covered by European indicator systems. But because of their focus on the European context and scale, these systems are not always suited to map differences within the Alps and do not obligatorily deal with all thematic aspects relevant for the Alpine space;
- the national indicator systems of the individual Alpine states do not yield results that can be compared across the entire area covered by the Alpine Convention. Moreover many of these systems are not even implemented (yet).

The Working Group on "Environmental Objectives and Indicators", set up by the Alpine Conference, has suggested 95 indicators for a system that would be customised to the area covered by the Alpine Convention and has checked the availability of data[12]. This system of indicators is the essential base line for the work on indicators in DIAMONT (cp. Section I:3.1). However, there is one caveat: this system of indicators has been developed solely for the objectives of the Alpine Convention. As it is well-known, the Alpine Convention – still – leaves out some relevant aspects such as climate change and Alpine cities. This means that in terms of the indicators required for sustainable regional development this system is by definition incomplete.

The DIAMONT system of indicators aims to describe the relevant developments within the area covered by the Alpine Convention with sufficient spatial differentiation and in adequate thematic breadth (cp. Fig. III-1). Starting point for all considerations on the subject is the concept of sustainability, which however does not gain structural dominance as it has in many systems of sustainability indicators. Those often aim at a comprehensive evaluation of e.g. a municipality or region in terms of sustainability or the respective pillars.

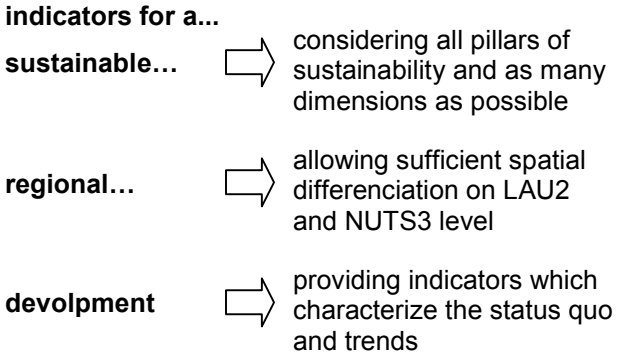


Fig. III-1: Purposes of indicators in DIAMONT

The DIAMONT system of indicators rather revolves around the main trends (cp. Section II:2), whereas the pillars of sustainability (economy, ecology and society) only play secondary role. It aims to make a statement about the following questions:

- Where, i.e. in which individual parts of the Alps (municipalities, districts), and to what extent are these trends occurring (cp. also Section III:3.5.2)?
- Are the individual parts of the Alps, where the main trend is occurring, developing in a sustainable way?

Regarding these questions the DIAMONT indicators can be divided in two categories (cp. Fig. III-2):

- the "identification indicators" (I), which shall identify the occurrence of a main trend (cp. Section III:1.2), and
- the "evaluation indicators" (E), which try to describe if the manifestation of the respective trend can be characterised as sustainable or not (cp. Section III:1.3).

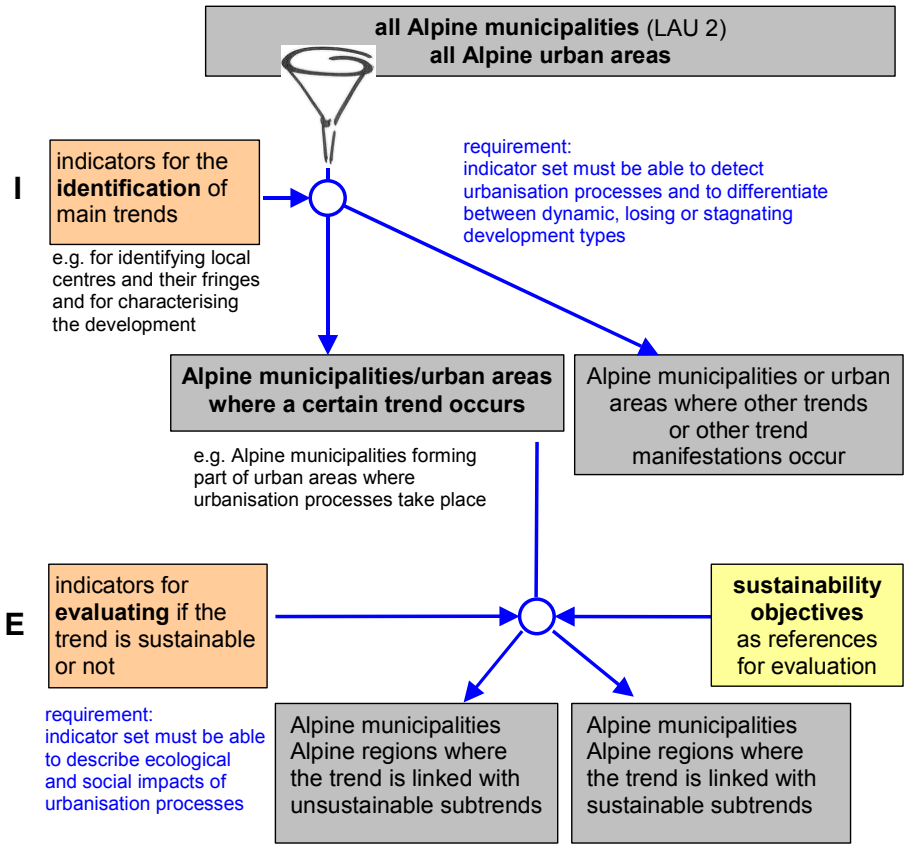


Fig. III-2: Functions of identification and evaluation indicators within the DIAMONT indicator system

Furthermore it is possible that "identification indicators" also function as "evaluation indicators" at the same time. This happens when characteristic sub-trends of a main trend can be evaluated per se as fostering or constraining sustainable development.

1.2 Identification indicators

As mentioned above, the "identification indicators" shall be used to localise the main trends and to describe the extent of their occurrence. To allow a synoptic view on the identification indicators, the idea of generating so-called "main trend images" was developed (cp. Section III:3.4.2). Every municipality or complex of municipalities (e.g. within an urban area) is expected to be described by a certain combination of indicator values, forming a specific image for the municipality. Ideally, by comparing those images across the Alps, symptomatic „main

trend images" will become apparent (cp. Section III:3.4.2). To facilitate an Alpine-wide comparison of the development trends, it will be necessary to classify the resulting "main trend images" or rather the underlying data by means of statistical classification methods such as cluster analysis (cp. Section III:3.5.2).

As important pre-condition for generating main trend images, it is of utter importance to clearly define the direction of the phenomena characterising the main trend (cp. Section II:4.1). For instance, with respect to the main trend "Local centres and fringes…", the decision was taken, that the phenomena describe the dynamic type of urbanisation, e.g.: "strong labour market" or "increasing competition of land use".

It shall be stressed once again that this direction does not allow interpretation in view of sustainability (unless the "identification indicator" is additionally classified as "evaluation indicator").

Practical work with data within WP8 will show, whether the main trend – until then only deduced from literature research and expert inquiries by using a more theoretical approach, and described in a hypothetic way (cp. Section II:2.2) – actually reflects the real situation. Possibly a retroactive adjustment of the main trend formulation will be necessary (cp. Section III:3.5.2). Fig. III-3 gives an overview of the whole procedure, also revealing where WP7 finalises and WP8 – searching for data and testing them – ties in with the results of WP7.

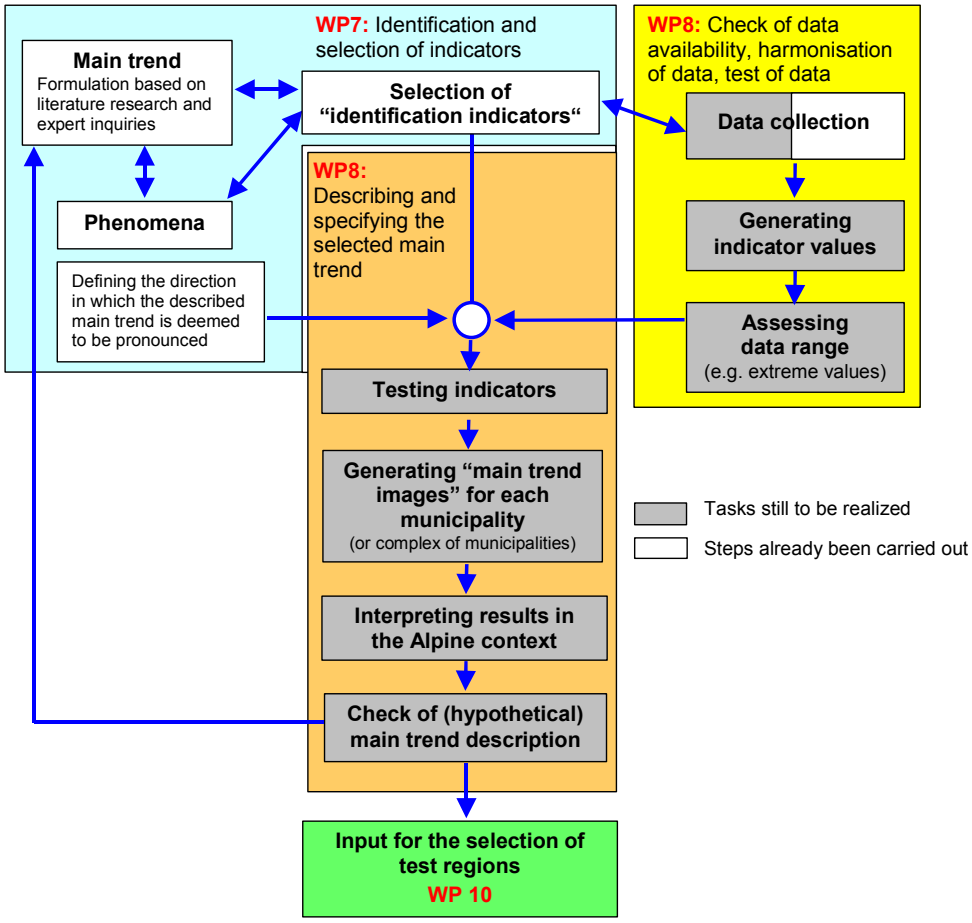


Fig. III-3: Procedure for creating "main trend images" by using "identification indicators"

1.3 Evaluation indicators

Having identified the occurrence and extent of a main trend, the real question is to be answered: Does this trend with its proposed phenomena comply with the requirements of a sustainable regional development? Therefore the "evaluation indicators" rely on references to (sustainability) objectives: only the interpretation of the indicator values against the objectives will give us the necessary information, if the respective status or process can be evaluated as being sustainable or not.

Alpine-wide agreed objectives on sustainable development can mainly be gathered from the Alpine Convention[10] and its Protocols as well as from European documents. It has not been a task of WP7 to realise a comprehensive analysis of these objectives. As an example objectives of the Alpine Convention were assigned to "evaluation indicators" of the selected main trend "Local centres and fringes between competition and cooperation" (cp. Section III:5.1).

In literature and experts inquiries risk and chances of sustainability are often discussed closely linked with the description of main trends. The formulation of phenomena, to which "evaluation indicators" have been assigned, reflects these hypotheses (e.g. "Low healthiness of urban life style" or "Decreasing river water quality"). Nevertheless hasty estimations and evaluations should be avoided. Only working with concrete data and objectives will finally provide the necessary information how certain risks of non-sustainable development go along with main trends or not (cp. Section III:3.5.2).

The "evaluation indicators" form an important link to WP9, where instruments for stimulating and steering sustainable regional development will have to be elaborated and optimised (ifuplan 2006). These instruments should be suitable for influencing the development of municipalities in a manner that the identified "evaluation indicators" develop in the "right" i.e. a more sustainable way. Within WP9 the indicator set of WP7 will possibly be completed by additional indicators which may express if and how the respective instruments are implemented.

The work in the selected test regions (cp. WP10 and 11) will provide the framework for testing indicators and tools or instruments respectively.

[10] Nevertheless, it has to be considered that until now not all the Alpine states ratified all the Protocols of the Alpine Convention.

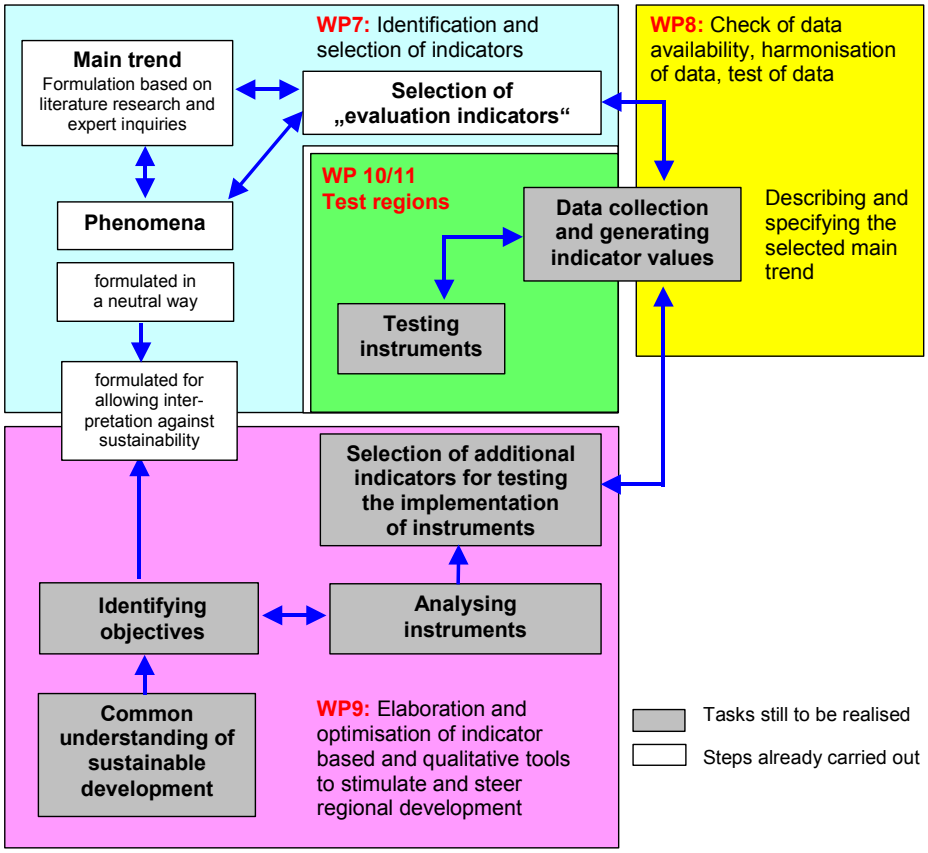


Fig. III-4: Procedure for assessing sustainability of main trends and sub-trends by using "evaluation indicators"

1.4 General requirements of the indicator system

It is evident that the indicator set suitable for DIAMONT needs to meet certain requirements in order to fulfil its function. There are criteria that environmental, but also economic and social indicators should generally meet. The OECD (1993) has defined three basic criteria for indicator selection: a) policy-relevance, b) analytical soundness and c) measurability (cp. Tab. III-1).

Tab. III-1: Criteria for indicator selection (OECD 1993).

Policy relevance and utility for users
An environmental indicator should: • provide a representative picture of environmental conditions, pressures on the environment or society's responses; • be simple, easy to interpret and able to show trends over time; • be responsive to changes in the environment and related human activities; • provide a basis for international comparisons; • be either national in scope or applicable to regional environmental issues of national significance; • have a threshold or reference value against which to compare it so that users are able to assess the significance of the values associated with it.
Analytical soundness
An environmental indicator should: • be theoretically well founded in technical and scientific terms; • be based on international standards and international consensus about its validity;

• lend itself to being linked to economic models, forecasting and information systems.
Measurability The data required to support the indicator should be: • readily available or made available at a reasonable cost/benefit ratio; • adequately documented and of known quality; • updated at regular intervals in accordance with reliable procedures.

"These criteria describe the 'ideal' indicator and not all of them will be met in practice" (OECD 1993). In the context of the DIAMONT project, most of these criteria are also valid and should be regarded. However, due to the scope and the objectives of DIAMONT, some additional interpretations are necessary.

Spatial differentiation:

DIAMONT aims to enable municipalities and districts to monitor and analyse their development in terms of sustainability. The indicators ought to facilitate a differentiation of development trends on a local level, i.e. LAU2 or at least NUTS3. This can only be analysed by working with concrete data, but already the development of indicators should consider this aspect as far as possible. For instance, an indicator of the taxation of vehicles will not allow for any differentiation on a local or regional, but only on a national level.

Thematic differentiation:

The indicators should allow an analysis of the respective main trend as accurate as possible. Therefore after the phenomena best representing the main trends have been selected (cp. Section II:4.2), indicators most suitable to display those phenomena are required (cp. Section III:1.2). Considering the concept of sustainability, the whole range of dimensions should be represented (cp. Section III:1.1).

The compilation of the indicators in a comprehensive scheme for generating trend images implies that information doubling by using (very) similar indicators should be strictly avoided for fear of overvaluing single aspects within the overall main trend image. For the same reason doubling of information should be prevented by selecting suitable variables used for the generation of more complex indicators. If for instance the traffic volume is already considered as indicator to identify and characterise the main trend "Congestion of transport system", additional indicators which are calculated using primarily the variable of traffic volume (like emission of noise) should not be integrated in the main trend image. Ideally, the selection and definition of indicators should ensure that variables are mostly independent from each other.

Status and trend, existence of reference values:

In order to identify and characterise main trends, it is obvious that trend indicators, i.e. indicators showing changes in time, will be the most appropriate ones to fulfil the task. The formulation of the phenomena, which the (identification) indicators are assigned to, already gives a basic reference towards the interpretation of indicator values (e.g. "high importance of branches of an urban economy" or "increasing land take for infrastructure " contributes to a pronounced occurrence of the main trend). Nevertheless, sometimes the status value itself allows interpretation. So we know that an unemployment rate of more than 10% is rather high, one of less than 5% would be desirable and already be seen as close to full employ-

ment[13] . We do not imperatively need information on the temporal evolution of this indicator to decide, whether the situation characterises a dynamic or a losing developing type of urbanisation. In other cases only the combination of status and trend values is helpful to describe the occurrence of a main trend or the level of sustainability (e.g. it is important to know from which present status of infrastructure density a further enlargement and concentration of infrastructure take place to evaluate the ecological risks coming along with this process).

The formulation of the indicator has to clearly define, if the indicator has to be calculated for describing a status or a trend.

Data availability:

The identification of appropriate indicators should be always an iterative process, searching for thematically well focussed indicators (“best needed indicators”) in accordance with data availability (“best available indicators”) and compatibility with other already existing systems of indicators (“best established indicators”).

The check of data availability was not intended to be realised within WP7. It will be the task of WP8. Nevertheless, knowledge from other pre-DIAMONT indicator projects (cp. Section I:3.1) was used to come to an estimation on data availability. The aim was to focus on indicators where the chance is given that they can actually be calculated on the required spatial level. Furthermore – referring also to “best established indicators” – other indicator systems were analysed for providing suitable indicators for the DIAMONT indicator system (cp. Section III:2).

2 Inputs from other indicator systems in the Alps

Although the idea of the indicator system in DIAMONT does neither refer to common structural concepts of indicator systems as PSR, DSR, DPSIR nor intends to allow interpretation on the development of the pillars of the sustainability concept, it should not be elaborated detached from other activities for indicator development respectively from other indicator systems already in use. As all these initiatives already dealt with questions of thematic assignment, the informative value of indicators and data availability, they may inspire the indicator selection and development within the framework of DIAMONT.

In order to structure the work with existing indicator systems, an indicator database was created for internal use, comprising information on the name of the indicator system, the name of the organisation using the indicator set, the geographical level of application (NUTS0, NUTS1, etc.), the area covered by the indicator set (name of country or region), and the number of indicators contained to a given point in time. The references listed in Section IV:2 give an overview of all systems considered for elaborating the DIAMONT indicators.

2.1 Development of indicators in the context of the Alpine Convention

Considering the special needs of the Alpine Convention and the fact that indicator systems on a national or European level do not suffice to monitor the development of single regions (cp. Section III:1.1), efforts have been taken to install instruments tailored to the spatial and thematic coverage of the Alps. The most important approaches in this context are

- the indicators developed by SOIA (cp. Section I:3.2) which was focused on issues of climate change, water balance, fauna and flora, forest and socio-economy,
- the indicators of the working group on “Environmental Objectives and Indicators” (WG EOI, cp. also Section I:3.1).

2.2 Indicator systems on the national and international level

As already mentioned in Section III:1.1, there is a wide range of indicator sets used for environmental and sustainability reporting by different institutions and organisations on a global, European or national level. Their objective mainly is generating information in an aggregated spatial context rather than differentiating development trends on a regional or even local level. However, some of these indicator systems have been borne in mind while approaching certain issues of indication in the framework of DIAMONT (compiled in Tab. III-2).

Tab. III-2: Examples of indicator systems on a national or regional scale

Level	Source/author	Indicators / Indicator system
International	OECD	Environmental Indicators for Sustainable Development (OECD 2002)
	European Environment Agency	Core Set of Indicators[14]
	EUROSTAT	Environmental Pressure Indicators for the EU (EUROSTAT 2001)
	European Communities	Sustainable Development Indicators to monitor the implementation of the EU (EC 2005a)

Level	Source/author	Indicators / Indicator system
Austria	Bundesregierung	48 indicators developed in the context of „Die österreichische Strategie zur Nachhaltigen Entwicklung 2002“ (the Austrian strategy on sustainable development)
Germany	Umweltministerkonferenz	Kernindikatoren einer nachhaltigen Entwicklung (UMK-Indikatoren)[15] (core indicators of sustainable development)
	Umweltbundesamt	Kernindikatoren[16] (core indicators)
	Bundsamt für Bauwesen und Raumordnung	INKAR: Indikatoren und Karten zur Raumentwicklung (BBR 2004) (indicators and maps on spatial development)
France	Institut français de l’environnement	45 indicators of sustainable development (IFEN 2003)
Italy	Agency for Environmental Protection and Technical Services	Environmental data yearbook (APAT 2005)
Switzerland	Bundesämter für Raumentwicklung, Umwelt, Wald und Landschaft sowie Statistik	Indikatoren der Nachhaltigen Entwicklung MONET[17] (indicators of sustainable development)
Slovenia	Ministry of the Environment and Spatial planning	State of the Environment Report 2002 (GOVERNMENT OF THE REPUBLIC OF SLOVENIA 2002) – Indicators
	Institute of Macroeconomic Analysis and Development	43 development indicators of the Development Report 2005

2.3 Municipal indicators systems in the context of Local Agenda 21

Indicator systems designed to monitor sustainable development on a municipal level are of particular interest in the framework of DIAMONT. Those developments started in connection with the follow-up processes of the 1992 Earth Summit in Rio. Their aim is to offer tools for monitoring and controlling the success of municipal strategies and measures in the framework of Local Agenda 21-processes.

Sustainability indicator systems are in use in a number of municipalities or have at least been used once for a first report on the situation of local sustainability (GEHRLEIN 2003)[18]. Conscious that those indicator systems are not specially focussed on municipalities in the Alpine space, they gain importance in the context of DIAMONT as they reflect main municipal issues concerning sustainability. Additionally, looking at these indicator systems helps to get some sense of which indicators are feasible in terms of data availability.

In the following some selected initiatives are shortly described.

2.3.1 Towards a Local Sustainability Profile – European Common Indicators

The Europe-wide sustainability monitoring initiative “Towards a local sustainability profile - European common indicators” (EC 2000) was developed through a bottom-up approach by a working group of the Expert Group on the Urban Environment in close consultation with local authorities across Europe. The monitoring initiative is intended to support local authorities in their work towards sustainability and provide objective and comparable information on progress towards sustainability across Europe. From the perspective of local authorities the monitoring initiative will provide a practical tool for monitoring progress towards sustainability,

with a view to enabling further development of local processes and initiatives to promote sustainability (EC 2000).

The initiative is based on a common set of 10 integrated indicators reflecting the interactions between environmental, economic and social aspects. To enable comparability of the monitoring results across Europe and to foster the dissemination of the indicators, those have been documented in comprehensive methodology sheets (EC 2001c).

2.3.2 Indicators in the framework of Local Agenda 21

As small and medium sized municipalities sometimes lack the financial possibilities and the manpower to develop own indicator sets, the German federal states of Baden-Württemberg, Bavaria, Thuringia and Hesse undertook a joint project to provide an unified but flexible set of indicators on a municipal level (DIEFENBACHER et al. 2005). The indicator system is oriented towards objectives of sustainability and consists of 24 core indicators which can be substituted or supplemented by additional 90 indicator proposals. The system is structured by four pillars of sustainability, i.e. by the fields of economy, ecology, society and social aspects as well as participation. The indicator set has been developed and tested in close co-operation with municipalities and districts. Several of those have used the indicator set to start a reporting on local sustainability.

2.3.3 Sustainability indicators for South Tyrol

Aim of the project is to quantify sustainable development in South Tyrol and to provide the basis for planning sustainability for the future. Starting from the analysis of existing international indicator systems, indicators were adapted to the special needs of a mountain region. Thus a link to systems at the international level could be maintained. The indicators are derived from periodically updated variables on a municipal level. The indicator system covers the areas environment, economy and society (TROI et al. 2002, EURAC & IRE 2006).

2.4 Development of indicators within research projects and initiatives

Advanced indicator systems have also been developed within research projects carried out in the Alpine space. Some of the projects mentioned below have already been presented in Section II:1.2 in the context of describing important stimuli for developing the concept of main integrative trends. Nevertheless, they shall be named once again to highlight their special contributions in the context of indicator development.

2.4.1 ESPON

The European Spatial Planning Observation Network (ESPON)[19] is set up to support policy development and to build a European scientific community in the field of territorial development. The main aim is to increase the general body of knowledge about territorial structures, trends and policy impacts in an enlarged European Union. For this purpose, national, regional and local knowledge from applied research and studies on territorial development and spatial planning are looked at from an European perspective. Expectations of the EC and the Members states, among others, include:

- to obtain a diagnosis of principal territorial trends at EU-scale,
- the development of integrated tools and appropriate instruments (ESPON database, indicators, methodologies for territorial impact analysis and spatial analyses, mapping facilities) in order to improve the spatial co-ordination of sector policies,
- a cross-sectoral analysis and spatial scenarios offering an European perspective on regions and larger territories and their development opportunities.

To achieve the objectives of the ESPON programme, a number of applied research projects has been launched covering a wide range of spatial issues as well as research goals and approaches. One outcome, for instance, is the ESPON Database, providing fundamental indicator based regional information down to level NUTS3. The information contained is on the one hand derived from national and European statistical offices or similar sources, on the other hand different ESPON projects produced specific data.

2.4.2 Indicators in MARS

One important objective of the project Monitoring the Alpine Regions' Sustainability (MARS) – besides the main objective of creating and establishing a platform of sustainability on regional level – is the provision of a database consisting of suitable indicators and comparable data. Moreover, respective methods of aggregation and integration to monitor a sustainable development of the Alpine space and its regions should be provided (BAK BASEL ECONOMICS 2005).

In the framework of the project, data have been used to analyse a set of 45 indicators from the fields of economy, society and environment on the level NUTS2 by using the database of the BAK Basel Economics. A further detailing of the data to the level of NUTS3 is planned (and needed) to obtain a closer view of the specific situation of the Alps. Apart from the spatial aggregation, criticism has been raised that indicators of the environmental pillar refer to rather general aspects, which do not show special relevance concerning the mountain area (CARABIAS-HÜTTER et al. 2005).

2.4.3 Indicators in SUSTALP

In the framework of SUSTALP (cp. Section II:1.2.4) an empirical study was carried out analysing 5.558 municipalities of the whole Alpine range by 43 static and dynamic variables from the social, economic and environmental field. The variables were derived from 76 variables. According to the goal of the project, those were mainly displaying the agricultural structure, but to a smaller extent also the socio-economic situation as well as natural and geographic conditions (TAPPEINER et al. 2003). Nevertheless the fact that the creation of an Alpine-wide comparable database has been managed in the framework of the project also influences the work in DIAMONT especially for selecting indicator on the main trend of "Modernisation of agriculture in favoured areas".

2.4.4 Indicators in NORDREGIO

The study "Mountain Areas in Europe: Analysis of mountain areas in EU member states, acceding and other European countries" (NORDREGIO 2004) used an extensive set of indi-

cators to reach its objectives of developing a common delineation of mountain areas, of describing and analysing their situation as well as of developing a typology of mountain areas. Furthermore, the study aimed to analyse and evaluate the measures and policies implemented by national governments and the EU with regard to mountain areas as well as the development of proposals to adjust measures and policies to the situation and needs of mountain areas (NORDREGIO 2004).

In order to reach its aim, the study used statistical and geographical data from national and European sources on a municipal level (LAU2) as far as possible. Main problems for the researchers arose from incomplete data as well as from changing administrative entities. The approach of the study was strongly data-driven. Thus the set of indicators is not based on an underlying structure as e.g. the sustainability concept or a problem-oriented approach.

2.4.5 Cultural landscape indicators of REGALP

In WP2 of the REGALP project (cp. Section II:1.2.2), main "regional development trends" were identified and described by using indicators for characterising cultural landscape changes on a municipal level. The 20 indicators are based on statistical data (socio-economic and land use data) which were harmonised for the Alpine countries (PFEFFERKORN & MUSOVIĆ 2003).

2.4.6 Indicators in FUNalpin

As explained in Section II:1.2.3, the intended main result of the project FUNalpin consisted in regional policy recommendations as a contribution to achieve a sustainable development of the Swiss Alpine regions in the long run. As a core element the concept of "label regions" is introduced, a certification granted to regions that develop in accordance to the objectives of sustainability. As a benefit, those certified regions should then be preferentially treated in regional and sector policies.

One part of the project was the design of a set of indicators to facilitate an evaluation of regions against objectives of sustainable development as well as an indicator-based certification procedure for label regions. The set comprises 15 indicators which are assigned to the pillars of sustainable development and respective sub-objectives. The set has been tested within test regions – also in comparison to two other indicator sets of sustainable and landscape development – and proven to be suitable to evaluate sustainable regional development in mountain regions (CARABIAS-HÜTTER & RENNER 2004, CARABIAS-HÜTTER et al. 2005).

2.5 Specialized indicator systems as input for main trend indication

For selecting and developing indicators for identifying and evaluation the main trends, some specialized, partly also sectoral indicator systems have been of special interest. Some examples are presented hereinafter. More references are listed in Section IV:2.

2.5.1 Rural Areas in Switzerland

Main objective of the study "Nicht-städtisch, rural oder peripher – wo steht der ländliche Raum heute?" (Non-urban, rural or peripheral – what is the position of the rural zone today?, SCHULER et al. 2004) was to identify the position of regional development in Switzerland. In particular the questions were pursued, how the term "rural area" can be approached today, what functions those areas fulfil in Switzerland and how these areas developed in the last two decades. In order to analyse the developments of territorial units according to different definitions, indicators describing the trends in demography, economy, land use as well as commuter relations were used. The indicators were derived from statistical data on a municipal level.

The study was of special interest for the main trend "Local centres and fringes between competition and co-operation". It discusses differences in the development of rural and urban areas and comprises indicators for distinguishing rural from urban areas.

2.5.2 IRENA

During each of its meetings at the end of the 1990ies[11], the European Council requested the European Commission to report on the integration of environmental concerns into Community sectoral policies. As a contribution to meeting this requirement for the agricultural sector, it was stated to be necessary to develop indicators for monitoring such integration, i.e. agri-environmental indicators. Thereafter preliminary sets of indicators were identified in several communications from the Commission to the Council and European Parliament[20]. Furthermore conceptual background and initial methodological proposals for the indicator development were provided by these documents.

In order to meet this need for clear information DG Agriculture, DG Environment, DG Eurostat and DG Joint Research Centre have agreed to pool skills and resources with the European Environment Agency to assess the integration of the environment into the Common Agricultural Policy and in particular to develop indicators to monitor such integration, i.e. agri-environmental indicators, through the project known as IRENA (Indicator Reporting on the Integration of Environmental Concerns into Agriculture Policy)[21].

IRENA also tried to integrate other agri-environmental indicators resulting from activities of the OECD, EUROSTAT, and the EEA as well as indicators developed in the context of EU programmes like ELISA (Environmental Indicators for Sustainable Agriculture).[22] The final indicator report was published in 2006 (EEA 2006a).

IRENA was of special interest for giving ideas for indicators of the main trend "Modernisation of agriculture". It had to be considered that IRENA do not intend to monitor regional policies. Therefore the IRENA indicators are established on NUTS2 and 3 level.

[11] Cardiff (June 1998), Vienna (December 1998) and Helsinki (December 1999)

2.5.3 ILO-KILM-Indicators

The “Key Indicators of the Labour” (KILM) are a multi-functional research tool of the International Labour Organization (ILO). KILM is a comprehensive database of country-level data on 20 key indicators of the labour market. It allows analyses of key issues in the labour market. Each indicator is accompanied by descriptions of the standard international definition of the concept and measurement procedures, guidelines on how the indicator can be used in analyses of labour market issues, and words of cautions on comparability limitations.[23] Even if the “Key Indicators of the Labour” are designed for analyses on national level, they can also be applicable on local and regional level due to generally good statistical databases in the respective countries.

2.5.4 TERM

The Amsterdam Treaty[24] identified the integration of environmental and sectoral policies as the way forward to sustainable development. The need for integration strategies and for monitoring environmental themes as well as sectoral integration was re-emphasised by the sixth environmental action programme (EC 2001b) and the EU strategy for sustainable development (EC 2001a). The main aim of the Transport and Environment Reporting Mechanism (TERM) is to monitor the progress and effectiveness of transport and environment integration strategies on the basis of a core set of indicators (EEA 2006b).

In the meantime, 40 indicators have been defined in the framework of TERM, e.g. representing the fields of investments, economic instruments, spatial planning and infrastructure supply. The indicators are structured around seven main policy questions (e.g.: Is the environmental performance of the transport sector improving?) and can also serve as benchmarking tools by the comparison with concrete policy objectives (EEA 2000).

The TERM-indicators were of special interest for the main trend “Congestion of transport system”.

3 Aggregation of indicators

3.1 Objectives and examples of aggregation

Aggregation means the grouping and amalgamation of two or more different variables or indicators into one indicator or index (OECD 2002). Aggregated indicators become more and more popular, but at the same time reservation on their utilisation is increasing. The discussion on suitable forms of condensing information by generating aggregated values had historically been more anchored in economics and social science than in ecological research (LAND 2000). Already in the 1990ies a lot of studies related to these subjects had been realised (HAGERTY et al. 2001 and SHARPE 1999 cit. in NOLL 2002). National accounting including the calculation of the Gross Domestic Product (GDP) has ever been an incentive for social and ecological research to develop own summarising indices. But the orientation on this index is very ambivalent. On the one hand the deficiency of the GDP for measuring welfare resulted in a lot of criticism and stimulated the search for alternative welfare indices (e.g. the Index of Sustainable Economic Welfare (ISEW) measuring the state of human well-being by considering economic, social and environmental factors, OECD 2002). On the other hand the comprehensive index GDP emanates great fascination in politics (NOLL 2002).

Objectives of aggregating indicators can be, among others:

- generating reliable and well-synthesised information for policy makers and the public,
- providing simple messages about complex issues,
- reducing the number of indicators,
- facilitating the comparison of regions,
- highlighting best-practices.

According to these objectives different categories of aggregation can be distinguished (OECD 2002):

- "Spatial aggregation that is dependent on geographic scale. National environmental statistics are often based on the compilation and aggregation of data produced at sub-national level. The choice in geographic scale influences the area over which monitoring results can be estimated and whether the data can be aggregated on an ecosystem, administrative boundary or other geographic level and be representative of conditions over that area.
- Temporal aggregation is linked to the natural "variability" of the variables monitored and to the need for more synthesised and usable information (e.g. annual averages for variables measured daily or even hourly).
- Thematic aggregation is linked to the need for more readable and digestible information. Thematic aggregation establishes totals based on data for subcategories (e.g. total NO_2 emissions based on emission inventories, or total water resources based on water accounts). It may further be used to establish indices of urban air quality, global warming potential, acidifying substances, nutrient balances, etc., through the use of proper conversion factors."

Furthermore aggregation processes can be realised on different levels. There is a wide range beginning from easy and transparent aggregation processes of only some single variables up to the generation of synoptic, highly aggregated indices which aim or claim to give a comprehensive view of very complex issues (like the already mentioned GDP).

Examples of such highly aggregated indices are:

- the Ecological Footprint for quantifying the human pressures on the natural environment arising from the consumption of renewable resources (food, materials and energy) and pollution (WWF 2004),
- the German Environmental Barometer and the German Environmental Index DUX (UBA)[25],
- the Natural Capital Index, combining pressure and state indicators concerning ecosystems and related species developed by the World Conservation Monitoring Centre and the National Institute of Public Health and the Environment (The Netherlands), for evaluating progress made in conservation of biodiversity (used for instance in the context of the UNEP GEO-1 report, UNEP 1997 and WCMC n.d.).

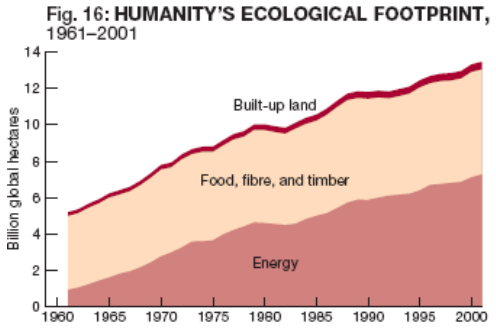


Fig. III-5: Ecological Footprint (WWF 2004)

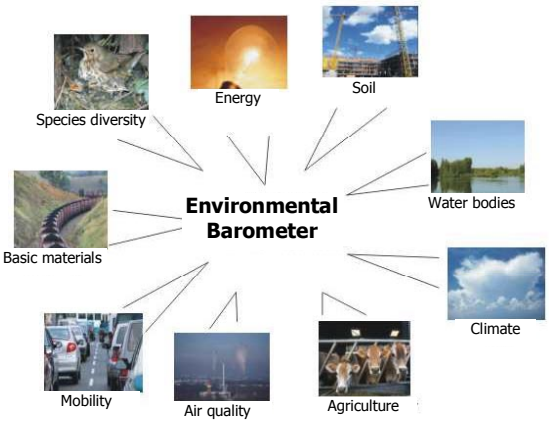


Fig. III-6: German Environmental Barometer (UBA[27], translated)

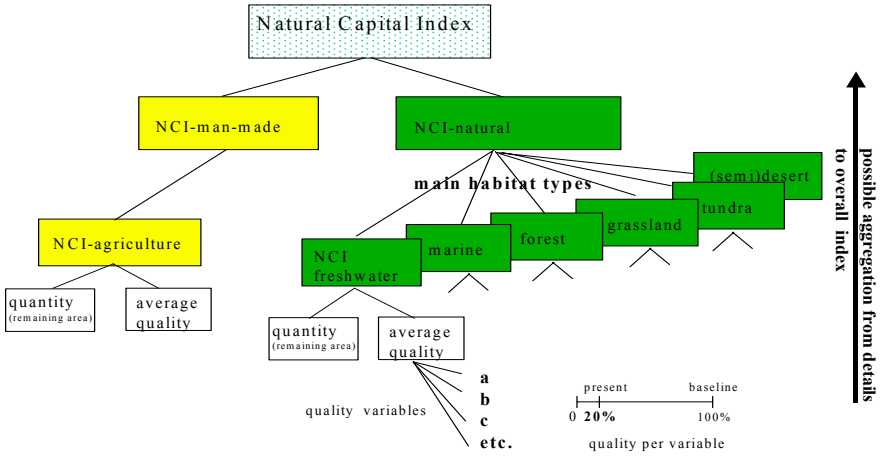


Fig. III-7: Natural Capital Index (OECD 2002)

Aggregation on lower levels are often realised for drawing together variables (frequently pollutants) within one single environmental sector such as air, atmosphere or water. Examples are:

- air quality indices like, for instance, the "ATMO-index for urban areas" provided by the French Agency for the environment and Energy Management (ADEME, cp. Fig. III-8)[26] or the German "Luftqualitätsindex" used by the Bavarian Agency for Environment for regular environmental reporting (BayLfU 2004);
- the quality categories of the morphological structure of waterbodies being subject e.g. of regular reporting based on German-wide maps (LAWA 2002);

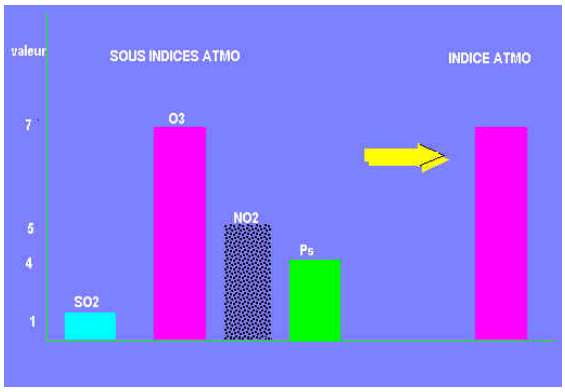


Fig. III-8: The French urban air quality index ATMO (OECD 2002)

- the chemical indices of water quality (e.g. BACH 1980);
- the Global Warming Potential, which had been elaborated by the Intergovernmental Panel on Climate Change consulted by the Subsidiary Body for Scientific and Technological Advice, and which is used to calculate the carbon dioxide equivalence of anthropogenic emissions by sources and removals by sinks of greenhouse gases listed in Annex A of the Kyoto Protocol[27];
- the Ozone Depleting Potential which had been developed by the UNEP Ozone Secretariat and which was integrated, inter alias, in the core set of indicators of EEA[28].

All these indices are often used and meanwhile well established in a lot of (environmental) reports.

3.2 Aggregation procedures

Following the OECD-paper "Aggregated Environmental Indices: Review of Aggregation Methods in Use" (OECD 2002), the process of aggregation can be differentiated into four sequent steps. The rules to be regarded during the different steps of the process are described respectively. The aggregation process as such needs to be completely transparent, i.e. raw data and aggregation methods must be described:

- Selection of a set of variables
  - being representative of the topic or policy issue,
  - satisfying the criteria of soundness for the selection and development of indicators (cp. Section III:1.4),
  - being as independent as possible: indicators aggregated to an index must not influence each other (cp. Section III:1.4: Thematic differentiation),
  - being in the same position in the cause-effect-chain (PSR or DPSIR).

- Transformation of the variables for ensuring that changes in one variable do not dominate those of the others in the final score of the index (a lot of different methods of transformation exist, cp. Section III:3.5.1):
  - bringing all variables to a common metric,
  - for making them "behaving" in a similar fashion.
- Weighting (optional): judging relative importance of the different components of the index based on
  - scientifically sound weighting factors (reproducible, internationally recognised and relatively objective) such as the weighting of the components of the "Warenkorb" (basket of commodities)[12] for the Customer Price Index, or
  - subjectively used weighting factors.
- Valuation: comparing scores with a predetermined classification of what constitutes good or poor values.
- Presentation and Layout.

3.3 Main criticism and alternatives

The transition from a simple indicator to a composite index often entails a shift from objectivity to subjectivity. This causes a lot of scepticism, especially about highly aggregated indicators. There is nearly no indicator aggregation or index which does not receive bad review due to the methodology it is based on. UMBRICHT & MEIER (2005) sharpened the criticism by questioning "do aggregated sustainability indicators give evidence for anything, or are they just 'short, simple, and stupid'?" Sometimes there are too many and too unsystematically composed variables, sometimes the weighting of the variables or the algorithm is criticised, sometimes it is the transformation procedure which does not seem to be adequate (NOLL 2002):

- Aggregated indicators and indices have to unify variables or indicators which are measured or observed on totally different scales and with different measurement units ("comparing apples with oranges"). Therefore scale transformation procedures are necessary (cp. Section III:3.2). But which transformation method will be the most suitable and which effects have the different methods for the resulting index value?
- Often calculation procedures are required for "unifying" the variables or indicators. But which are really

"In a chemistry laboratory one learns to be a little cautious about 'combining' substances. But ...the somewhat analogous 'combining' of information has not been widely recognised to have a property analogous to blowing up in the experimenter's face".
(OTIS D. DUNCAN 1984 cit. in NOLL 2002)

[12] In economics the so-called representative commodity basket is a compilation of different goods and services as representative as possible in order to calculate the Customer Price Index (as average change in prices over time) and the inflation. The changes in prices of the goods and services of the commodity basket are calculated for a certain time (e.g. four years) using a constant weighting for the single categories in accordance to the proportionate expenditures of the private households. From time to time the selection of goods and services is adopted and new commodities are included, others are removed from the index.

suitable algorithms? Is it better to add up the figures or to multiply them? To which level is it justified to compensate a good by a bad value?

- Different weightings of variables or indicators within an index may be justified. But who can decide it? Shall we base the weighting on scientific knowledge, experts' estimations, public opinion or, for instance, on factor scores taken from factor analyses?

It can be summarised that the following are regarded as specific risks of aggregation:

- misinterpretation due to simplification,
- pretended objectivity although subjective methods are applied, and
- concealment of data gaps or methodological shortcomings.

We do agree that realising a well funded and transparent aggregation requires the fulfilment of a wide range of pre-conditions. Therefore alternatives are discussed which allow to provide a comprehensive synopsis of different variables or indicators but avoid the risks of mathematic aggregation. Two important alternative approaches shall be presented:

- the well known and also internationally established concept of identifying so-called key or headline indicators (cp. Section III:3.3.1), and
- the application of typological analyses for combining information (cp. Section III:3.3.2).

3.3.1 Key indicators

Unlike the aggregation of indicators, the concept of "key", "lead" or "headline" indicators is a way of condensing information which is by far less demanding from a statistical point of view. Key indicators are consciously selected from a wider range of indicators in order to provide simple and clear information to decision-makers and the general public about policy progress in certain fields[29]. Depending on scientific progress, improvements of data availability and most certainly on changes of political relevance, the selection is open to changes (OECD 2001, NOLL 2002).

In terms of environmental sustainability, the OECD among other organisations uses a set of key environmental indicators, taken from their core set of indicators. The selection took into account their policy relevance with respect to major challenges for the first decade of the 21st century, including pollution issues and issues related to natural resources and assets, their analytical soundness and their measurability (OECD 2004).

Generally, the selection of key indicators is based on the assumption that a higher potential of information is inherent to these indicators and that they are summarising and representing a whole field of indication (NOLL 2002). The methodological approach to the identification and selection of key indicators is a key question. One possibility close at hand in order to find representative indicators is to analyse the correlation of indicators. One indicator highly correlated to all other indicators of the same field of indication could be used as a representative key indicator (LEIPERT 1976 cit. in NOLL 2002). However, the selection of key indicators often lacks a transparent methodological approach and is handled rather arbitrary, for instance based on considerations of plausibility. From a scientific point of view the application of methodology-based procedures is a precondition for satisfying results of the use of key indicators to generate condense and simplified information.

3.3.2 Typological analyses

Typological analyses combine information and aim to preserve the original information contained in each variable or indicator and thus avoid loss of information (ABRUZZINI 2000 and BÖHNKE 2001 for analysing indictors on poverty and social exclusion). Certainly, also these procedures suffer certain weaknesses – simply due to the limited capacity to gain an overview of a great number of different values. Nevertheless, it seems that until now one has not taken full advantage of their strengths (Noll 2002).

Not merging but combining indicators demands for techniques to simplify the perception and to allow **visual aggregation**. Different forms to present the complex information have been developed. Some of them shall be mentioned here:

- The European Statistical Laboratory presented the so-called Dashboard of Sustainability (Policy Performance Index)[30] which is primarily a visual display methodology being applicable to a variety of datasets.
  The dashboard image is a metaphor for using information presented on dials to steer a system in a defined direction, e.g. towards sustainable development (OECD 2002). The policy performance for any issue can be characterised through the importance (reflected by the size of the segments) and "good vs. bad performance" (expressed on a green-to-red colour scale) and allows the national or regional benchmarking (cp. Fig. III-9). The dashboard was also used to display "Swiss regional dashboards" within the FUNalpin Project (cp. Section II:1.2.3 and CARABIAS-HÜTTER et al. 2005).
- Widely spread are also presentations in form of rosettes, ceiling roses, spider's webs or amoebae being suitable to display scenarios or distance to target situations (cp. Fig. III-10 and Fig. III-11). Fig. III-12 shows another variant but generally used for the same purposes.

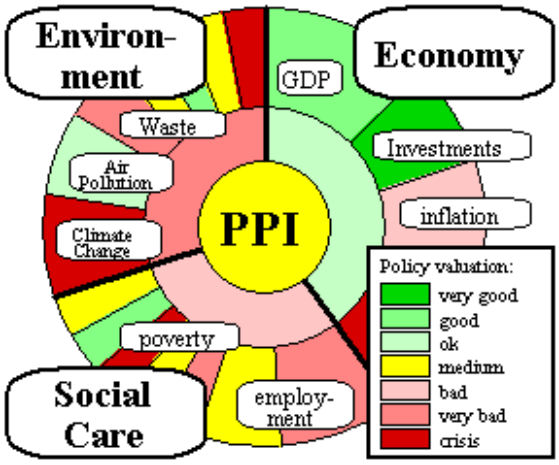


Fig. III-9: The Policy Performance Index (Dashboard of Sustainability)

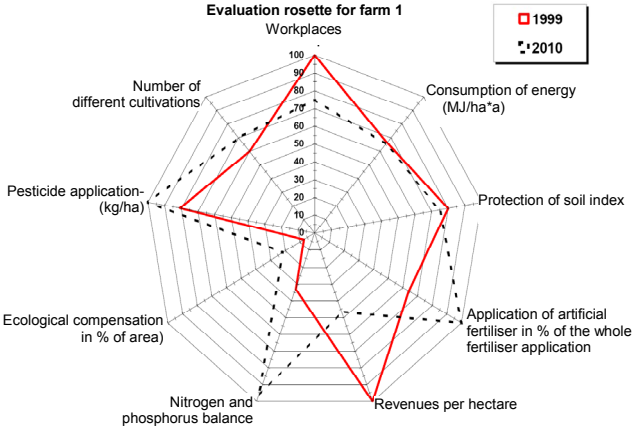


Fig. III-10: Evaluation rosette
(KESSLER 2000, translated)

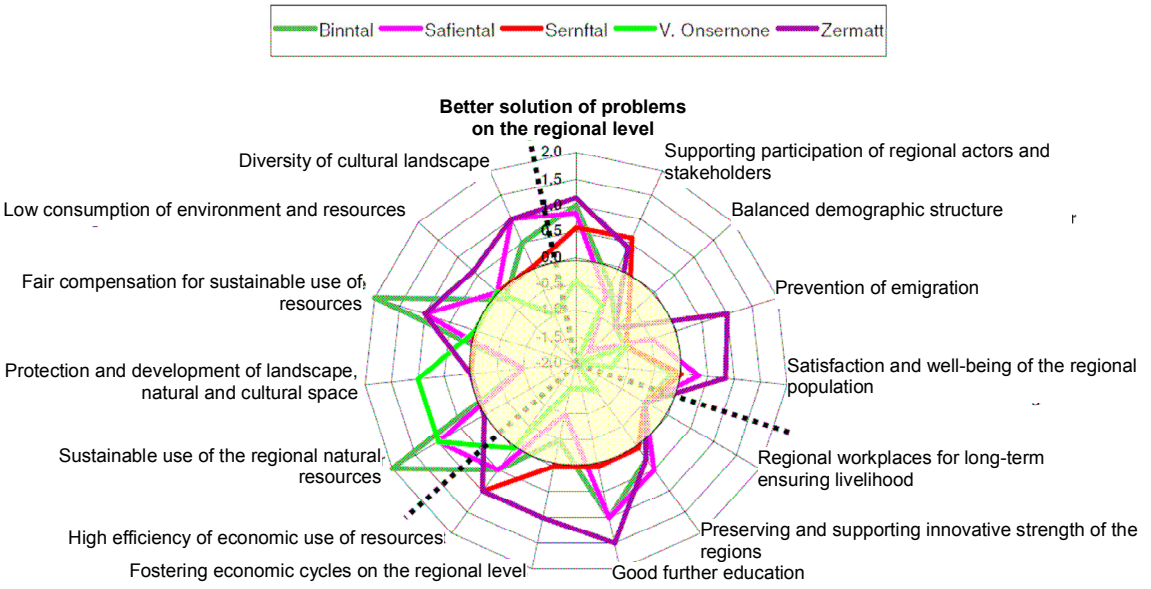


Fig. III-11: Spider's web – Results of the "Self-Assessment & Control SAC" (CARABIAS-HÜTTER et al. 2005, translated)

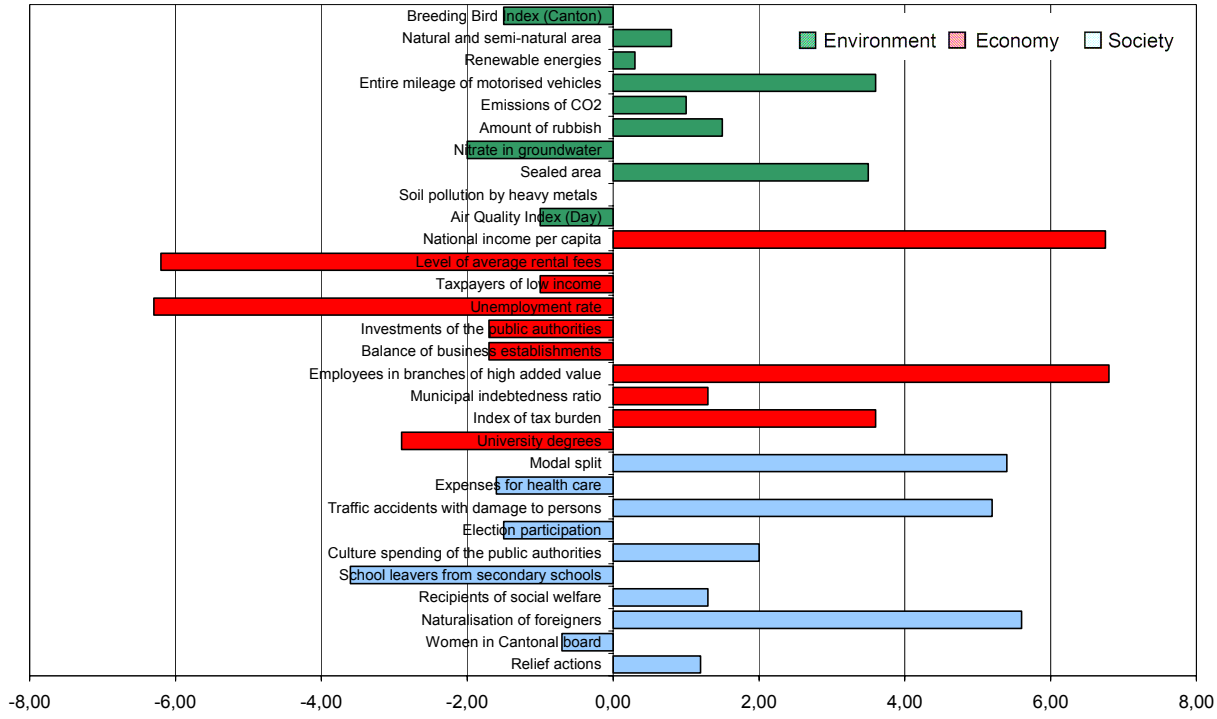


Fig. III-12: Deviation of indicator values of one town compared to the average value (UMBRICHT & MEIER 2005, slightly modified and translated)

Even if at first glance the visual aggregation seems transparent and comprehensible, there are often other aggregation and / or transformation procedures behind the displayed categories. Therefore, transparency and comprehensiveness is only given when all these aggrega-

tion and transformation procedures are explained in detail and all data and information used for the analysis and evaluation is presented.

3.4 Aggregation procedures in DIAMONT

If coherent information on the main trends is to be achieved, then indicator based information must of necessity be aggregated. As presented in Section III:3.3, processes of aggregation are often contested in principle and confronted with the allegation of not being scientifically justified and sufficiently transparent. Also some pre-DIAMONT indicator projects, such as RAUMALP and MARS, experimented with different methods of aggregating indicators. DIAMONT is taking advantage of this wealth of experience and works to the rule of "as little aggregation as possible, as much aggregation as necessary."

Within DIAMONT aggregation procedures have to be realised on three different levels:

1. for aggregating variables with the purpose to reduce the number of data sets to be presented in form of indicators (cp. Section III:3.4.1),
2. for providing a comprehensive synopsis of the indicators (or rather indicator values) selected to characterise the occurrence of a main trend, with the purpose to compare municipalities or groups of municipalities with respect to the occurrence of this main trend (cp. Section III:3.4.2),
3. for evaluating, if the main trends or sub-trends described by the respective phenomena correspond to the requirements of regional sustainable development (cp. Section III:3.4.3).

3.4.1 Aggregation of variables

For DIAMONT we set up the rule that variable aggregations should be limited as strictly as possible to minimise the risks of aggregation. If we decided to aggregate variables, we tried to use well-established and already scientifically discussed aggregation methods and indices. Two examples shall be mentioned here:

- "Air quality index for urban areas": defined by the highest scale-transferred value of the four substances NO_2, SO_2, PM10 and CO being typical immissions for urban areas, caused by traffic, domestic fuels, industrial plants as well as power and heating plants.[13] These are also the most frequently measured substances on measurement stations situated in the urban context. Mostly O_3 is also measured, even if high concentrations are much more characteristic for non-afflicted rural areas. The formation particularities of ozone[14] are the reason, why high concentrations of ozone cannot be used for indicating

[13] For details on the calculation method see indicator fact sheet in the DIAMONT data base.

[14] Ozone is not directly emitted in the atmosphere, it is formed by photochemical reactions triggered by the concentration of the precursors of ozone. The combination of ozone formation, vertical mixing and depletion at solid surfaces triggers the daily variation of ozone concentrations. Depletion and titration with NO lead to low concentrations near ground during night time, whereas in the reservoir layer at elevated altitudes, high concentrations can prevail over several days. Therefore areas remote from the sources of the precursors are affected by higher ozone levels – especially long-term concentrations – than areas directly influenced by the emissions of the precursors.

and localising areas (municipalities or regions) directly afflicted by relevant emissions. Therefore its has been decided not to include O_3 in the index formation (in contrast to the ATMO-index for urban areas, cp. Fig. III-8).

- "Change of number of employees subject to social insurance contribution in branches of a high added value and high innovative potentialities": the indicator provides information of the branch structure of the urban areas by adding the number of employees subject to social insurance contribution in selected branches. Particularly innovative branches and those of a high value added show a tendency towards centralisation and may indicate a high dynamic of the urban area. The following NACE-sectors are regarded as being important for the indicator calculating: communication (64), banking and insurances (65 - 67), business related services (70 - 74) and machinery, chemistry, electrical engineering, and micro-techniques (24, 29, 30, 32 - 35).

In some cases both the status quo and the development of an issue seem important to be indicated, e.g. if the evaluation requires to know, from which recent status on a changing process takes place. Therefore it is proposed for further DIAMONT work to test combining methods such as:

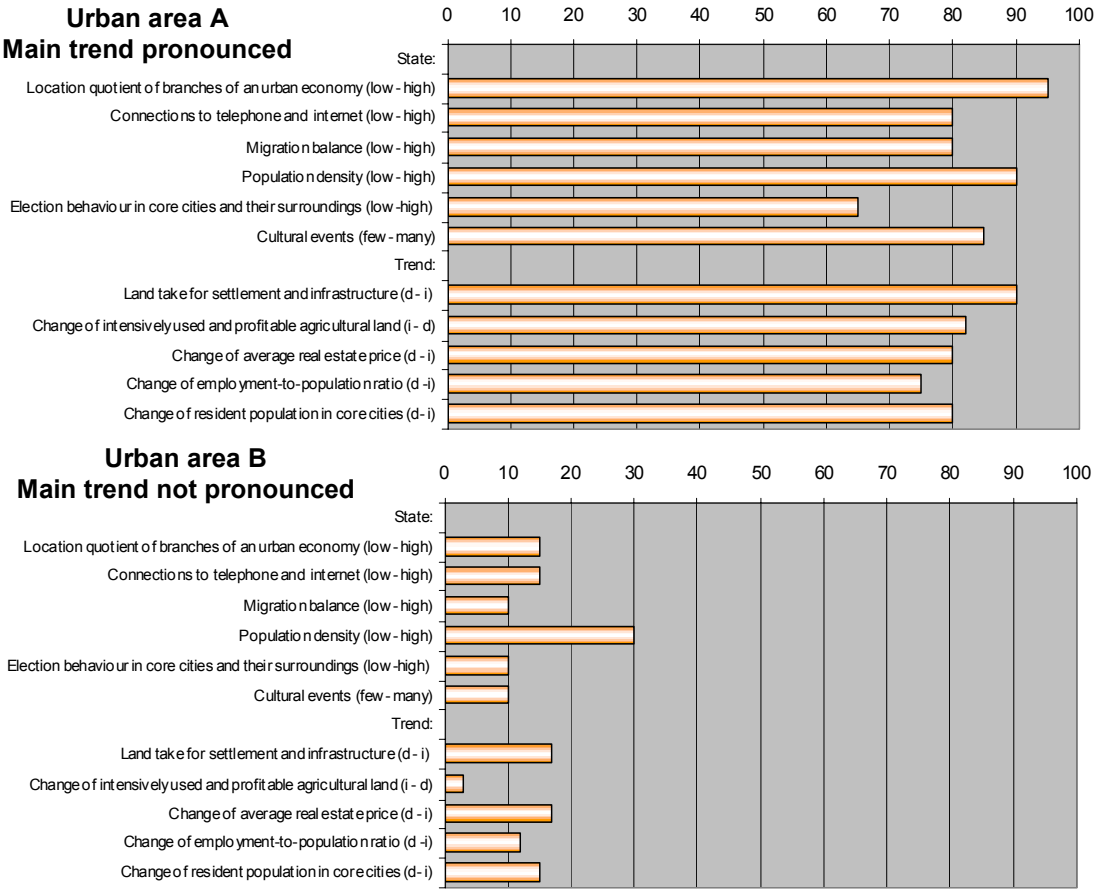
- "Change of natural and semi-natural areas": It has been supposed that a further shrink of natural and semi-natural areas from an already low level (e.g. less than 10% of the whole area) is to be evaluated as more critical than a reduction starting from a relatively high level. Therefore a combination of both factors, the degree of shrinking or increasing and the present situation, is experimented for following the calculation procedure:
  % of loss in area of natural and semi-natural biotopes (pastures, forests, wetlands and other semi-natural areas such as moors, heathland) * 1 / reduction factor.
  As reduction factors have been proposed:
  area of natural and semi-natural biotopes > 50%: 1
  area of natural and semi-natural biotopes > 40-50%: 0,9
  area of natural and semi-natural biotopes > 30-40%: 0,8
  area of natural and semi-natural biotopes > 20-30%: 0,7
  area of natural and semi-natural biotopes > 10-20%: 0,6
  area of natural and semi-natural biotopes < 10%: 0,5
  Due to lack of scientific rationale for the calculation procedure this first proposal was elaborated to be tested by using concrete data.

3.4.2 Aggregation of indicator values to main trend images

The "identification indicators" for characterising the main trends (cp. Section III:1.2) were deduced from literature research and analyses of other indicator systems. As long as they have not been tested by using and analysing concrete data, it remains hypothesis, if the indicators are really suitable to describe the respective main trends. Therefore it has been decided to choose the method of typological analyses (cp. Section III:3.3) for combining the information and - at the same time - preserving the original information contained in each indicator. So-called "trend images" shall provide a coherent and comprehensive visual synopsis of all indicator values determined for each municipality or each group of municipalities. It is assumed

that in municipalities with similar combinations of indicator values a main trend is similarly pronounced.

Fig. III-13 shows the fictive example of the main trend “Local centres and fringes between competition and co-operation”. The indicator values of urban area A point to a strong occurrence of urbanisation processes, whereas those processes supposedly are rather weak in urban area B.



(d – i) = decreasing - increasing

Fig. III-13: Fictive main trend images

The precondition for bringing together all values of the identification indicators, which are possibly strongly differing in magnitude and (measurement) unit, in one scheme and for improving the conditions for further statistical analyses is the scale transformation of all indicator values. In Section III:3.5.1 we will propose some methodological steps for realising the scale transformation. Applying, specifying and testing these methods by using concrete data will be one task of WP8.

It is assumed, that in municipalities with similar combinations of indicator values a main trend is similarly pronounced – or not pronounced. The main trend images thus also give information about, for instance, the different development types of urban areas (cp. Fig. II-8). In order to interpret the results under a wider perspective beyond the interpretation of single municipalities, statistical methods can be used to achieve a classification of the results. In Section III:3.5.2 we will shortly introduce such statistical methods.

3.4.3 Aggregation for evaluating sustainability

As the “identification indicators” shall be brought together by displaying main trend images (cp. Section III:3.4.2), an adequate method has also to be found for condensing the information provided by the “evaluation indicators” (cp. Section III:1.3). The latter have been selected to answer the question, if the municipalities or groups of municipalities, where a certain main trend is identified, are developing in a sustainable way.

Generally, the same visual aggregation method as explained above for the “identification indicators” is thinkable to be applied. But additionally also mathematical aggregations are possible. This depends on the information to be aimed at:

- If all municipalities shall be compared for the purpose of a benchmarking, “ranking points analyses” could be a suitable method (for further explanations cp. Section III:3.5.1, step 3).
- If the indicator-based assessment shall be used for consulting the municipal actors and developing recommendations for improving the situation, differentiated information for each indicator will be needed to identify where most urgent action has to be taken. In this case, visual aggregation methods should be preferred. Considering the objectives of WP9 to find or improve indicator-based instruments for steering sustainable regional development (cp. Fig. III-4), this approach should be pursued within DIAMONT.

Municipalities with similar combinations of evaluation indicator values can be supposed to develop in a similar manner in terms of sustainability. Therefore also in the context of the evaluation indicators, statistical methods can be used to achieve a classification of the results (cp. Section III:3.5.2).

3.5 Methodological proposals

3.5.1 Scale transformation

The scale transformation includes the following partial steps:

1. giving all indicators the same order of magnitude,
2. defining the extreme values of the scale of transformation,
3. selecting the best fitting transformation method.

Step 1: giving all indicators the same order of magnitude

As the indicators are generally formulated in a neutral way (cp. Section II:4.1), a clear orientation for their interpretation with respect

- to the occurrence of a main trend (“identification indicators”),
- to risk of unsustainable developments (“evaluation indicators”).

will be necessary. The formulation of the phenomena helps to provide such an orientation:

indicator:	phenomena:		interpretation of indicator:
"identification"	(main trend is pronounced)		
Change of average real estate price	Increasing competition of land use	⇨	high real estate price = high competition low real estate price = low competition
Population growth	high attractiveness of town as place of residence	⇨	high growth rate = high attractiveness low growth rate = low attractiveness
"evaluation"	(risk of unsustainable development is high)		
Effective mesh size	High fragmentation of green areas	⇨	high value = low fragmentation = low risk low value = high fragmentation = high risk
Air quality index for urban areas	Bad air quality	⇨	high index value = bad air quality = high risk low value = good air quality = low risk

Step 2: defining the extreme values of the scale of transformation,

The second step of the transformation procedure consists in the determination of the extreme or threshold values delimiting the "tails" of the scale: Which indicator value will be equated with the lowest (e.g. "0"), which with the ceiling limit (e.g. "100") of the scale? Defining these extreme values also implies that means beyond and above them will be truncated and equalised with the threshold values, and changes will not be considered any more - unless they exceed the lowest or fall below the highest value.

The determination of the threshold values can be based on:

- the analyses of the real data distribution, checking which maximum and minimum values do occur and if there are outliers which may be ignored. This method demands for broad – in the case of DIAMONT Alpine-wide - data availability for characterising the whole range of existing values. The advantage of this method would be that it is relatively objective except the possible cutting of the scale at its minimum and maximum. A disadvantage may be that each additional or changing data set can result in a change of the threshold values;
- objectives which are formulated for the respective indicator. However, it is obvious that quantified objectives will never be available for all indicators (BMU & UBA 2003);
- experiences or predefinitions taken from literature or singular data sets. This method, for instance, was applied in the FUNalpin project (cp. Section II:1.2.3). It allows the determination of threshold values even if neither complete data sets nor objectives are available. However the determination of the thresholds is not really transparent and therefore this method is assailable.

For the "identification indicators" it is recommended to base the threshold determination on real data assessments. The formulation of the main trends does not imply statements on sustainability, nor can the values of the "identification indicators" be evaluated against sustainability objectives.

In contrast, for the "evaluation indicators" other methods can be experimented dependent on the availability of objectives going with the indicators.

In the environmental sector quantified objectives for describing high environmental quality are rare. Nevertheless, if quantitative environmental objectives exist, these values can be

used for fixing at least the "sustainable end" of the scale. But which is then the situation to be characterised as "non-sustainable"? Limit values defining critical impairment of natural resources (e.g. limit and target values as well as thresholds of EC Directives) generally seem not to be appropriate as thresholds for scaling, because the compliance with these critical limits or thresholds does often not allow any conclusion with regard to sustainability.

For the social sector, often very ambitious objectives are formulated (as for example in the AGENDA 21: elimination of poverty, in the Social Action Programme of des EC 1974: full employment, e.g. FRIEDRICH & WIEDEMEYER 1998). Underlying such objectives the question arises which deviation from the objective can be evaluated as "still sufficient" for achieving or fostering sustainable development.

These reflections should be deepened within the WPs 9, 10 and 11. Especially working in the test regions and realising local workshops will give the opportunity to discuss objectives, which later can be monitored by indicator (cp. Fig. III-4).

Step 3: selecting the best fitting transformation method

The transformation method decides how the intermediate values are spaced between the threshold values. Among others three general strategies can be used (MATTHES & SCHRÖDER 2004):

- The "ranking points analysis" finds out which is the individual ranking position of a municipality or region concerning each indicator and deduces the resulting ranking points. Afterwards all ranking points (within a respective thematic topic) are added up for determining a final ranking position. The ranking points analysis had been applied by the MARS project (Section III:2.4.1) aiming "to aggregate the indicators in such a way that a complete evaluation of the sustainability of the regions can be made in relation to the others" (BAK BASEL ECONOMICS 2005: 211). An important disadvantage is that the method aggregates ordinal values and does not consider the "distances" between the indicator values of the analysed regions.
- The "factor scoring" grades all the indicators according to a unique scale. Each indicator is assigned to an integral evaluation score previously fixed (e.g. all inflation rates between 3 and 6% are evaluated with 4 points). In further steps these scores can be added up for all the indicators. In contrast to the ranking points analysis this method is based on an evaluation process derived from analytical knowledge. Nevertheless the limits of the respective classes are eventually randomised, and the change from a class to the other results in a saltus of points even if the indicator value is only slightly different from another. The factor scoring is a frequently used method (e.g. for generating the Index of Economic Freedom, HERITAGE FOUNDATION 2006).
- "Metric procedures" avoid such salti and transform the indicator value directly using an unique scale, which also allows to consider decimal numbers. The lowest number is equated with the lowest score, the highest with the highest score or vice versa. Based on the unique scale all values can be further elaborated (e.g. added or averaged).

For generating the main trend images it has been decided to use a metric transformation procedure. This is because on the one hand the main trends do not imply evaluations so that

ranking procedure are not adequate, on the other hand the visual aggregation of the indicator values does not require the factor scoring but can operate based on real values.

For the metric transformation, there are different methods in use. The most frequently used scale transformation procedure is standardisation (= z-transformation). Nevertheless, the most appropriate method should be individually determined in reliance on the specific indicator in dependence of its individual behaviour (OECD 2002, MATTHES & SCHRÖDER 2004). If the values show a more or less equal distribution, linear transformation will be possible. Linear transformations are e.g. the conversion from a measurement unit to another (like centimetres to inches, pounds to kilograms, Fahrenheit to Celsius, or EURO in Dollar). One characteristic of linear transformations is that they preserve relative spacings. Values that are evenly spaced before transformation remain evenly spaced after transformation. This transformation method was strictly applied for all transformation procedures within the FUNalpin project (Section II:1.2.3).

If values are asymmetrically distributed (e.g. the population density in the Alpine municipalities, cp. Fig. III-14), a nonlinear transformation should be used which manipulates the data. Such transformation methods are, for instance, standardisation, normalisation, root transformation or logarithmic transformation. They allow for a better visual differentiation of very similar values within the main trend images and improve the for a further interpretation by statistical methods. Looking on the Alpine wide data set on population density, a linear transformation will nearly make impossible to differentiate the low populated municipalities from each other. In contrast, a logarithmic transformation will reduce the positive skewness compressing the upper end (tail) of the distribution while stretching out the lower end.

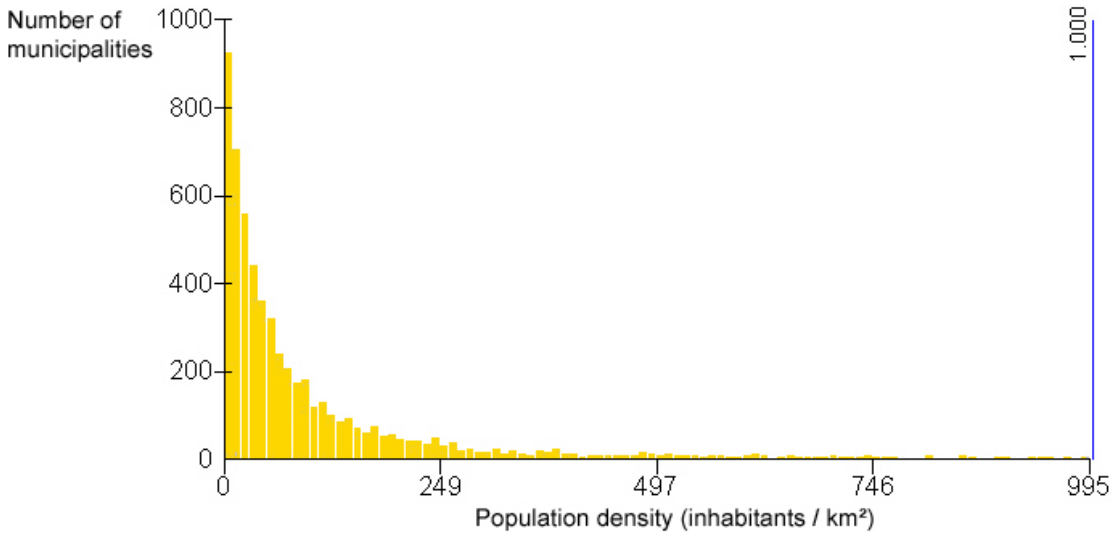


Fig. III-14: Distribution of values on population density in Alpine municipalities
(own data evaluation)

3.5.2 Classification

There are approx. 6.000 municipalities in the perimeter of the Alpine Convention. Although not all of these municipalities are affected by all of the main trends, it will not be possible to get an overview of the results on municipality level. For instance, the number of urban areas,

which are to be regarded in the context of the selected main trend “Local centres and fringes – between competition and cooperation”, amounts to approx. 190. Thus, in order to get an Alpine-wide interpretation of the situation concerning the main trends, it is necessary to classify the municipalities or groups of municipalities according to similarities of the indicator values.

Multivariate statistics offer different methods of analysis which can be used for classifications (LEYER & WESCHE 2007). Without going into the further detail, the methods can be distinguished into two main approaches. There are agglomerative approaches as the cluster analysis, which combine similar objects in a stepwise procedure starting from the total number of single objects. The similarity of the objects is displayed by means of dendrograms. In contrary, divisive approaches classify the objects starting from the whole set of objects, which is then stepwise divided into smaller groups. The results are either dendrograms (hierarchical methods as TWINSPAN) or rather groups of similar objects (non-hierarchical methods as cluster-centroid analysis).

The methods allow the use of different transformation methods, measures of similarities and algorithms and thus are rather flexible. For this reason, also the results of the methods can strongly differ from each other without suggesting the “correct” classification. The recommendation of a specific approach is not possible. The analyses rather have to be carried out in an explorative way and have to be interpreted thoroughly, until a reasonable result is achieved. This step can only be done in further WPs by analysing existing data.

4 DIAMONT database

4.1 Objectives and purposes

In the framework of DIAMONT a web-based database was installed and developed in order to facilitate the exchange of knowledge and data between the partners. The XML-based DIAMONT database (in the following referred to as “database”) is administrated by the Bavarian State Ministry of the Environment, Health and Consumer Protection (BayStMUGV) and located on the respective servers. Within WP7 the database has been further developed in close co-operation between the BayStMUGV and the German DIAMONT partners Bosch & Partner and ifuplan.

The database can be accessed at www.diamont.bayern.de by Diamont partners equipped with user name and password.

As mentioned in Section I:3 important parts of the DIAMONT concept was developed in close co-operation with the steering bodies of the Alpine Convention to give an impetus to SOIA e.g. by the development of indicators and of data processing methods. The database contributes to the envisaged exchange of knowledge between DIAMONT and SOIA as it is compatible to the SOIA database installed also at the BayStMUGV. First considerations about the SOIA database were made in the context of the WG RSA / SOIA (cp. Section I:3.2). Basing on the outcomes of the WG EOI (cp. Section I:3.1) concerning the structure and contents of metadata fact sheets on indicators and variables, the SOIA database is laid out as a managing tool for metadata as well as an instrument for storing and possibly processing data for indicator calculation. To facilitate an easy transfer from the results of DIAMONT to SOIA, the indicators were developed and documented in a compatible way within the DIAMONT database.

4.2 Contents

On its highest level, the database is organised in working domains called “classes” consisting of data sets described by the same attributes. The different classes fulfil various functions within the database.

The classes ‘Directory’ and ‘Library’ serve organisational purposes to store the addresses of the database users or rather to exchange documents between DIAMONT partners.

The two classes ‘Specific data sets’ and ‘Metadata on specific data sets’ are provided for future uses of the database, when specific data on municipalities or regions will be delivered to and possibly also processed within the database.

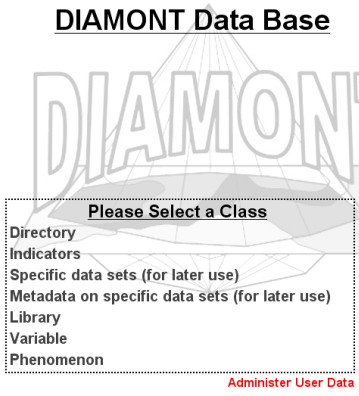


Fig. III-15: Classes of the DIAMONT database

To some extent, the work conducted in WP7 bases on the preliminary work of the WG EOI (cp. Section III:1.1, Section III:2.1). Thus the indicators proposed by the WG EOI are contained in the database as a single class, which can be linked to the indicator proposals in DIAMONT where appropriate. Hereby the development of the indicators can be traced back and the inputs of WG EOI can be made visible.

In the context of WP7, the most relevant classes are 'Indicator', 'Variable' and 'Phenomenon'. The information on the classes provided in the following tables is also contained in explanatory sheets within the database itself.

The functions of the database are explained in Annex 4.

4.2.1 Class 'Indicator'

The fact sheets of the class 'Indicator' contain all meta information necessary to describe and calculate the indicator, the approach of indication, sources considered as well as information on how to evaluate the indicator values. Tab. III-3 describes the respective database fields in detail. Fig. III-16 presents an example of a filled in fact sheet.

Tab. III-3: Database fields of the class 'Indicator'

Category	Field	Content
Identification	Diamont ID	Unique ID for numbering and coding the indicators
	Indicator title	Title of the indicator. Indicators having country-specific formulas are treated as separate indicators having specific 'Indicator titles' and 'DIAMONT ID's
	Indicator purpose	Purpose of the indicator as **identification** of the main trend respectively **evaluation** of its local shape (cp. Section III:1.2 and Section III:1.3)
	Calculation idea	Description of the specific calculation method of the indicator and the necessary variables
	Variable Indicator link	Link to the fact sheets of the variables needed for calculating the indicator
	Indicator unit	Unit of the indicator as t, kWh, km² etc.
	Indicator type	Indicator describes a current **status quo** or a development **process**?
	Data origins	Possible sources of data
	Assessment	Formulation of a clear orientation for the interpretation of the indicator
	Main trend	Assignment to the main trend
	Phenomenon	Assignment to a phenomenon
	Pillar	Assignment to a pillar of sustainability
	Dimension	Assignment to a dimension
	Topic	Assignment to topics according to European settings (cp. thesaurus)
	Abstract	Non obligatory field for describing an abstract of the indicator sheet
	Contact	Person responsible for content
	Distributor Contact	Organisation holding distributing permission
Reporting	Reference to Alpine Convention	Degree of reference to objectives of the AC (Categorisation)
	Objectives of Alpine Convention	Specific objectives of the Alpine Convention related to the indicator

Category	Field	Content
Work progress	Comments	Comments by the DIAMONT partners
	State of advance	Self estimation of the editor on state of advance of the indicator description
Comment	Background + Recommendation	Background information on the idea of indication and the interrelation of indicator and phenomenon.
	References	Sources of literature considered while developing the indicator.
	Estimation on Data Availability	Synoptic estimation on data availability in spatial and temporal regard based on the country-specific estimations on the variables by the experts
	Estimation on information comparability	Estimation on the comparability of eventual country-specific sub-indicators of one indicator (e.g. if variables used for indicator calculation differ between the countries)
	Scientific Rationale	The indicator bases on acknowledged standards and is used in indicator-based reports by e.g. the EEA or the OECD ('yes', 'no')
Transformation	References for Scaling	Description of the reference of the transformation values
	V_max	Maximum threshold value suitable for evaluation of the current indicator value respectively for scale-transforming the value (country specific where appropriate)
	V_min	Minimum threshold value suitable for evaluation of the current indicator value respectively for scale-transforming the value (country specific where appropriate)
	Transformation procedure	Rule for transforming the indicator values
	Transformation rationale	Rationale of transformation rule and for setting references for maximum and minimum thresholds (country specific where appropriate)
	Transformation source	Sources (of literature) for formulating 'transformation procedure' and 'transformation rationale'
Technical Data	Technical responsibility	Person responsible for correctly entering the database record
	Institution	Institution technically responsible
	Link	Link to institution technically responsible

DIAMONT Alpine Convention Indicators

Indicator title	**Location quotient of branches of an urban economy**		
Indicator purpose	**Identification**		
Calculation idea	**Combined location quotient of the sectors Trade (50 - 52), Transport (60 - 63), Communication (64), Banking and insurances (65 - 67), Business related services (70 - 74), Social services (75, 80, 85, 91, 92) as (sum of jobs in the respective sectors in the municipality / total number of jobs in the respective sectors per municipality) / (sum of jobs in the respective sectors in all alpine municipalities / total number of jobs in the respective sectors in all alpine municipalities)**		
Indicator unit	**no unit**	Indicator type	**1) Status quo**
Data origins	**Number of employees according to branch groups (LAU2)**		
Maintrend	**1) Local centres and fringes between competition and cooperation** info		
Phenomenon	**High importance of branches of an urban economy**		
Editor	**Andrian**		
Assessment	**The higher the indicator value, the stronger the indicator points to urbanity.**		
Pillar	**2) Economy**		
Dimension	**EC-1) Economic performance and infrastructure**		
Topic	**economy**		
Metadata date Stamp	**2006-08-08**		
Contact show hide	**Bosch & Partner GmbH : Stefan , v. Andrian-Werburg**		
Distributor Contact show hide	**Bosch & Partner GmbH : Stefan , v. Andrian-Werburg**		

Reporting

Objectives Alpine Convention	**0) not existent (no relation between indicator and objectives of the AC in spite of a wide-ranging interpretation)**

Work progress

State of advance	**2) advanced**

Comment

Background + Recommendation	**A suitable indication to display the importance of branches is the location quotient (“Standortquotient”), comparing the ratio of jobs of a certain branch to the total of jobs in one municipality to the ratio of a reference unit. Their occurrence in different parts of agglomeration varies (e.g. commercial services are strong in core cities, whereas transport is strong in core zones adjacent to the core city). Different aspects are important. On the one hand, the mix of branches is important, i.e. the dependency of the municipality of certain branch groups (e.g. tourism sector; social services). On the other hand, a high average value of sectoral location quotients shows the economic strength and prosperity of urban branch groups within the municipality, as branches concentrating in agglomeration are said to be of high added value. Relevant branches belong mostly to the tertiary sector and are in particular: - Trade - Transport - Communication - Banking and Insurances - Business related services - Social services.**
References	**ARE - Bundesamt für Raumentwicklung 2005a: Monitoring Ländlicher Raum, Themenkreis U2: Struktureller Wandel der Wirtschaft im ländlichen Raum. Version 1/05. ARE – Bundesamt für Raumentwicklung 2005b: Monitoring urbaner Räume Schweiz, Themenkreis 2: Spezialisierung der Wirtschaft im städtischen Raum (Vertiefungsstudie). Version 01.05. Perlik M. 2001: Wirtschaftliche Strukturtypen als Indikator für die Verstärkung der internationalen Netzwerkverbindungen der Alpenstädte. Revue de Géographie Alpine 89/1. http://hdl.handle.net/1801/308 (loaded 13.07.2006) Schuler M., Perlik M., Pasche N. 2004: Nicht-städtisch, rural oder peripher - wo steht der ländliche Raum heute? ARE, Bundesamt für Raumentwicklung, Bern.**

Transformation Data

Transformation (1) - Country:

Transformation rationale	**Comparison to the lowest and highest values in the Alpine space**

Technical Data

Technical responsible show hide	**Bosch & Partner GmbH : Stefan , v. Andrian-Werburg**
Link	**www.boschpartner.de**
Institution show hide	**Bosch & Partner GmbH**

General file attachments

List of attached files

Description

show document online: NACE-NOGA_1155301981705.xls file download (use right click and 'save as')

This indicator is linked by following documents:

Fig. III-16: Example of a filled in fact sheet of the class ‘Indicator’

4.2.2 Class 'Variable'

The class 'Variable' contains the metainformation on the variables necessary to calculate the indicators. The respective fact sheets contain descriptive information on the variables as well as fields for country-specific information on data availability in space and time. Tab. III-4 describes the respective database fields in detail. Until now the fact sheets of the class "Variable" are not filled in yet.

Tab. III-4: Database fields of the class 'Variable'

Category	Field	Content	Possible example
Identification	Variable ID	Unique ID for numbering and coding the variables in the framework of DIAMONT	001; 002; … A1, B1, C1 …
	Variable title	Name of the variable	Resident population
	Variable formula	if necessary: Formula for calculation of the variable	none
	Variable unit	Unit of the variable (t, kWh, km², etc.)	Number of persons
	Variable type	Type of geographic data needed	polygonal
	Variable Indicator link	if necessary: link to variables / indicators needed to calculate the variable	none
	Topic	Assignment to topics according to European settings (cp. thesaurus)	society
	Abstract	Non obligatory field for describing an abstract of the variable sheet	
	Contact	Person responsible for content	Bosch & Partner GmbH : Konstanze , Schönthaler
Comments	Country	Name of country giving information on the data situation concerning the variable	AT
	Type of data available	Type of geographic data available	polygonal
	Spatial resolution	Spatial resolution of the data	LAU2
	Data availability in space	Are data collected systematically and representatively?	data collected systematically and representatively
	Future data availability (in space)	Changes in data availability	no future improvement of data availability to be foreseen
	Data availability (in time, frequency)	Frequency of data collection	yearly
	Responsible for comment	Person responsible for variable information	Austrian Partner

4.2.3 Class 'Phenomenon'

Within the class 'Phenomenon', the phenomena characterising the respective main trends are described. Basic information for all phenomena is the assignment to the main trends, the

title and a definition of the direction the phenomenon is deemed to be pronounced in the context of the respective main trend. Some phenomena could not be covered by suitable indicators. For these phenomena, the database contains additional information on relevant literature references as well as on possible approaches towards an indication. Tab. III-5 describes the respective database fields in detail.

Tab. III-5: Database fields of the class 'Phenomenon'

Field	Content	Example
Main trend	Assignment to the main trend	1) Local centres and fringes between competition and cooperation
Phenomenon	Description of the phenomenon	High attractiveness as a place of residence
Assessment	Rule or proposal for defining the direction how the phenomenon is deemed to be pronounced in the context of the actual main trend	High population density: 100 (main trend is strongly pronounced) Low population density: 0 (main trend is not pronounced)
Connotation	Associations and ideas towards the indication of the phenomenon. It explains the reasons for not elaborating an indicator and names possible approaches towards indication.	Only used if no indicator can be defined.
Reference	References used in the process of developing the phenomenon and approaches for indication	Only used if no indicator can be defined.
Comment	Comments by the DIAMONT partners	Phenomenon generally suited, but it has to be regarded…

4.3 Further work with the DIAMONT database

The database allows the realisation of several working steps envisaged in the framework of the following DIAMONT WPs. With respect to the continuation of the work on phenomena, indicators and variables, it can be used in twofold regard.

- as a platform accessible to all partners: with the database a suitable tool for discussion is available. There are fields provided for commenting on the proposals of phenomena and indicators, thus enabling a further precision and distinct formulation of the elements of these classes, also resulting from experiences gathered within WP10 and WP11.
- Furthermore, the database offers the possibility to gather country-specific information needed for the description of the indicator and its variables. In the context of variables, i.e. variables necessary to calculate the indicators, each DIAMONT partner will have the possibility to describe the country-specific data situation. Thus the specific situations in terms of data availability can be taken into account while specifying the calculation methods for the indicators. Additionally, the database provides a form sheet for collecting information on specific national or regional objectives for supporting the transformation of the "evaluation indicators" (cp. Section III:3.5.1, step 2).

The database can also be configured to meet the demands of further work steps (cp. Fig. I-1), e.g.:

- data storage and processing in WP8,
- assignment of instruments to phenomena and indicators in WP9.

5 Indicator list

In the following sub-chapters, the indicators for the four main trends selected for being studied with more detail, are presented in a summarising form. Details on each indicator like calculation procedures, units, background information on the selection and development process, rationales and references, etc. are presented in the DIAMONT database as explained in Section III:4.2.

Some general and specific remarks shall be given:

- The check of data availability was not intended to be realised within WP7. Indicators should be primarily selected by applying the "best needed" criteria (cp. Section III:1.4). Nevertheless it has been decided to focus the indicator selection and development as strong as possible on those indicators which can be hopefully brought to life.
- Often a lot of different indicators were discussed for representing the phenomena. Ideas have been cancelled, others further elaborated. Not all of these ideas could be documented in the DIAMONT database, but we tried to make at least some of our ideas transparent by giving comments in the database field "Background + Recommendation" (cp. Tab. III-3).
- The indicator titles are consciously formulated as short as possible, so that conclusions concerning the specific characteristics and the focus of the indicators are not possible. These details have to be gathered from the respective calculation procedures.
- Nevertheless, not for all indicators the calculation procedures could be already documented with all the necessary details. Especially, if indicators are adopted from other indicator systems, more detailed research will be necessary partly due to insufficient access to the calculation methods. For the selected main trend "Local centres and fringes…" we tried to specify all the calculation procedures to facilitate direct continuation of work within WP8.
- All calculation procedures have generally to be interpreted as drafts. They have to be tested and confirmed working with real data. In particular if the indicators are composed of several variables, the range of resulting values and their distribution will finally decide on the suitability of the calculation procedure.

The following tables (in Section III:5.1, 5.2, 5.3 and 5.4) will present the indicators developed for the main trends grouped by their function of either "identification" or "evaluation". They will also give an overview of the elaborated phenomena. The phenomena, which "identification indicators are assigned to, are formulated in such a way as to point out the direction, in which the main trend is pronounced. The formulation of phenomena linked with "evaluation indicators" expresses the direction in which the risks of constraining sustainable development are increasing (regardless of these risks being evident or not).

5.1 Indicators for the main trend "Local centres and fringes between competition and co-operation"

As the main trend "Local centres and fringes between competition and co-operation" aims to characterise the overall status and development of urban areas, most of the indicators proposed below are designed to be generated for the whole urban area to differ it from the others. Nevertheless, the data will be collected on LAU2-level - if it is possible - and aggregated for the whole urban area (by generating mean values).

This methodological concept includes, that after having characterised the whole urban area, also differences within the urban area and relations between the municipalities (forming part of the urban area) can be assessed by using the same indicators. This should be tested in the test regions (WP10 and WP11).

In contrast to the other main trends, the characterization of the urban areas (dynamic, stagnating or losing) assumes that first of all these zones are delimited. For this purpose an independent set of indicators was defined closely referring on previous results of PERLIK 2001 (cp. Section II:2.2.1). This indicators have to be generated on municipal level. Tab. III-6 provides an overview of the different purposes of indication.

Tab. III-6: Main trend "Local centres and fringes between competition and co-operation" - purposes of indication

Indicators	**Generating indicator values**		**Interpretation of indicator values with the purpose to...**
Identification indicators	Generating indicator values on LAU2 level		identify the local centres and to delineate the urban area
		generating integrated values for each urban area (e.g. mean values)	characterise the urban areas as a whole with respect to the occurrence of the main trends (main trend images)
			differentiate the urban area itself and to identify relations of co-operation and competition between the municipalities
Evaluation indicators	Generating indicator values on LAU2 level	generating mean values for each urban area if possible	characterise the urban areas as a whole with respect to the sustainability of the main trends (possibly resulting in a ranking of urban areas)
			characterise each municipality within the urban area with respect to sustainability (for identifying needs for action)

Tab. III-7: Indicators for the main trend "Local centres and fringes between competition and co-operation"

Pillar	Dimension	Phenomenon[1)]	Indicator Title	Indicator Purpose I =identification E=evaluation	Indicator Type P=Process S=Status quo
Identification indicators to identify the local centres and to delineate the urban area					
Economy	Labour	Strong labour market	Number of employees	I	S
Economy	Labour	Strong functional interrelation between municipalities	Outbound commuter ratio (to core city and/or in a inner-periurban zone)	I	S
Society / Culture	Public services and security	Provision of central and administrative functions	District capital	I	S
Society / Culture	Population	High attractiveness of town as place of residence	Resident population	I	S
Identification indicators to characterise the urban areas and the single municipalities with respect to the occurrence of the main trend					
Economy	Economic performance and infrastructure	High importance of branches of an urban economy	Location quotient of branches of an urban economy	I	S
Economy	Economic performance and infrastructure	Increasing land take for infrastructure and settlement	Land take for settlement and infrastructure	I	P
Economy	Economic performance and infrastructure	Increasing competition of land use	Change of intensively used and profitable agricultural land	I/E	P
Economy	Public and private financing	Increasing competition of land use	Change of average real estate price	I	P
Economy	Labour	Strong labour market	Change of employment-to-population ratio	I	P
Economy	Innovation, technology and information	High density of communication infrastructure	Connections to telephone and internet	I	S
Society / Culture	Population	High attractiveness of town as place of residence	Migration balance	I	S
Society / Culture	Population	High potential for social interactions	Population density	I	S
Society / Culture	Population	Population growth in the core city	Change of resident population in the core city	I	P
Society / Culture	Social participation and freedom	Urban renewal	Election behaviour in core cities and their surroundings	I	S
Society / Culture	Culture	Increasing cultural relevance	Cultural events	I/E	P

Pillar	Dimension	Phenomenon	Indicator Title	Indicator Purpose I =identification E=evaluation	Indicator Type P=Process S=Status quo
Evaluation indicators to characterise the urban areas and the single municipalities with respect to sustainability					
Environment	Structure	Loss of typical natural biotopes of Alpine valleys	Change of natural and semi-natural areas	E	P
Environment	Structure	Increasing land take for infrastructure and settlement	Land take for infrastructure and settlement – Variant	E	P
Environment	Structure	Fragmentation of green areas	Effective mesh size	E	S
Environment	Species	Declining species diversity	Species diversity	E	P
Environment	Matter exchange	Bad air quality	Air quality index for urban areas (short term)	E	S
Environment	Water exchange	Decreasing river water quality	Change of river water quality categories	E	P
Environment	Water exchange	High dependency on water importation	Local water consumption and water abstraction	E	S
Environment	Water exchange	Low water absorbing capacity	Municipal water balance	E	S
Environment	Human health	Impairment of human health by noise	Population exposed to noise	E	S
Environment	Human health	Low healthiness of urban life style	Children suffering from asthma	E	S
Environment	Aesthetics	Loss of landscape diversity	Landscape diversity	E	S
Environment	Aesthetics	Lack of recreational areas	Disposability of recreational area	E	S
Economy	Economic performance and infrastructure	Increasing competition of land use	Development of infrastructure and settlement in designated advice zones of natural hazards	E	P
Economy	Economic performance and infrastructure	Coupling of economic and population growth to space consumption	Efficiency of land use	E	P
Economy	Public and private financing	Financial squeeze of the municipality	Indebtedness-by-revenues-ratio	E	S
Economy	Labour	Low qualification of labour force	Educational attainment of labour force	E	S
Economy	Labour	Unemployment	Long-term unemployment rate	E	S
Economy	Production and consumption	High waste generation	Municipal waste generation	E	S

Pillar	Dimension	Phenomenon	Indicator Title	Indicator Purpose I =identification E=evaluation	Indicator Type P=Process S=Status quo
Economy	Innovation, technology and information	Low importance of branches of a high added value and high innovative potentialities	Change of number of employees subject to social insurance contribution in branches of a high added value and high innovative potentialities	E	P
Economy	Innovation, technology and information	Low importance of branches of a high added value and high innovative potentialities	Number of patent applications	E	S
Society / Culture	Population	Unfavourable age structure	Change of age dependency index	E	P
Society / Culture	Population	Low potential for social interactions	Degree of population mixture (age groups, educational level, nationalities)	E	S
Society / Culture	Social equity and family	Gender inequity	Women's labour market participation	E	S
Society / Culture	Public services and security	Bad provision of public transport	Access to public transport	E	P
Society / Culture	Public services and security	Bad provision of business related services	Employment in business related services	E	S
Society / Culture	Public services and security	Bad provision of educational services	Employment in educational sector	E	S
Society / Culture	Social participation and freedom	Low participation in democratic processes	Participation in local elections	E	S
Society / Culture	Culture	Low interest in cultural attractions	Visitors of cultural attractions	E	S
1) Phenomena to which objectives of the Alpine Convention and its Protocols could be assigned are marked with grey colour.					

5.2 Indicator for the main trend “Congestion of transport system”

The main trend “Congestion of transport system” focuses on regions, which are particularly affected by the traffic loads on the Alpine transport infrastructures. Tab. III-8 gives an overview of the indicators, covering fields as transport infrastructures, the development of passenger and freight transport as well as the impacts on environment, economy and society.

Tab. III-8: Indicators for the main trend “Congestion of transport system”

Pillar	Dimension	Phenomenon	Indicator Title	Indicator Purpose I =identification E=evaluation	Indicator Type P=Process S=Status quo
Identification indicators					
Economy	Economic performance and	Increasing land take for infrastructure and set-	Change of length of high-ranking road network	I	P

Pillar	Dimension	Phenomenon	Indicator Title	Indicator Purpose I =identification E=evaluation	Indicator Type P=Process S=Status quo
	infrastructure	tlement			
Economy	Economic performance and infrastructure	Increasing land take for infrastructure and settlement	Land take for infrastructure	I	P
Economy	Economic performance and infrastructure	High density of high-ranking road network	Road density	I	S
Economy	Public and private financing	Increasing competition of land use	Change of average real estate price	I	P
Economy	Public and private financing	High investments in infrastructure	Investments to road network	I	S
Economy	Production and consumption	High likeliness of traffic jams	Likeliness of traffic jams	I	S
Economy	Production and consumption	Congestion of transport system	Traffic loads on high-ranking roads (total)	I	S
Evaluation indicators					
Environment	Matter exchange	Pollution of soils	Pollution of soils nearby the streets	E	S
Environment	Matter exchange	Bad air quality	Air quality index for traffic related sites (short term)	E	S
Environment	Structure	Fragmentation of green areas	Effective mesh size	E	S
Environment	Human Health	Impairment of human health by noise	Population exposed to noise	E	S
Environment	Aesthetics	Damages of Alpine scenery	Length of infrastructural elements exceeding the minimum height of 10m	E	S
Economy	Economic performance and infrastructure	Increasing competition of land use	Development of infrastructure and settlement in designated advice zones of natural hazards	E	P
Economy	Public and private financing	Unbalanced investments in infrastructure of different transport modes	Modal split of infrastructure investment	E	S
Economy	Labour	Economic decline in the vicinity of supra-regional transit corridors	Change of employment-to-population ratio	E	P
Economy	Production and consumption	Increase of road transport	Change of road transport volumes (total)	E	P
Economy	Production and consumption	Congestion of transport system	Road freight transport	E	S
Economy	Production and consumption	High emission of transport specific air pollutants	Slope of road sections	E	S
Society / Culture	Population	Low attractiveness as space for living	Migration balance	E	P

5.3 Indicator for the main trend "Modernisation of agriculture in favoured areas"

The indicators proposed for the description and evaluation of the main trend "Innovation and competitiveness - modernisation of agriculture in favoured areas" got important impulses from indicator work done especially within IRENA (cp. Section III:2.5.2) and SUSTALP (cp. Section III:2.4.3). Some indicators proposed in the list below are directly copied from IRENA- or SUSTALP-indicators. The corresponding IRENA and SUSTALP indicator identification codes are documented in the DIAMONT database.

The calculation procedures of IRENA mostly base on national data submissions and cannot be directly assumed for indicator purposes on regional or local level (cp. for instance the proposed indicators on emission of agriculture). Therefore further critical review of both the indicator proposal and the respective calculation procedure is still necessary.

Tab. III-9: Indicators for the main trend "Innovation and competitiveness - Modernisation of agriculture in favoured areas"

Pillar	Dimension	Phenomenon	Indicator Title	Indicator Purpose I =identification E=evaluation	Indicator Type P=Process S=Status quo
Identification indicators					
Economy	Economic performance and infrastructure	Higher inputs in intensified modern agriculture	Changing share of agricultural area managed by low-, medium- or high-input farm types	I	P
Economy	Economic performance and infrastructure	High share of full-time farms	Share of full-time farms	I	P
Environment	Structure	Decline of environmental impacts by organic farming	Share of area occupied by organic farming	I	P
Environment	Species	Loss of diversity of breeds and seeds	4 alternatives are still discussed:	I/E	
			Share in production of main crop varieties registered and certified for marketing		
			Diversity of breeds in total livestock population (cattle, pigs, sheep, goats and poultry)		
			Number of livestock breeds and plant varieties		
			Proportion of livestock breeds and plant varieties		
Environment	Matter exchange	Livestock density	Aggregated livestock density	I	P

Pillar	Dimension	Phenomenon	Indicator Title	Indicator Purpose I =identification E=evaluation	Indicator Type P=Process S=Status quo
Evaluation indicators					
Environment	Structure	Loss of characteristic small-sized landscape elements	Occurrence of linear structures and small biotopes	E	P
Environment	Species	Loss of species biodiversity	Impacts on habitats and biodiversity	E	P
Environment	Species	Loss of species biodiversity	Population trend of farmland birds	E	P
Environment	Matter exchange	Increasing emissions of acidifying and eutrophying substances	Atmospheric emission of ammonia	E	P
Environment	Matter exchange	Increasing emissions of GHG	Emissions of methane and nitrous oxide	E	P
Environment	Matter exchange	Decreasing river water quality	Nitrates in surface water	E	S
Economy	Economic performance and infrastructure	Economic decline of farming	Agricultural factor income	E	S
Economy	Public and private financing	High dependence of agriculture by refunds	Producers subsidy equivalent	E	P
Economy	Labour	Low importance of agriculture for job market	Share of employed in agriculture (var.: agricultural manpower density)	E	P
Economy	Labour	Low importance of agriculture for job market	Share of jobs in agriculture	E	S
Economy	Labour	Low qualification of labour force	Agricultural holders' trainings levels (male, female)	E	S
Economy	Production and consumption	Increase of water consumption	Total area covered by irrigation infrastructure	E	P
Economy	Production and consumption	Increase of water consumption	Agricultural share of water use	E	P
Society / Culture	Population	Unfavourable age structure of farm holders	Rate of farmers above the age of 45	E	S
Society / Culture	Social equity and family	Gender inequity	Share of farms managed by women	E	P
Society / Culture	Income and wealth	Low income of farmers	Comparison of income between farmers and non-agricultural population	E	S
Society / Culture	Income and wealth	Low income of farmers	Comparative incomes of organic farms	E	P
Society / Culture	Social participation and freedom	Limited access to modern communication infrastructure	Share of holdings having access to assisted telecommunication facilities / services	E	S
Society / Culture	Culture	Loss of cultural landscapes and traditional land use practises	Man-made objects (cultural features) - indicator in development OECD	E	S

5.4 Indicator for the main trend "Increasing generation of energy from renewable sources"

The indication in the following draft is primarily focussed on the actual generation and use of renewable energies and their (ecological) risks and consequences. The indicators proposed neither allow interpretation concerning the different preconditions of the Alpine municipalities and regions for using renewable energy sources nor estimations to what extent the potentials are presently being tapped.

Discussing the specific natural preconditions for generating renewable energies the following factors might be considered:

- access to geothermic sources,
- availability of wind and appropriate sites for wind parks,
- hydropower potential (gradient, quantity of run-off, water systems apt for energy use from an ecological point of view),
- photovoltaic energy generation (micro-climate, annual solar quantity, extended foggy periods).

In general the whole main trend "Increasing generation of energy from renewable sources" suffers from strongly limited data availability and data accessibility. Especially data on energy generation are not available on local level (LAU2 and NUTS3).

Tab. III-10: Indicators for the main "Increasing generation of energy from renewable sources"

Pillar	Dimension	Phenomenon	Indicator Title	Indicator Purpose I =identification E=evaluation	Indicator Type P=Process S=Status quo
Identification indicators					
Economy	Economic performance and infrastructure	High installed capacity for generating renewable energy	Installed capacity of hydro power	I	S
Economy	Economic performance and infrastructure	High installed capacity for generating renewable energy	Installed capacity for generating geothermic energy	I	S
Economy	Economic performance and infrastructure	High installed capacity for generating renewable energy	Installed capacity of wind turbines	I	S
Economy	Economic performance and infrastructure	Increasing importance of energy generation as additional income source for farmers	Agricultural area under energy crop cultivation	I	S
Economy	Economic performance and infrastructure	Increasing demand for biomass residues	Share of forest products used as firewood	I	P
Economy	Economic performance and infrastructure	Increasing demand for surge power	Surge power generated by pump storage water plants	I	P
Economy	Production and consumption	Increasing energy self sufficiency	Local/regional energy generation and consumption	I	S

Pillar	Dimension	Phenomenon	Indicator Title	Indicator Purpose I =identification E=evaluation	Indicator Type P=Process S=Status quo
Economy	Production and consumption	Increasing use of de-centralised alternative energy sources	Households obtaining energy generated by micro or private power plants	I	P
Economy	Public and private financing	Increasing demand for biomass residues	Local (fire) wood price	I	P
Economy	Labour	High importance of energy generation for the job market	Employees in energy supply (NACE 40.1, 40.2 and 40.3)	I	S
Economy	Innovation, technology and information	Increasing quality standards for generation of renewable energy	Share of labelled commercial energy generation	I	P
Evaluation indicators					
Environment	Structure	Loss of structural qualities of water bodies	River continuity	E	P
Environment	Structure	Loss of ecosystems in backwater flooding areas	Increase of water surface	E	P
Environment	Structure	Intensified used of forest	Percentage of non-used wood increment	E	P
Environment	Water exchange	Disturbance of natural water discharge regime	Approximation to (legally regulated) minimum water discharge	E	S
Environment	Matter exchange	Emissions of air pollutants	Emissions taken from emission declarations of installations subject to licensing	E	S
Environment	Matter exchange	Bad air quality	Air quality index for energy generation and consumption	E	S
Environment	Aesthetics	Damages of Alpine scenery	Concentration of wind turbine sites	E	P
Society / Culture	Social equity and family	Gender inequity	Gender equity in renewable energy generation	E	P

Weblinks

[1] http://www.are.admin.ch/are/de/nachhaltig/indikatoren_schweiz/index.html
http://www.bfs.admin.ch/bfs/portal/de/index/themen/nachhaltige_entwicklung/uebersicht.html

[2] http://glossary.eea.europa.eu/EEAGlossary/D/DPSIR
http://org.eea.europa.eu/documents/brochure/brochure_reason.html
http://ceroi.net/reports/arendal/dpsir.htm

[3] http://www.wbgu.de/wbgu_syndromkonzept_en.html (loaded: 13.06.06)

[4] http://ec.europa.eu/research/quality-of-life/ka5/en/02329.html (loaded: 13.06.2006)

[5] http://www.alpinespace.org/view+M599c3ff7778.html (loaded: 23.05.2006)

[6] INTERREG III B 4th call: http://www.alpinespace.org/view+M599c3ff7778.html (loaded: 23.05.2006)

[7] http://www.i-d.co.uk/perip/

[8] http://www.umweltbundesamt.de/uba-info-presse/hintergrund/Klimaaenderungsworkshop.pdf
(loaded: 07.07.2006)

[9] http://www.un.org/esa/sustdev/natlinfo/indicators/isdms2001/table_4.htm

[10] http://www.who.int/about/definition/en/

[11] VIII. Tagung der Alpenkonferenz, 16.11.2004, Garmisch-Partenkirchen: Beschlussprotokoll:
http://www.convenzionedellealpi.org/NR/rdonlyres/00500F83-714A-4980-8543-3C01EE749463/0/
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[12] cp. also DIAMONT Newsletter No.3, Hain B.: Indicators for the Alpine space – much work has already been done: http://www.uibk.ac.at/diamont/downloads/newsletter/diamontnewsletter_nov2005.pdf

[13] e.g.: http://www.ihk-nordwestfalen.de/volkswirtschaft_statistik/arbeitsmarktreformen.php
http://de.wikipedia.org/wiki/Arbeitslosenquote
http://de.wikipedia.org/wiki/Vollbesch%C3%A4ftigung

[14] http://themes.eea.europa.eu/indicators/all_indicators_box

[15] http://www.blak-ne.de/index2.php?seite=40500

[16] http://www.env-it.de/umweltdaten/

[17] http://www.bfs.admin.ch/bfs/portal/de/index/themen/nachhaltige_entwicklung/indikatoren/ind7.html

[18] for further examples of local sustainability indicator developments compare e.g. also:
http://195.37.134.139/lu/miners/
http://www.iisd.org/measure/compendium/
www.nachhaltigkeit.info

[19] http://www.espon.eu/ (loaded:16.08.2006)

[20] COM(2000) 20, COM(2001) 144, http://europa.eu.int/eur-lex/en/com/cnc/2000/com2000_0020en01.pdf (loaded: 15.08.2006)

[21] http://reports.eea.europa.eu/eea_report_2005_6/en (loaded: 15.08.2006)

[22] http://europa.eu.int/eur-lex/en/com/cnc/2000/com2000_0020en01.pdf (loaded: 15.08.2006)

[23] http://www.ilo.org/public/english/employment/strat/kilm/ (loaded: 15.08.2006)

[24] Treaty of Amsterdam amending the Treaty on European Union, the Treaties establishing the European Communities and certain related acts, signed on 2 October 1997.
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[25] www.umweltbundesamt.de/dux/kl-inf.htm (loaded 17.08.2006)

[26] http://www.oramip.org/html/en/102-missions.php (loaded 18.08.2006)

[27] http://unfccc.int/resource/docs/convkp/kpeng.html (loaded 18.08.2006) and Kyoto Protocol to the United Nations Framework Convention on Climate Change (Art. 5: 3)

[28] http://themes.eea.europa.eu/IMS/ISpecs/ISpecification20041007131537/guide_summary_plus_public#Definition (loaded 18.08.2006)

[29] http://glossary.eea.europa.eu/EEAGlossary/E/environmental_headline_indicator (loaded: 21.08.2006)

[30] http://esl.jrc.it/envind/db_meths.htm (loaded 17.08.2006)

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3 Indicator Development

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DIAMONT

Annexes

Annex 1: Dimensions of the pillars of sustainability

1.1 Dimensions of the environmental pillar

1	2	3	4	5	6	7	8
Structure	• Distribution of ecosystems and landscape elements • Distribution of habitats • Fragmentation of ecosystems and habitats			• (Intrinsic) structure of ecosystems • Structure of soils, soil sealing			
Land – Urbanisation					Ressource Depletion (e.g. increase in territory permanently occupied by urbanisation)	Soil	Soil degradation
Land – Desertification		Terrestrial					
Species	• Change of species composition • Species biodiversity						
Biodiversity (Ecosystems, Species)	Biodiversity	Biodiversity				Nature and Biodiversity	Biological diversity
Matter exchange	• Emission and immission of air pollutants • Emission and immission of water pollutants • Emission and immission of soil pollutants						
Atmosphere – Air quality, Ozone layer depletion)	Air quality, stratospheric ozone depletion	Air pollution and stratospheric ozone depletion			Air pollution Ozone depletion	Air	Air pollution Stratospheric ozone depletion
			Supporting – nutrient cycling, soil formation			Soil	Soil degradation
					Dispersion of toxic substances		Chemicals

1	2	3	4	5	6	7	8
Water exchange	• Change of water regime: precipitation regime, snow cover, melting water, development of glaciers • Change of flooding area, flooding						
		Water	Regulating - flood regulation, water purification	Water Extraction	Ressource Depletion (e.g. water consumption) Water pollution	Water	Water Technological and natural hazards
Energy balance	• Emission and immission of radiation • Emission and immission of noise • Change of temperature regime						
Atmosphere - Climate change	Climate change	Climate Change	Regulating - climate regulation	Climate change, emissions of CO_2	Climate change	Ozone and climate change	Climate change
Aesthetics	• Alpine scenery • Landscape biodiversity						
			Cultural (aesthetic, spiritual, educational recreational, etc.)				
Human health	• Impairment of human health by air pollution • Impairment of human health by water pollution • Impairment of human health by noise						
Fresh water (water quantity, water quality)	Fresh water quality , fresh water resources		Provisioning: fresh water; Regulating - disease regulation			Health	Human health

1) UNCSD: SDI Guidelines and methodologies (http://www.un.org/esa/sustdev/natlinfo/indicators/isdms2001/table_4.htm)

2) Environmental Indicators on Sustainable Development (OECD 2002)

3) EEA: Core Set of Indicators (http://themes.eea.europa.eu/IMS/CSI)

4) Ecosystem services (MILLENNIUM ECOSYSTEM ASSESSMENT 2005a and b)

5) MARS / environmental pillar (BAK BASEL ECONOMICS 2005)

6) Environmental Pressure Indicators for the EU (EUROSTAT 2001)

7) State of the Environment Report 2002 (GOVERNMENT OF THE REPUBLIC OF SLOVENIA 2002)

8) Europe's environment: the third assessment (EEA 2003)

1.2 Dimensions of the economic pillar

1	2	3	4	5	6
Economic performance and infrastructure	• Value added • Relevance of the economic sectors and branches • Competitiveness • Structure of enterprises (number and size)		• Provision of infrastructure (buildings, transport infrastructure and other public utilities like electricity, natural gas, coal delivery, water supply, sewers, radio and television bandwidth allocation, cable television service, etc.)		
Economic performance	Economic stability	Economic Performance – Real GDP, Real GDP per capital		Development of an efficient economic infrastructure	
	Structures and functioning of market economy				
Trade					
	Social responsibility of enterprises		New understanding of entrepreneurship and administration	Structuring of enterprises and enhancement of competitiveness	
		Productivity and competitiveness (Real hourly productivity of labour)			
	Agriculture				
Public and private financing	• Investment • Subsidies • Social welfare • Taxes		• Insurances • Prices and costs, inflation, indebtedness • Credits, saving and interests		
Financial Status				Development of an efficient financial system	
				Public finances	
					Principles of responsibility and precaution (research and national debt)
			Prices		

1	2	3	4	5	6
Production and Consumption		• Consumption of material and resources • Buying / spending power • Consumption of energy		• Waste management • Transport performance	
			Eco-efficiency		Ecoefficient growth
	Sustainable production and consumption		Sustainable products and services		
Material consumption					Sustainable use of re-sources
Waste generation and management					
Energy use					
Innovation, technology and information		• Science • Technical progress • Research by enterprises		• Access to communication, communication infrastructure • Innovative potential, activities and obstructions	
Science and technology	Science and technology, communication		Innovative structures and competitiveness	Research and technologi-cal development	Principles of responsibility and precaution (research and national debt)
Communication infrastructure				Information and communi-cation infrastructure ; de-velopment of new services	
Information access					
Labour		• Demand and offer of working places • Jobs in the different economic sectors • Employment and unemployment			
	Labour	Labour market participation			

1) UNCSD: SDI Guidelines and methodologies (http://www.un.org/esa/sustdev/natlinfo/indicators/isdms2001/table_4.htm)

2) Soziale und ökonomische Nachhaltigkeitsindikatoren (HENSELING et al. 1999)

3) MARS / economic pillar (BAK BASEL ECONOMICS 2005)

4) NSSD Austria - Main objective "Dynamic business location" (ÖSTERREICHISCHE BUNDESREGIERUNG 2002)

5) Slovenia: Strategy for economic development 2001-2006 (ŠUŠTERŠIČ J. et al. 2001)

6) IFEN 45 Indicators of SD (IFEN 2003)

1.3 Dimensions of the social pillar

1	2	3	4	5	6	7	8	9	10
Population			• Spatial distribution of population • Seasonal distribution of population			• Increase and decrease of population (migration and birth and mortality rates) • Age pyramid			
Population composition and change		Population	Demographic changes		Common social objectives: Population	Demography			
Social equity and family[1]			• Good social relations, social cohesion • Equality of gender, generations, migrants, disabled people, ethnic minorities (also in the sense of "social mobility")						
Socio-economic groups and social mobility	Good social relations (social cohesion, mutual respect, ability to help others)	Justice (equity)		Overcoming the discrimination and strengthening the integration of handicapped people, ethnic minorities and immigrants	Individual needs: Equity			Gender equity	
									Handicapped people
						Demography (migration, foreigners)			Migration and integration
Households and families		Justice (well-being of children)				Participation / social capital (family network)			Family
Public services and security[2]			• Services provided to the citizens (by the public sector or the private sector): access to education, health care, (public) transport, information			• Personal safety (accidents, delinquency) • Security form (natural) disasters			

[1] The dimension is also closely linked with the terms of "social cohesion" (defined by OECD Social Indicators 2003) and "good social relations" (defined by MILLENNIUM ASSESSMENT 2005b) being an important precondition of a society for developing and living social equity.

[2] In the Millennium Assessment (2003) the term „security" comprises personal safety, secure resource access, and security form disasters.

1	2	3	4	5	6	7	8	9	10
Health and health services Social security and welfare services	Health (strength, feeling well, access to clean air and water)	Health (nutrition, illnesses, mortality, sanitation, medical care)	Human health protection and lifestyles	Modernisation of social security systems	Individual needs: Health, securing subsistence	Health	Public sphere (medical care, social security)	Health security; reproductive health	Health
				Improvement of access to high quality services					
			Pensions adequacy						
Learning and educational services		Education	Other aspects of social exclusion (early school leavers)	Reduction of discrimination in education and training	Individual needs: Education	Education		Education	Education
	Security (personal safety, security form disasters)	Safety (crime)				Safety	Public sphere (public security)		
Social participation and freedom			• Democratic participation • Social self-organizing			• Solidarity • Freedom and choice of action			
	Freedom and choice of action				Common social objectives: Solidarity, freedom		Aspects of social cohesion		
	Freedom and choice of action				Common social objectives: Democracy, peacekeeping, strengthening social self-organizing ,etc.)	Participation / social capital			Social participation and civic engagement

1	2	3	4	5	6	7	8	9	10
Income and wealth			• Access to basic material for good life: nutrition, shelter • Personal income (sources) The dimension is oriented on the „Basic material for good life“ of the Millennium Assessment (MILLENNIUM ASSESSMENT 2005b) comprising amongst others the fields of adequate livelihoods, shelter, nutrition, and free access to goods[3]						
Human settlements and housing	Basic material for good life (shelter)	Housing (living conditions)		Guaranteeing adequate living space	Individual needs: Shelter	Poverty / income distribution	Living standard and shelter		Shelter
Consumption	Basic material for good life (sufficient nutritious food)		Food safety and quality		Individual needs: Nutrition			Food security	
Income, consumption and wealth	Basic material for good life	Justice / equity (Poverty)	Monetary Poverty	Elimination of child poverty			Living standard and shelter	Poverty and distribution	Income and wealth Poverty (social welfare)
	Freedom and choice of action				Individual needs: Mobility				
Culture			• Maintenance of cultural tradition • Cultural identity						
					Common social objectives: cultural diversity				

[3] The term “poverty” has consciously been avoided for defining this dimension, because it comprises much more than material poverty. Poverty is the state of being without the necessities of daily living, often associated with need, hardship and lack of resources across a wide range of circumstances. For some, poverty is a subjective and comparative term; for others, it is moral and evaluative; and for others, scientifically established. The principal uses of the term include:

- Descriptions of material need, including deprivation of essential goods and services, multiple deprivation, and patterns of deprivation over time.
- Economic circumstances, describing a lack of wealth (usually understood as capital, money, material goods, or resources, especially natural resources).
- Social relationships, including social exclusion, dependency, and the ability to live what is understood in a society as a "normal" life: for instance, to be capable of raising a healthy family, and especially educating children and participating in society. (http://en.wikipedia.org/wiki/Poverty)

1	2	3	4	5	6	7	8	9	10
Income and wealth			• Access to basic material for good life: nutrition, shelter • Personal income (sources) The dimension is oriented on the „Basic material for good life“ of the Millennium Assessment (MILLENNIUM ASSESSMENT 2005b) comprising amongst others the fields of adequate livelihoods, shelter, nutrition, and free access to goods[3]						

1) Handbook on social indicators (UN – Department of Economic and Social affairs, Statistical Office 1998)

2) Constituents of well-being (MILLENNIUM ECOSYSTEM ASSESSMENT 2005b)

3) UNCSD: SDI Guidelines and methodologies (http://www.un.org/esa/sustdev/natlinfo/indicators/isdms2001/table_4.htm)

4) Sustainable Development Indicators to monitor the implementation of the EU Sustainable Development – sub-themes (EC 2005a)

5) Gemeinsamer Bericht über Sozialschutz und soziale Eingliederung – Kap. 2.2 (Politische Prioritäten) (EC 2005a)

6) Soziale und ökonomische Nachhaltigkeitsindikatoren (HENSELING et al. 1999)

7) MARS / social pillar (BAK BASEL ECONOMICS 2005)

8) Datenreport 2004 (StaBA 2004)

9) Social watch indicators (selection) (SOCIAL WATCH 2005)

10) Lebenslagen in Deutschland (BUNDESMINISTERIUM FÜR GESUNDHEIT UND SOZIALE SICHERUNG 2005)

Annex 2: Selection of phenomena – weighting results of experts and partners

2.1 Analysing and interpreting the weighting results

During the task of defining and selecting phenomena for indication, a prioritisation of phenomena was conducted based on a weighting of phenomena by the DIAMONT partners as well as on the results of the third round of the Delphi survey carried out in WP6. Due to the different ranking methods and other difficulties of comparability (cp. Section II:4.2), the weightings had to be interpreted and combined carefully in the following steps:

- interpretation of the weighting results of the DIAMONT partners,
- interpretation of the results of the Delphi survey in WP6,
- integration of the results of both weightings.

2.1.1 Weighting results of DIAMONT partners

The overall weighting result is consciously not based on an average value of all scores to respect the different conditions in the Alps. These can evoke significant differences in the importance of certain phenomena from one country to the other. Furthermore in the case of Italy weighting was required by two institutions (EURAC and UNCEM), additionally within the EURAC several colleagues participated in the process.

The weighting results were categorised into five classes by the criteria presented in Tab. 1.

Tab. 1: Interpretation of the weighting results of the DIAMONT partners

Classes / Colours	Criteria
low weighting prevailing	at least two scores lower than 3 (if there are two scores of Italy lower than 3, they will be weighted as only one)
diverse weighting (low to very high)	at least two scores lower than 3, but at the same time at least two scores of 5 or three scores of four and five
medium to high weighting prevailing	all scores except one of 3 and 4 (if there are two scores of Italy lower than 3, they will be weighted as only one)
medium to very high weighting prevailing	all scores except one of 3 and 4, additionally two scores of 5 (if there are two weightings of Italy lower than 3, they will be weighted as only one, as second score of 5 is accepted also one of the EURAC-team, if the other 5 is not form Italy, too)
high to very high weighting prevailing	all scores except one of 4 and 5 (if there are two scores of Italy lower than 4, they will be weighted as only one)

2.1.2 Results of Delphi survey

The third round of the Delphi survey asked the experts to estimate the importance of certain phenomena in the context of main trends referring to their present and future relevance and to distinguish the spatial dimension. The experts could estimate the relevance by the help of codes ranging from 1 (very low) to 4 (very high).

Tab. 2: Example of the Delphi survey's results

Phenomenon	Appreciation of the importance in the present state							
	% of answers:		Score index			Regional dimension of the appreciation		
	Important	Not important	General score	Highest	Lowest	General average	Highest	Lowest
Growing isolation due to low accessibility	47	47	2,36	3,13 (IT)	2,00 (AT)	1,55	2 (CH)	1,4 (DE)
Growing isolation due to weakening of social links	45	51	2,40	3,11 (FR)	1,55 (DE)	1,56	2 (CH)	1,4 (DE)
Decreasing efficiency in public and private service provision	64	36	2,79	3,00 (IT)	2,50 (CH)	1,52	2 (CH)	1,4 (DE)

For the interpretation in the framework of WP7, three criteria (marked with grey colour in Tab. 2) were defined, of which at least two had to be met. These criteria reflected the general appreciation of the phenomenon by the majority of experts and a prevalence of high or very high values, expressed by the general score. Again, with respect to the differences between the regions of the Alpine space, the interpretation was not merely based on average values. Therefore the highest national score was taken into account additionally. The criteria were applied separately to the estimations of the present and the future relevance of the phenomena.

Tab. 3: Interpretation of the Delphi survey's results

Criteria	Class / Colour	
	high (at least two criteria)	low
General Appreciation: Important (2nd column)	> 50% of the answers	<=50% of answers important
General score: high or very high (4th column)	>2,5	<=2,5
Highest score: very high importance in one country (5th column)	>3,5	<=3,5

2.1.3 Integration of the results

The third step was the integration of the interpreted weighting results of the DIAMONT partners and the Delphi survey. Phenomena which have not been subject to the third round of the Delphi survey were interpreted solely according to the weighting of the DIAMONT partners.

The phenomena were finally divided in three categories:

- [0] – Low importance in present and future
- [1] – High importance in future
- [2] – High importance in present and future

Phenomena categorised in the last two groups ([1] and [2])are seen as prioritised with respect to the indicator development. The results of the integration proceedings with respect to the main trends defined is displayed in the chapters below.

Tab. 4: Proceeding of the integration

		Delphi survey 3rd round			
		low future importance	low present importance	high future importance	high present importance
DIAMONT Partners	low weighting prevailing	[0]	[0]	[1]	[2]
	diverse weighting (low to very high)	[0]	[0]	[1]	[2]
	medium to high weighting prevailing	[0]	[0]	[1]	[2]
	medium to very high weighting prevailing	[2]	[2]	[2]	[2]
	high to very high weighting prevailing	[2]	[2]	[2]	[2]

To facilitate an easier overview of the weighting and interpretation results, the following abbreviations are being used:

Concept of sustainability		
Pillar	**Abbreviation:**	**Dimension**
Environment	EN-1	Structure
	EN-2	Species
	EN-3	Matter exchange
	EN-4	Water exchange
	EN-5	Energy balance
	EN-6	Human Health
	EN-7	Aesthetics
Economy	EC-1	Economic performance and infrastructure
	EC-2	Public and private financing
	EC-3	Labour
	EC-4	Production and consumption
	EC-5	Innovation, technology and information
Society / Culture	SC-1	Population
	SC-2	Social equity and family
	SC-3	Income and wealth
	SC-4	Public services and security
	SC-5	Social participation and freedom
	SC-6	Culture
Estimation of Delphi experts		

Concept of sustainability	
Abbreviation	**Category**
App. pr.	Appreciation present (%)
Av. pr.	Average present (1=very low, 4 =high)
HVPr	Highest value present (1=very low, 4 =high)
App. fut.	Appreciation future (%)
Av. fut.	Average future (1=very low, 4 =high)
HVFut	Highest value future (1=very low, 4 =high)
Weighting of DIAMONT partners	
Abbreviation	**Category**
AMGI	Anton Melik Geographical Institute
UIBK	Universität Innsbruck
EURAC	Europäische Akademie Bozen
UNCEM	Unione Nazionale Comuni Comunità Enti Montani
ifuplan	ifuplan GbR
CEMAGREF	Cemagref - Unité de Recherche Développement des Territoires Montagnards, Grenoble

2.2 Weighting results: Local centres and fringes – between competition and cooperation

Pillar	Dimen-sion	Phenomenon	Delphi survey						DIAMONT partners					
			App. pr.	Av. pr.	HVPr	App. fut.	Av. fut.	HVFut	AMGI	UIBK	EU-RAC	UN-CEM	ifuplan	CEMA-GREF
Envi-ronment	EN-1	Soil sealing in areas, where open spaces are already rare							1,0	5,0	3,7	-	3,0	5,0
	EN-1	Fragmentation of natural biotopes by construction							4,0	5,0	3,3	2,0	3,0	4,0
	EN-1	Loss of green corridors and open space	62	2,98	3,8	79	3,3	3,88	4,0	4,0	3,3	3,0	3,0	5,0
	EN-1	Loss of typical natural biotopes of Alpine valleys due to high competition of nature protection and agriculture with urban uses	62	2,98	3,8	79	3,3	3,88	2,0	4,0	4,0	3,0	3,0	4,0
	EN-1	Loss of fertile soils of Alpine valleys due to high competition of agriculture with urban uses	60	2,86	3,33	66	2,98	3,63	4,0	4,0	3,7	4,0	3,0	5,0
	EN-1	Layouts regulating space consumption	53	2,77	3,17	77	3,2	3,83	5,0	-	-	-	-	4,0
	EN-2	Loss of species adapted to extensive non-fragmented areas							3,0	4,0	3,0	3,0	-	-
	EN-3	High contribution of agglomerations to the entire air emissions							3,0	4,0	4,3	3,0	4,0	4,0
	EN-3	Air pollution in agglomeration, especially in valleys and basins							3,0	4,0	4,3	3,0	1,0	5,0
	EN-3	Pollution of groundwater caused by insufficient technical infrastructures and increasing traffic							4,0	3,0	3,3	2,0	2,0	4,0
	EN-3	Pollution of rivers by insufficient waste water treatment							4,0	3,0	2,3	2,0	1,0	5,0
	EN-4	Loss of water absorbing capacity by soil sealing							2,0	4,0	3,3	3,0	3,0	5,0
	EN-4	Loss of retention area and flooding area for rivers by infrastructural development and soil sealing	62	2,98	3,8	79	3,3	3,88	4,0	5,0	4,0	2,0	4,0	4,0
	EN-4	Excessive exploitation of drinking water in the vicinity of agglomerations							3,0	3,0	3,7	1,0	2,0	4,0
	EN-5	Emissions of noise							3,0	4,0	3,7	3,0	3,0	2,0
	EN-6	Impairment of human health by air pollution							3,0	4,0	4,0	2,0	3,0	4,0
	EN-6	Impairment of human health by noise							3,0	5,0	3,3	2,0	3,0	2,0
	EN-6	Increasing interest paid to wooded areas in densely populated valleys for citizens oxygenation	32	2,18	2,63	53	2,64	3,29	3,0	2,0	3,3	1,0	2,0	3,0
	EN-7	Damages of Alpine scenery due to uncontrolled urban sprawl	74	3,07	3,56	68	3,09	3,67	3,0	5,0	4,0	3,0	3,0	5,0

Pillar	Dimen-sion	Phenomenon	Delphi survey						DIAMONT partners					
			App. pr.	Av. pr.	HVPr	App. fut.	Av. fut.	HVFut	AMGI	UIBK	EU-RAC	UN-CEM	ifuplan	CEMA-GREF
		In the suburb loss of environmental quality as a former rural quality							4,0	4,0	3,5	2,0	2,0	4,0
Economy	EC-1	Expansion of urban regions							4,0	5,0	3,0	3,0	3,0	5,0
	EC-1	Growing together of city and suburb							3,0	5,0	3,7	3,0	1,0	4,0
	EC-1	Expansion of areas used for settlements (especially one-family houses) and infrastructure in suburban areas							4,0	4,0	3,3	-	4,0	5,0
	EC-1	Expansion of areas used for settlements and infrastruc-ture in suburban areas disproportionate to population growth							3,0	3,0	2,7	-	-	4,0
	EC-1	Coalescence of traditional villages into suburban areas	53	2,73	3	62	2,91	3,25	4,0	5,0	4,0	2,0	2,0	4,0
	EC-1	Usage of hazardous zones (like valleys slopes, flood expansion fields, etc.) for construction							4,0	5,0	3,5	2,0	3,0	4,0
	EC-1	Development of high tech business parks (industrial and commercial areas, also combining of shopping and leisure activities) in urban areas	36	2,4	3,13	57	2,78	3,29	3,0	4,0	3,0	2,0	4,0	5,0
	EC-1	Abandonment of previous industrial and warehouse sites in inner cities							2,0	3,0	2,0	3,0	2,0	4,0
	EC-1	Retreat of agriculture in urban and suburban areas							3,0	3,0	3,5	2,0	3,0	4,0
	EC-1	Concentration of economic power and entrepreneurial oriented decisions in agglomerations							3,0	4,0	4,3	3,0	3,0	3,0
	EC-2	Concentration of capital market oriented decisions in agglomerations							3,0	4,0	4,0	3,0	-	2,0
	EC-2	Budget imbalances between core cities and sub-urbs (core cities offer extensive services for the whole agglom-eration)							2,0	-	2,0	3,0	1,0	4,0
	EC-2	Loss of buying power and income taxes in core cities in favour of the suburban areas							3,0	3,0	2,7	2,0	1,0	4,0
	EC-2	High costs for construction due to increasing costs for safety and security standards							2,0	4,0	3,0	3,0	1,0	2,0
	EC-2	High real estate prices due to high competitiveness of land use							4,0	5,0	4,7	1,0	4,0	4,0
	EC-3	Concentration of jobs in agglomerations							4,0	5,0	3,7	3,0	-	4,0
	EC-3	Concentration of jobs in the tertiary sector in agglomera-tions							4,0	3,0	3,7	2,0	-	4,0

Pillar	Dimen-sion	Phenomenon	Delphi survey						DIAMONT partners					
			App. pr.	Av. pr.	HVPr	App. fut.	Av. fut.	HVFut	AMGI	UIBK	EU-RAC	UN-CEM	ifuplan	CEMA-GREF
	EC-3	Lower decline of persons employed in metropolitan areas in comparison to rural and other urban areas							3,0	4,0	2,5	3,0	-	2,0
	EC-3	Autonomisation of suburban labour market							3,0	-	-	2,0	-	3,0
	EC-4	Intensive commuter connections between core cities and suburbs	34	2,26	3,5	61	2,85	3,5	3,0	5,0	4,7	2,0	3,0	5,0
	EC-4	High quantity of waste accumulation							3,0	3,0	3,3	2,0	1,0	4,0
	EC-4	High quantity of waste water accumulation							3,0	3,0	3,3	2,0	1,0	4,0
	EC-5	Generating technical and scientific innovations in metro-politans							3,0	3,0	3,7	3,0	3,0	5,0
	EC-5	Generating social and cultural innovations in metropoli-tans							3,0	4,0	3,3	3,0	1,0	4,0
Society / Culture	SC-1	High part of the Alpine population living in towns							2,0	3,0	3,7	3,0	-	4,0
	SC-1	High density of population in urban areas							2,0	5,0	4,3	3,0	-	4,0
	SC-1	Immigration of extra-Alpine population due to high attrac-tiveness of the Alpine agglomerations (e.g. due to their attractive landscape)	57	2,67	3,22	66	2,91	3,57	2,0	3,0	3,0	3,0	3,0	4,0
	SC-1	Immigration out of peripheral rural areas due to high at-tractiveness of the agglomerations for the population searching for a more urban lifestyle							2,0	5,0	3,0	3,0	3,0	3,0
	SC-1	Selective migration from the core cities to the agglomera-tion communities							2,0	2,0	2,7	2,0	1,0	4,0
	SC-2	Concentration of deprived people in the core cities, con-centration of the middle and upper class in the communi-ties in suburban areas							3,0	2,0	2,3	3,0	1,0	4,0
	SC-2	Loss of social cohesion as a former rural quality in the suburb	36	2,44	2,78	51	2,59	3,13	3,0	3,0	2,3	3,0	1,0	4,0
	SC-3	Increase of households with an income higher than the average in the suburban areas							3,0	-	3,7	2,0	1,0	4,0
	SC-4	Concentration of public and private service provision in agglomerations							3,0	5,0	3,7	3,0	3,0	4,0
	SC-4	Development of new services activities polarizing in cities peripheries	40	2,7	2,86	47	2,92	3,86	2,0	3,0	1,0	3,0	-	4,0
	SC-5	Concentration of political decisions and control in agglom-erations							3,0	3,0	3,7	4,0	-	3,0

Pillar	Dimen-sion	Phenomenon	Delphi survey						DIAMONT partners					
			App. pr.	Av. pr.	HVPr	App. fut.	Av. fut.	HVFut	AMGI	UIBK	EU-RAC	UN-CEM	ifuplan	CEMA-GREF
	SC-6	In the suburban area loss of cultural traditions as a former quality of rural areas							3,0	3,0	3,3	4,0	-	3,0
	SC-6	Loss of identity caused by transformation of the cultural landscape and the coalescence of traditional villages and suburban areas							4,0	3,0	2,0	2,0	-	4,0
	not yet assigned	Marginalisation of small and medium-size cities							3,0	-	-	-	-	5,0
	not yet assigned	Setting up planning documents including cities peripheries	66	2,98	3,8	79	3,3	3,88	3,0	-	-	-	-	4,0
	not yet assigned	Inclusion into metropolises commuters catchments							3,0	-	-	-	-	4,0
	not yet assigned	Revitalisation of city centres							4,0	-	-	-	-	4,0
please add:		**Additional phenomena**												
		Urban decline, shrinking								x				
		Vacuum of urban development strategies after the collapse of central city theory								x				
		Globalised architecture								x				
		Recycling of urban materia								x				

2.3 Weighting results: Marginalisation of rural area

Pillar	Dimen-sion	Phenomenon	Delphi survey						DIAMONT partners					
			App. pr.	Av. pr.	HVPr	App. fut.	Av. fut.	HVFut	AMGI	UIBK	EURAC	UN-CEM	ifuplan	CEMA-GREF
Envi-ronment	EN-1	Increase of fallow land							5,0	5,0	4,5	2,0	-	4,0
	EN-1	Increase of shrubland and forest							5,0	5,0	4,5	2,0	-	4,0
	EN-1	Loss of semi-natural biotopes, cultivated land by abandonment							4,0	4,0	4,0	3,0	4,0	5,0

Pillar	Dimension	Phenomenon	Delphi survey						DIAMONT partners					
			App. pr.	Av. pr.	HVPr	App. fut.	Av. fut.	HVFut	AMGI	UIBK	EURAC	UN-CEM	ifuplan	CEMA-GREF
	EN-1	Loss of semi-natural biotopes by local concentration of intensified and specialized agricultural use							3,0	2,0	3,5	3,0	3,0	3,0
	EN-1	Change of soil structure in areas with spatial concentration of agricultural mountain businesses							2,0	2,0	3,0	2,0	-	-
	EN-1	Loss of biodiversity: diverse landscapes							4,0	4,0	5,0	3,0	4,0	4,0
	EN-1	Development of new wilderness areas							2,0	3,0	3,7	2,0	4,0	5,0
	EN-1	Establishment of new protected areas							4,0	3,0	3,3	3,0	3,0	5,0
	EN-1	Better spatial linkage of existing protected areas							2,0	3,0	4,3	3,0	3,0	4,0
	EN-1	Danger of erosion and avalanches due to low or not yet managed grassland							3,0	3,0	3,8	2,0	4,0	4,0
	EN-2	Loss of species adapted to conditions of semi-natural biotopes							3,0	4,0	4,0	3,0	4,0	4,0
	EN-2	Loss of biodiversity: species diversity							3,0	4,0	4,0	3,0	4,0	4,0
	EN-2	Reintroduction of certain animal species like wolves and bears adapted to the living conditions of extensive wild areas							3,0	4,0	2,7	2,0	2,0	4,0
	EN-3	Soil pollution in areas with spatial concentration of agricultural mountain businesses							2,0	2,0	2,5	3,0	-	1,0
	EN-4	Change of local water balances							2,0	3,0	4,0	2,0	-	5,0
	EN-7	Change of Alpine scenery due to higher part of forests and shrubland							4,0	4,0	1,3	2,0	2,0	4,0
Economy	EC-1	Decreasing economic importance of mountain agriculture (contribution to GDP, number of farms)	66	2,98	3,13	68	3,07	3,38	3,0	4,0	4,0	2,0	3,0	2,0
	EC-1	Low competitiveness of mountain agriculture	55	2,73	3	62	2,91	3,31	3,0	4,0	3,5	2,0	1,0	3,0
	EC-1	Devaluation and abandonment of less productive agriculture land	60	2,8	3,14	70	3,04	3,29	4,0	5,0	4,0	2,0	4,0	4,0
	EC-1	Expansion of the remaining agricultural businesses							3,0	3,0	3,0	3,0	4,0	4,0
	EC-1	Spatial concentration of agricultural mountain businesses							3,0	4,0	3,7	1,0	2,0	4,0

Pillar	Dimen-sion	Phenomenon	Delphi survey						DIAMONT partners					
			App. pr.	Av. pr.	HVPr	App. fut.	Av. fut.	HVFut	AMGI	UIBK	EURAC	UN-CEM	ifuplan	CEMA-GREF
	EC-1	Specialisation of agricultural mountain businesses							4,0	4,0	3,8	3,0	4,0	3,0
	EC-1	High dependence of agricultural businesses on options for new and interconnecting sources of income (agricultural and non-agricultural activities, part-time farming)	72	3,02	3,5	77	3,34	4	3,0	5,0	4,3	3,0	5,0	4,0
	EC-1	High part of part-time farming							4,0	5,0	4,3	2,0	-	3,0
	EC-1	Structural change of the economy towards the third sector							3,0	4,0	3,3	3,0	4,0	2,0
	EC-1	Increasing dependence of the economical development of rural areas on the industrial production and commercial sector such as the dynamics of the tertiary sector							4,0	3,0	3,3	2,0	-	2,0
	EC-1	Revival of self sufficient rural economy by increasing energy costs (also revival of self sufficient agricultural units)							1,0	3,0	2,0	-	2,0	2,0
	EC-1	Bad structures of marketing of agricultural products							4,0	2,0	3,8	2,0	4,0	4,0
	EC-1	Significant proportion of second homes							3,0	3,0	2,5	2,0	-	4,0
	EC-1	Change of demand for products due to the concentration of old people							1,0	3,0	3,3	4,0	3,0	3,0
	EC-2	High dependence of agriculture by subsidies							3,0	5,0	4,3	3,0	4,0	5,0
	EC-2	No cost-covering prices for agricultural products							3,0	5,0	4,5	3,0	-	4,0
	EC-2	High costs for maintaining and providing adequate infrastructure (traffic, communication, services)							4,0	4,0	3,5	3,0	-	4,0
	EC-2	Uncertainties in public funds provision to support rural development	45	2,5	3,75	62	2,93	3,75	4,0	4,0	3,3	2,0	4,0	5,0
	EC-2	Low public budget due to high part of retired people							2,0	2,0	3,5	2,0	1,0	3,0
	EC-2	Decreasing financial possibilities for effective protection against the consequences of natural disasters							3,0	2,0	4,0	2,0	3,0	3,0
	EC-3	Higher decline of employment in rural areas in comparison to urban and periurban areas	64	2,86	3,5	70	2,98	3,5	3,0	5,0	4,8	3,0	4,0	4,0
	EC-3	Decrease of the number of agricultural employees							2,0	5,0	4,5	3,0	4,0	4,0

Pillar	Dimen-sion	Phenomenon	Delphi survey						DIAMONT partners					
			App. pr.	Av. pr.	HVPr	App. fut.	Av. fut.	HVFut	AMGI	UIBK	EURAC	UN-CEM	ifuplan	CEMA-GREF
	EC-4	Change of consumption patterns and demands due to demographic changes (aging)							2,0	4,0	3,3	3,0	3,0	3,0
	EC-4	Low buying power in rural areas							2,0	3,0	3,0	2,0	3,0	4,0
	EC-5	Low part of high innovative businesses and firms adding high value in rural areas							3,0	4,0	3,5	3,0	4,0	4,0
	EC-5	Loss of traditional forms of land-use due to the lack of capacity for innovation (adapting carefully traditional practices to new conditions)							3,0	2,0	2,5	2,0	3,0	3,0
	EC-5	Notable decrease of potential for innovations by aging (the critical mass for innovative action is often not reached in rural areas)							2,0	3,0	4,0	2,0	4,0	2,0
	EC-5	Development of new and maintenance of traditional lifestyles due to the return of well-trained young people into the alps							1,0	2,0	3,0	3,0	4,0	3,0
	EC-5	High importance of decentral teleworking (e.g. due to increasing transport costs)							1,0	3,0	3,3	3,0	3,0	3,0
	EC-5	Modernization of agricultural mountain businesses							3,0	3,0	2,3	2,0	4,0	3,0
	EC-5	Promotion of regional and local labels (brands)	69	2,9	3,25	83	3,36	3,88	3,0	5,0	3,8	4,0	3,0	5,0
Society / Culture	SC-1	Decrease of population in rural communities							4,0	5,0	4,0	3,0	4,0	4,0
	SC-1	Aging							4,0	5,0	4,3	2,0	4,0	4,0
	SC-1	Aging of the farming population							5,0	5,0	4,5	2,0	4,0	4,0
	SC-1	Emigration of (young) people							4,0	5,0	4,5	3,0	3,0	4,0
	SC-1	Immigration of retired people							1,0	3,0	1,8	4,0	3,0	4,0
	SC-2	Growing isolation due to low accessibility	47	2,36	3,13	40	2,43	2,86	3,0	3,0	2,5	4,0	2,0	4,0
	SC-2	Growing isolation due to weakening of social links	45	2,4	3,11	55	2,67	3,25	3,0	2,0	3,7	4,0	2,0	4,0
	SC-2	Problems of integration of new members into the local rural community							2,0	4,0	4,7	3,0	3,0	4,0

Pillar	Dimen-sion	Phenomenon	Delphi survey						DIAMONT partners					
			App. pr.	Av. pr.	HVPr	App. fut.	Av. fut.	HVFut	AMGI	UIBK	EURAC	UN-CEM	ifuplan	CEMA-GREF
	SC-2	Increasing social differences in mobility in consequence of energy costs rise							2,0	3,0	3,0	2,0	2,0	2,0
	SC-2	Social tensions between rural and urban areas							2,0	3,0	3,3	2,0	2,0	2,0
	SC-4	Decreasing public service provision (including infra-structure) due to financial rationalisation of public ser-vices and decreasing efficiency in low populated areas	64	2,79	3	70	3,04	3,25	3,0	5,0	3,7	2,0	4,0	4,0
	SC-4	Increasing part of services in private ownership linked with increasing requirements of profitability							2,0	4,0	3,7	3,0	4,0	3,0
	SC-4	Decreasing private service provision due to decreasing efficiency in low populated areas							2,0	5,0	4,0	2,0	4,0	4,0
	SC-4	Good provision of crucial services by IT-technologies and telecommunication (like Internet-Banking)							3,0	3,0	3,0	3,0	3,0	3,0
	SC-4	Change of demand for services due to an increasing number of elderly people	49	2,55	3	85	3,02	3,43	2,0	4,0	4,0	3,0	4,0	3,0
	SC-4	Restricted access to services for people not owning a private car (worsened by mobility limitations of elderly people)							3,0	4,0	3,3	4,0	4,0	4,0
	SC-4	Increasing risk of natural hazards							3,0	4,0	3,0	3,0	4,0	3,0
	SC-5	Development (strength) of rural democracy							2,0	2,0	4,0	1,0	-	4,0
	SC-6	Loss of cultural diversity in rural areas							2,0	4,0	2,0	2,0	3,0	3,0
	SC-6	Loss of cultural identity in rural areas							3,0	3,0	2,0	3,0	3,0	4,0
	SC-6	Participation of local population as actors in cultural events	60	2,67	3,13	64	2,7	3						
	SC-6	Conservation of regional traditions and consciousness especially in less developed regions							3,0	4,0	4,3	2,0	3,0	2,0

2.4 Weighting results: Congestion of transport system[4]

Pillar	Dimension	Phenomenon	Delphi survey						DIAMONT partners					
			App. pr.	Av. pr.	HVPr	App. fut.	Av. fut.	HVFut	AMGI	UIBK	EURAC	UNCEM	ifuplan	CEMAGREF
Environment	EN-1	Soil sealing by construction of infrastructure							3,0	4,0	3,5	3,0	4,0	4,0
	EN-1	Loss of fertile soils of Alpine valleys by construction of infrastructure							4,0	4,0	2,8	3,0	3,0	4,0
	EN-1	Fragmentation of natural biotopes by construction of infrastructure							3,0	5,0	3,3	3,0	4,0	4,0
	EN-1	Loss of typical natural biotopes by construction of infrastructure							3,0	4,0	3,0	3,0	4,0	2,0
	EN-2	Loss of species adapted to extensive non-fragmented areas							2,0	3,0	2,0	3,0	4,0	-
	EN-2	Impairment of the fauna by noise							3,0	3,0	3,5	4,0	-	5,0
	EN-3	Pollution of soil nearby the streets (e.g. by safety salt, mineral oils)							3,0	4,0	4,7	4,0	4,0	4,0
	EN-3	Emission of transport specific air pollutants (eutrophying, acidifying and toxic substances)							3,0	5,0	4,3	3,0	4,0	5,0
	EN-3	Immission of transport specific air pollutants (eutrophying, acidifying and toxic substances)							3,0	3,0	4,0	3,0	-	5,0
	EN-3	Air pollution in steep-sided valleys on transit routes	81	3,13	3,5	81	3,39	4	2,0	5,0	3,8	4,0	-	4,0
	EN-4	Loss of retention area and flooding area for rivers by traffic infrastructure							4,0	4,0	1,7	4,0	4,0	3,0
	EN-5	Emission of noise							4,0	5,0	4,3	4,0	4,0	5,0
	EN-6	Impairment of human health by air pollution							3,0	4,0	3,8	2,0	4,0	5,0
	EN-6	Impairment of human health by noise							3,0	5,0	4,0	3,0	4,0	5,0
	EN-7	Damages of Alpine scenery due to traffic infrastructure							4,0	4,0	4,3	5,0	4,0	4,0

[4] In this context, originally a differentiation between supra-regional and inner-alpine transport was foreseen. With the working progress, the formulation of the main trend was focused on the impacts of a congested transport system. To integrate the formerly separated sub-trends, the results of the weighting were combined by considering the respective higher value.

Pillar	Dimen-sion	Phenomenon	Delphi survey						DIAMONT partners					
			App. pr.	Av. pr.	HVPr	App. fut.	Av. fut.	HVFut	AMGI	UIBK	EURAC	UNCE M	ifuplan	CEMA-GREF
		Decreasing negative effects of transport by the exten-sion of railway transport network	36	2,27	2,75	53	2,64	3,13	1,0	2,0	4,3	4,0	4,0	5,0
Econ-omy	EC-1	Increase of transport infrastructure, especially extension of the high-ranking road network							1,0	4,0	2,8	2,0	4,0	4,0
	EC-1	Modernisation of railway transport network (high speed connections)							2,0	4,0	3,0	2,0	3,0	4,0
	EC-1	High competition of infrastructural demands of transport with other space demands (in particular in regions of highly dynamic development)							4,0	4,0	2,0	1,0	-	3,0
	EC-1	Increasing competitiveness of public transport due to increasing energy costs							1,0	4,0	3,3	1,0	1,0	1,0
	EC-1	Economic prosperity in the vicinity of supra-regional transit corridors (activity and prosperity)							3,0	5,0	3,3	2,0	4,0	3,0
	EC-1	Change in the structure of freight transport towards smaller loads of more valuable goods instead of trans-port of high loads							2,0	-	1,5	-	-	4,0
	EC-1	Strong economical linkages between businesses inside and outside the Alps							3,0	4,0	4,0	3,0	5,0	2,0
	EC-2	High costs for the implementation and maintanance of traffic infrastructure in the moutains							3,0	-	4,8	3,0	4,0	5,0
	EC-2	Concentration of infrastructural investments on the extension of the high-ranking transport net-work							3,0	4,0	3,3	1,0	4,0	4,0
	EC-2	Increasing petrol prices							2,0	5,0	3,8	1,0	-	1,0
	EC-2	Increasing taxes and fees for transport (for motor-cars and tolls)	38	2,21	3	60	2,93	3,13	2,0	5,0	3,5	1,0	-	5,0
	EC-2	User costs (prices) of public transport							3,0	-	3,7	3,0	-	3,0
	EC-2	Increase of private-public initiatives in transit traffic							2,0	3,0	2,3	3,0	-	4,0
	EC-3													
	EC-4	Increase of the level of motorisation							4,0	3,0	3,8	3,0	-	3,0
	EC-4	Increase of emissions of transport specific air pollutants							4,0	4,0	4,3	3,0	-	5,0
	EC-4	Increasing importance of traffic emissions in compari-son to other emissions of domestic fuels and industry							4,0	3,0	3,0	4,0	-	4,0
	EC-4	Increase of Alpine transit							4,0	5,0	4,0	3,0	5,0	5,0
	EC-4	Increase of cross border transit							4,0	5,0	3,5	2,0	4,0	5,0

Pillar	Dimen-sion	Phenomenon	Delphi survey						DIAMONT partners					
			App. pr.	Av. pr.	HVPr	App. fut.	Av. fut.	HVFut	AMGI	UIBK	EURAC	UNCEM	ifuplan	CEMA-GREF
	EC-4	Increase of freight transport (road and railways)							4,0	5,0	4,0	2,0	4,0	5,0
	EC-4	Increasing transport of semi-finished products							3,0	-	4,0	-	4,0	4,0
	EC-4	Increase of individual traffic (kilometres and covered distances per person)							5,0	3,0	4,0	4,0	4,0	4,0
	EC-4	Change of modal split in favour of railway transport (due to extension of railway high speed net-work)							1,0	4,0	2,5	2,0	1,0	5,0
	EC-4	Changes of modal split of travel to work displacements in favour of public transport	23	2,14	2,5	49	2,64	3,11	1,0	1,0	3,0	-	3,0	5,0
	EC-4	Strong concentration of traffic on a few high-ranked corridors							4,0	5,0	4,0	4,0	-	4,0
	EC-4	Disturbance of inner-Alpine traffic by intensive use of transport network for transalpine traffic							2,0	5,0	2,0	3,0	1,0	4,0
	EC-5	Progresses in the development of new automotive tech-nologies (e.g. reduction of emissions)	34	2,3	2,86	64	2,84	3,29	2,0	4,0	2,8	3,0	-	3,0
	EC-5	Progress in the development of technical possibilities for achieving optimal traffic management							2,0	3,0	3,0	3,0	4,0	3,0
	EC-5	Development of alternatives to individual car transport (train + bike, car sharing, regional transport cards, etc.)	34	2,22	3	64	2,81	3,33	1,0	4,0	3,5	4,0	3,0	4,0
	EC-5	High influence of e-commerce on freight transport and of IT-communication technology on personal displace-ments	15	1,75	2,33	45	2,47	3,33	1,0	3,0	3,8	1,0	2,0	4,0
Society / Culture	SC-1	Concentration of population in the vicinity of supra-regional transit corridors							4,0	3,0	3,5	4,0	-	4,0
	SC-1	Concentration of population in settlements served by public transport							2,0	2,0	3,3	4,0	1,0	5,0
	SC-2	Increasing social differences in mobility							3,0	2,0	3,7	2,0	2,0	3,0
	SC-3													
	SC-4	High dependence of private and public provision on infrastructural facilities							3,0	4,0	4,0	3,0	-	2,0
	SC-4	Attractiveness (frequency, comfort and prices) of public traffic							1,0	4,0	4,5	3,0	4,0	4,0
	SC-4	Good public and private service provision in the vicinity of supra-regional transit corridors							2,0	4,0	3,5	-	4,0	3,0
	SC-4	Traffic accidents							1,0	3,0	1,5	3,0	-	1,0

Pillar	Dimension	Phenomenon	Delphi survey						DIAMONT partners					
			App. pr.	Av. pr.	HVPr	App. fut.	Av. fut.	HVFut	AMGI	UIBK	EURAC	UCEM	ifuplan	CEMA-GREF
	SC-5	Opposition of the political and ecological sectors to infrastructure development							2,0	5,0	4,0	2,0	4,0	4,0
	SC-5	High individualisation of society and importance of personal freedom expressed by unlimited mobility							4,0	4,0	3,8	2,0	4,0	3,0
	SC-6	Mixing of different cultural backgrounds due to high personal mobility							4,0	5,0	3,8	4,0	-	1,0
		Additional phenomena												
Environment	not yet assigned	Efforts to limit traffic flows in sensitive areas	47	2,54	3,17	74	3,14	3,33						
Economy	EC-4	Change of modal split in favour of railway transport of persons (due to extension of railway high speed network)												
	EC-4	Change of modal split in favour of railway freight transport (due to extension of railway high speed net-work)												
	EC-5	Adaptions in vehicles to reduce GHG-emissions	34	2,3	2,86	64	2,84	3,29						
	EC-5	Development of transport saving options meeting current needs (e-commerce, IT)	15	1,75	2,33	45	2,47	3,33						
	EC-5	High influence of IT-communication technology on personal displacements												
	EC-5	Increase in transport of hazrdous substances												
	EC-5	Increasing importance of local acceptance of transport projects												

2.5 Weighting results: Innovation and competitiveness – modernisation of agriculture in favoured areas

Pillar	Dimension	Phenomenon	Delphi survey						DIAMONT partners					
			App. pr.	Av. pr.	HVPr	App. fut.	Av. fut.	HVFut	AMGI	UIBK	EURAC	UCEM	ifuplan	CEMA-GREF
Environment	EN-1	Soil sealing by construction of industrial plants and for agricultural businesses							3,0	-	3,3	4,0	2,0	3,0
	EN-1	Loss of typical natural biotopes of Alpine valleys							5,0	4,0	4,0	2,0	2,0	4,0
	EN-1	Loss of characteristic small-sized landscape elements							5,0	-	4,0	3,0	4,0	4,0

Pillar	Dimension	Phenomenon	Delphi survey						DIAMONT partners					
			App. pr.	Av. pr.	HVPr	App. fut.	Av. fut.	HVFut	AMGI	UIBK	EURAC	UCEM	ifuplan	CEMA-GREF
	EN-1	Loss of soils and soil functions as a onsequence of land melioration in the Alpine valleys							4,0	3,0	4,0	2,0	3,0	-
	EN-1	Physical degradation of soil by use of heavy machinery							4,0	3,0	3,7	3,0	2,0	3,0
	EN-1	Physical degradation of soil by intensive pasturing							1,0	3,0	3,3	3,0	3,0	2,0
	EN-1	Loss of structural diversity due to the abandonment of traditional landscape management methods and intensification processes							5,0	5,0	4,0	4,0	4,0	4,0
	EN-2	Loss of species biodiversity due to the abandonment of traditional landscape management methods and intensification processes							4,0	4,0	4,0	3,0	4,0	4,0
	EN-2	Loss of diversity of rare breeds and seeds							3,0	4,0	4,5	3,0	4,0	4,0
	EN-3	Emission of air pollutants by intensive agriculture (livestock farming and machine-use) (Achtung:Schraffur war falsch!)							3,0	2,0	2,7	-	2,0	3,0
	EN-3	Immission of air pollutants (eutrophying, acidifying and toxic substances)							3,0	3,0	3,5	-	-	4,0
	EN-3	Soil pollution due to high part of specialized and very intensive cultures with high input of fertilizers and pesticides							4,0	3,0	4,0	2,0	4,0	4,0
	EN-3	Water pollution due to high part of specialized and very intensive cultures with high input of fertilizers and pesticides							4,0	3,0	3,7	4,0	4,0	4,0
	EN-4	Change of local water regime due to irrigation or change of traditional irrigation systems							2,0	3,0	4,0	3,0	1,0	3,0
	EN-7	Loss of landscape aesthetics by agricultural intensification							3,0	4,0	3,0	2,0	4,0	3,0
Economy	EC-1	High pressure of competition of Alpine agricultural production with non-Alpine agricultural production							3,0	4,0	3,5	3,0	4,0	4,0
	EC-1	High economic expectations to this type of agriculture (due to higher costs for transport and higher competitiveness of land use with non-agricultural e.g. urban uses)							4,0	2,0	3,5	1,0	-	-
	EC-1	High level of specialisation of entrepreneurs, specialisation on highly profitable agricultural production (e.g. fruits and wine)							3,0	4,0	3,8	4,0	1,0	3,0

Pillar	Dimen-sion	Phenomenon	Delphi survey						DIAMONT partners					
			App. pr.	Av. pr.	HVPr	App. fut.	Av. fut.	HVFut	AMGI	UIBK	EURAC	UCEM	ifuplan	CEMA-GREF
	EC-1	Production of niche products (e.g. delayed maturation of fruits)							2,0	4,0	3,3	4,0	1,0	5,0
	EC-1	High contribution of the agricultural sector to the local or regional GDP							2,0	3,0	3,3	4,0	2,0	2,0
	EC-1	Increasing importance of little and more flexible busi-nesses							3,0	2,0	3,0	4,0	4,0	2,0
	EC-1	Concentration of businesses alongside the transit corri-dors and important inner-Alpine traffic routes							4,0	2,0	2,8	3,0	2,0	2,0
	EC-1	Competition between municipalities to attract new firms, businesses	49	2,63	3,06	53	2,83	3,57	2,0	2,0	1,3	4,0	4,0	1,0
	EC-2	High influence of high capitalised large scale entrepre-neurs (partly situated outside the Alps, but with branches within in the Alps)							2,0	2,0	2,3	3,0	1,0	1,0
	EC-2	High dependence of agriculture by refunds							4,0	3,0	4,0	3,0	4,0	5,0
	EC-3	Loss of agricultural workplaces due to mechanisation and industrialisation (1st sector)							2,0	4,0	3,0	-	1,0	2,0
	EC-3	Spatial concentration of jobs in the 2nd sector							2,0	-	3,0	-	-	1,0
	EC-3	Creation of new workplaces by food processing indus-tries							1,0	-	2,8	2,0	2,0	3,0
	EC-4	Regional economy becoming more and more inde-pendent of regional demand							2,0	3,0	3,8	3,0	3,0	3,0
	EC-4	High need of energy and water by industrialized agricul-ture							3,0	4,0	3,8	3,0	1,0	3,0
	EC-4	Improvement of agricultural production conditions in valleys and basins due to warming in consequence of climate change							2,0	4,0	2,7	2,0	-	2,0
	EC-5	High spatial concentration of agricultural businesses in naturally / climatically favoured areas							4,0	5,0	3,5	2,0	2,0	2,0
	EC-5	Technical improvements for more efficient consumption of resources (energy, water, raw material)							3,0	3,0	3,5	2,0	-	4,0
	EC-5	Obstruction of innovation due to the strong orientation on traditional occupations							3,0	3,0	3,3	3,0	3,0	1,0
	EC-5	Innovative potential in agriculture due to combination of traditional and modern forms of production	32	2,18	2,43	51	2,5	3,29	2,0	3,0	2,5	-	2,0	1,0

Pillar	Dimension	Phenomenon	Delphi survey						DIAMONT partners					
			App. pr.	Av. pr.	HVPr	App. fut.	Av. fut.	HVFut	AMGI	UIBK	EURAC	UCEM	ifuplan	CEMA-GREF
	EC-5	Concentration of high innovative activities in already favoured areas and only in micro-territories	49	2,58	3,25	74	3,02	3,57	4,0	4,0	3,3	-	1,0	3,0
	EC-5	Use of GMO (genetically modified organism)							1,0	3,0	2,0	3,0	1,0	2,0
	EC-5	Development of environment friendly agriculture techniques (organic farming, etc.)							2,0	4,0	3,8	-	3,0	5,0
	EC-5	Development of controlled labels, certifications or "designation of origin" with systematic control of quality							3,0	5,0	4,5	4,0	4,0	5,0
Society / Culture	SC-2	Concentration of the non-Alpine population in innovative and well paid jobs							2,0	3,0	2,0	2,0	-	1,0
Society / Culture	SC-5	Loss of entrepreneurial participation of the Alpine producers and service providers, transfer of decision competences to extra-Alpine companies	11	1,94	2,5	19	1,97	2,6	2,0	2,0	2,0	2,0	1,0	1,0
Society / Culture	SC-6	Loss of traditional land use practices in valley bottoms and basins							4,0	4,0	4,3	2,0	4,0	3,0
		Additional phenomena												
Environment	not yet discussed	Industrial hazards persistence												1,0
Economy	not yet assigned	New opportunities to develop niche activities	49	2,54	2,88	70	2,98	3,5	3,0	-	-	-	-	5,0
	not yet discussed	Role of SME							-	-	-	-	-	-
	EC-4	Stronger integration of agriculture in food processing industries	32	2,28	2,57	50	2,51	2,83						
	not yet assigned	Involvement of local governments in economic development projects	43	2,43	2,75	70	3,02	3,57						
Society / Culture	not yet discussed	Social awareness of industrial hazards												1,0

2.6 Weighting results: Innovation and competitiveness – increasing importance of innovative technologies

Pillar	Dimen-sion	Phenomenon	Delphi survey						Diamont partners					
			App. pr.	Av. pr.	HVPr	App. fut.	Av. fut.	HVFut	AMGI	UIBK	EURAC	UNCEM	ifuplan	CEMA-GREF
Envi-ronment	EN-1	Soil sealing by construction of industrial plants and for agricultural businesses							2,0	3,0	3,5	2,0	3,0	4,0
	EN-1	Loss of typical natural biotopes of Alpine valleys							2,0	3,0	3,3	4,0	-	1,0
	EN-3	Industrial emissions of air pollutants							4,0	3,0	3,8	4,0	3,0	4,0
	EN-3	Decrease of emissions by industries due to the closing down of 'dirty' industries	38	2,24	2,75	34	2,05	2,57	3,0	4,0	3,0	3,0	2,0	4,0
	EN-3	Immission of air pollutants (eutrophying, acidifying and toxic substances)							3,0	2,0	4,3	-	-	4,0
	EN-3	Immission of industrial water (heavy metals residues)							4,0	2,0	3,3	3,0	1,0	4,0
	EN-6	Impairment of human health by industrial air pollution							4,0	2,0	3,3	3,0	1,0	4,0
	EN-5	Industrial emissions of noise							3,0	2,0	1,8	3,0	1,0	3,0
	EN-7	Loss of landscape aesthetics by extensive industrial plants							3,0	4,0	3,3	2,0	2,0	4,0
Econ-omy	EC-1	Increasing significance of competing locational features like social harmony, attractive landscape and less fluc-tuation seen as Alpine characteristics							3,0	2,0	2,0	-	3,0	2,0
	EC-1	Disappearance of the traditional Alpine industries (based on the nearly unlimited availability of water and energy)							5,0	4,0	3,5	3,0	1,0	3,0
	EC-1	Increasing part of "clean industries" and businesses (especially IT-enterprises)	38	2,28	2,75	62	2,67	3,29	3,0	3,0	2,5	3,0	-	5,0
	EC-1	High level of specialisation of entrepreneurs, specialisation on highly profitable agricultural production (e.g. fruits and wine)							3,0	-	3,3	3,0	4,0	3,0
	EC-1	Increasing importance of little and more flexible busi-nesses							3,0	4,0	3,7	2,0	4,0	4,0
	EC-1	Concentration of businesses alongside the transit corri-dors and important inner-Alpine traffic routes							4,0	4,0	3,8	4,0	2,0	4,0
	EC-1	Strengthening of the 3rd economic sector							4,0	4,0	4,0	3,0	3,0	2,0
	EC-1	Strengthening of the 4th economic sector							3,0	-	4,3	4,0	2,0	5,0

Pillar	Dimen-sion	Phenomenon	Delphi survey						Diamont partners					
			App. pr.	Av. pr.	HVPr	App. fut.	Av. fut.	HVFut	AMGI	UIBK	EURAC	UNCEM	ifuplan	CEMA-GREF
	EC-1	Concentration of the development of the 3rd and 4th economic sector in agglomerations and less in rural areas							4,0	4,0	3,0	2,0	3,0	5,0
	EC-1	Competition between municipalities to attract new firms, businesses	49	2,63	3,06	53	2,83	3,57	3,0	5,0	4,0	4,0	4,0	4,0
	EC-2	High influence of high capitalised large scale entrepre-neurs (partly situated outside the Alps, but with branches within in the Alps)							3,0	4,0	3,3	-	1,0	2,0
	EC-3	Spatial concentration of jobs in the 2nd sector							2,0	3,0	3,3	-	1,0	4,0
	EC-3	Wide spread of jobs in the 3rd an 4th economic sector							2,0	4,0	4,0	4,0	-	4,0
	EC-4	Regional economy becoming more and more inde-pendent of regional demand							2,0	4,0	3,8	4,0	3,0	3,0
	EC-5	Technical improvement of pollution control							3,0	4,0	4,0	4,0	2,0	4,0
	EC-5	Technical improvements for more efficient consumption of resources (energy, water, raw material)							3,0	3,0	3,8	3,0	-	4,0
	EC-5	Obstruction of innovation due to the strong orientation on traditional occupations							2,0	3,0	2,0	2,0	3,0	1,0
	EC-5	Concentration of high innovative activities in already favoured areas and only in micro-territories	49	2,58	3,25	74	3,02	3,57	4,0	3,0	3,5	-	-	5,0
	EC-5	Increasing importance of telecommunication for the establishment of enterprises and the creation of new, innovative jobs							4,0	4,0	4,3	3,0	3,0	2,0
	EC-5	Development of controlled labels, certifications or "des-ignation of origin" with systematic control of quality							3,0	3,0	3,5	2,0	1,0	2,0
Society / Culture	SC-2	Concentration of the non-Alpine population in innovative and well paid jobs							2,0	4,0	2,5	4,0	-	1,0
	SC-4	Decreasing public and private service provision in areas in industrial crisis							3,0	3,0	3,5	3,0	-	5,0
	SC-5	Loss of entrepreneurial participation of the Alpine pro-ducers and service providers, transfer of decision com-petences to extra-Alpine companies	11	1,94	2,5	19	1,97	2,6	3,0	3,0	3,0	4,0	3,0	1,0
		Additional phenomena												
Envi-	not yet	Industrial hazards persistence												5,0

Pillar	Dimen-sion	Phenomenon	Delphi survey						Diamont partners					
			App. pr.	Av. pr.	HVPr	App. fut.	Av. fut.	HVFut	AMGI	UIBK	EURAC	UNCE M	ifuplan	CEMA-GREF
ronment	discussed													
Econ-omy	not yet assigned	New opportunities to develop niche activities	49	2,54	2,88	70	2,98	3,5	-	-	-	-	-	5,0
	not yet discussed	Role of SME							-	-	-	-	-	4,0
	not yet assigned	Growing importance of external (extra-alpine) invest-ments in developing new activities	40	2,42	3,75	60	2,72	3,75						
	not yet assigned	Spreading effects from main innovation poles	40	2,51	3	57	2,82	3,2						
	not yet assigned	Increase in support to SME's and assistance to local enterprises	43	2,49	2,75	51	2,6	3						
	not yet assigned	Involvement of local governments in economic devel-opment projects	43	2,43	2,75	70	3,02	3,57						
		Creation of technopoles												
Society / Culture	not yet discussed	Social awareness of industrial hazards												5,0

2.7 Weighting results: Tourism: Towards the Alpine Experience

Pillar	Dimen-sion	Phenomenon	Delphi survey						DIAMONT partners					
			App. pr.	Av. pr.	HVPr	App. fut.	Av. fut.	HVFut	AMGI	UIBK	EURAC	UNCE M	ifuplan	CEMA-GREF
Envi-ronment	EN-1	Soil sealing in areas with high touristy intensity							2,0	5,0	3,8	3,0	3,0	4,0
	EN-1	Fragmentation and loss of natural biotopes by touristy installations and touristy traffic							3,0	4,0	3,0	4,0	3,0	4,0
	EN-1	Loss of wild areas due to an extension of winter sport facilities in higher altitudes							2,0	4,0	2,5	4,0	2,0	5,0
	EN-1	Risk of soil damages (erosion and landslides) by the preparation of land in sensible areas							3,0	4,0	4,3	2,0	-	3,0

Pillar	Dimen-sion	Phenomenon	Delphi survey						DIAMONT partners					
			App. pr.	Av. pr.	HVPr	App. fut.	Av. fut.	HVFut	AMGI	UIBK	EURAC	UNCEM	ifuplan	CEMA-GREF
	EN-1	Positive environmental effects of the concentration of tourism due to the abandonment of areas unfavourable for further touristy development	24	2,03	3	44	2,44	3	1,0	3,0	2,7	2,0	3,0	4,0
	EN-1	Deterioration of the natural structure of soil by trampling							3,0	2,0	2,3	2,0	2,0	4,0
	EN-2	Loss of species adapted to extensive non-fragmented areas							2,0	4,0	2,0	4,0	3,0	-
	EN-2	Impairment of species in wild and undisturbed areas (especially in higher altitudes							2,0	4,0	3,8	4,0	3,0	4,0
	EN-2	Impairment of species by touristy activities (e.g. due to cross country skiing)							2,0	3,0	3,8	3,0	3,0	2,0
	EN-2	Vegetation damages by trampling							3,0	2,0	2,3	2,0	2,0	3,0
	EN-3	Emissions of air pollutants by touristy infrastructures (transport, heating)							2,0	3,0	4,0	4,0	3,0	2,0
	EN-3	Pollution of air in intensively used tourism areas							3,0	3,0	4,0	3,0	3,0	3,0
	EN-3	Pollution of water in intensively used tourism areas (e.g. due to insufficient waste water treatment)							4,0	3,0	2,7	3,0	1,0	5,0
	EN-3	Pollution of soil in intensively used tourism areas (e.g. as consequence of the preparing of pistes)							2,0	3,0	3,5	2,0	2,0	3,0
	EN-4	Change of water regime due to excessive exploitation of drinking water in the vicinity of touristy agglomera-tions	36	2,28	3	51	2,63	3,69	3,0	4,0	4,0	3,0	2,0	5,0
	EN-5	Emissions of noise by touristy infrastructures (e.g. transport, snowmaking machines) and events							3,0	3,0	3,8	2,0	2,0	2,0
	EN-6	Impairment of human health by noise							2,0	3,0	2,0	2,0	3,0	2,0
	EN-7	Loss of landscape aesthetics by touristy installations							4,0	4,0	3,3	1,0	4,0	5,0
	not yet assigned	Efforts to contain over-frequentation of high value tour-ism sites	34	2,26	2,83	60	2,88	3,29						
Economy	EC-1	Change of customer habits and demands (e.g. trend towards short but frequent holidays, "all inclusive- of-fers", short-term-reservation)							4,0	3,0	4,3	2,0	4,0	5,0
	EC-1	Increasing demand of "well-fit"-holidays due to demo-graphic change							3,0	3,0	3,8	3,0	4,0	4,0
	EC-1	Demand of cultural tourism (in particular in attractive towns)							3,0	4,0	3,0	2,0	3,0	5,0

Pillar	Dimen-sion	Phenomenon	Delphi survey						DIAMONT partners					
			App. pr.	Av. pr.	HVPr	App. fut.	Av. fut.	HVFut	AMGI	UIBK	EURAC	UNCEM	ifuplan	CEMA-GREF
	EC-1	Increasing demand of agro-tourism							4,0	4,0	4,0	2,0	5,0	4,0
	EC-1	Rapid change of trends and diversification of leisure activities							3,0	5,0	3,3	1,0	4,0	5,0
	EC-1	Decrease in number of arrivals from distant areas	11	1,71	2	21	1,83	2,2	3,0	1,0	2,3	-	-	5,0
	EC-1	Spatial concentration of touristy infrastructure and villages economically dependent on tourism							4,0	4,0	4,0	4,0	-	4,0
	EC-1	Growth of main tourist areas at higher altitudes							2,0	4,0	2,7	3,0	1,0	4,0
	EC-1	Diversification of touristy offers in intensively used tourism centres							2,0	5,0	4,0	1,0	4,0	4,0
	EC-1	Expansion of areas used for settlements and infrastructure in touristy areas disproportionate to population growth							2,0	4,0	4,5	4,0	-	5,0
	EC-1	New accommodation capacities created by local residents	30	2,14	2,75	36	3	1,55	4,0	2,0	3,3	4,0	2,0	4,0
	EC-1	High dependence of the whole tourism sector on the general economic development							3,0	3,0	3,8	3,0	3,0	4,0
	EC-1	Decrease of local tourism enterprises, increase of external investors							3,0	2,0	2,3	-	-	5,0
	EC-1	Great international competition (e.g. high competition of Alpine winter tourism to all year overseas tourism destinations)							3,0	2,0	3,8	1,0	4,0	4,0
	EC-1	Higher competitiveness of international and other national destinations with summer tourism, but not with winter tourism							4,0	4,0	4,0	-	-	4,0
	EC-1	High competition between tourist destinations (advantages of destinations offering up-to-date-facilities and at high sea level)							4,0	4,0	3,8	2,0	-	3,0
	EC-1	High economic pressure on the mid-price lodging segment							3,0	3,0	4,3	-	-	3,0
	EC-2	High economic pressure on touristy enterprises (high investment necessities, reduction of time available to amortize the investments) and increasing rate of indebtedness of touristy enterprises							4,0	3,0	4,0	4,0	-	3,0

Pillar	Dimen-sion	Phenomenon	Delphi survey						DIAMONT partners					
			App. pr.	Av. pr.	HVPr	App. fut.	Av. fut.	HVFut	AMGI	UIBK	EURAC	UNCEM	ifuplan	CEMA-GREF
	EC-2	Increasing risk of investment in winter tourism infra-structure due to climate change effects (possible time for amortization is decreasing)							4,0	4,0	3,3	4,0	4,0	3,0
	EC-2	High cost of living for the local community (amongst others real estate speculation as consequence of high touristy demand of land)							3,0	5,0	4,8	3,0	3,0	5,0
	EC-2	Big economic power in intensively used touristy areas, better possibilities for financing environmental protec-tion measures	28	2,02	2,25	62	2,64	3,29	3,0	1,0	3,0	3,0	-	4,0
	EC-2	Outflow of capital out of tourism areas due to domi-nance of extra-alpine companies (global hotel chains)							3,0	1,0	2,3	-	3,0	3,0
	EC-2	Concentration of agricultural subsidies on rural areas with great importance for tourism	21	1,88	2,17	30	2,15	2,71	2,0	2,0	2,0	3,0	2,0	5,0
	EC-3	Increase of job market especially in intensively devel-oped touristy areas							4,0	4,0	4,0	3,0	3,0	4,0
	EC-3	Concentration of jobs in the tertiary sector							4,0	5,0	4,0	3,0	4,0	1,0
	EC-3	High seasonality of workplaces in the tertiary sector							4,0	4,0	4,3	4,0	4,0	1,0
	EC-3	Great part of seasonal jobs							3,0	3,0	4,5	4,0	-	1,0
	EC-3	Changes in origin of seasonal workers	23	1,99	2,71	41	2,41	3	2,0	5,0	4,3	3,0	-	4,0
	EC-4	High consumption of water resources (by tourists and snowmaking machines)							4,0	5,0	4,8	3,0	3,0	5,0
	EC-4	High consumption of energy (by tourist installations and transport)							4,0	4,0	5,0	4,0	3,0	4,0
	EC-4	Disproportionately high waste accumulation							4,0	4,0	4,5	2,0	3,0	3,0
	EC-4	Increase of leisure traffic							5,0	4,0	4,8	4,0	-	5,0
	EC-4	Development of inter-dependences between local or regional producers e.g. of agricultural products and touristy consumers							3,0	3,0	3,0	3,0	-	2,0
	EC-5	Lack of innovative formula proposed by the operators to meet fast changing tourism demands	55	2,67	3,75	89	3,3	3,75	4,0	1,0	1,3	2,0	4,0	5,0
Society / Culture	SC-1	Seasonal change of population							2,0	3,0	3,8	2,0	4,0	1,0
	SC-2	Social tensions due to low benefits of tourism for local residents							2,0	3,0	2,5	3,0	1,0	4,0

Pillar	Dimen-sion	Phenomenon	Delphi survey						DIAMONT partners					
			App. pr.	Av. pr.	HVPr	App. fut.	Av. fut.	HVFut	AMGI	UIBK	EURAC	UNCEM	ifuplan	CEMA-GREF
	SC-3	High importance of tourism (especially agro-tourism and cultural tourism) as an additional source of local income	38	2,44	2,88	57	2,8	3,43	3,0	4,0	3,8	4,0	4,0	5,0
	SC-3	High workload for farmers working in agro-tourism							3,0	4,0	3,8	1,0	3,0	4,0
	SC-3	Increasing importance of leisure activities for social wellbeing and recognition							4,0	4,0	3,8	2,0	-	1,0
	SC-4	Good provision of public and private services also in smaller villages (in the neighbourhood of touristy centres)							4,0	5,0	3,8	4,0	3,0	3,0
	SC-4	Awareness of benefit from ample forest cover for natural hazards prevention	55	2,59	3	72	3,09	3,43	3,0	4,0	4,3	3,0	3,0	4,0
	SC-4	Strong seasonality affecting the quality of public and private services							3,0	4,0	4,0	2,0	3,0	3,0
	SC-5	Low influence of local residents on municipal development due to great influence of foreign capital							3,0	2,0	2,8	2,0	2,0	4,0
	SC-6	Enforcement of local culture and traditions due to increased awareness of their value in tourist areas	27	2,2	3,67	49	2,64	3,67	3,0	4,0	3,0	3,0	3,0	4,0
	SC-6	Improvement of the preconditions for preserving cultural identity by a higher level of living							4,0	2,0	3,0	4,0	-	3,0
	SC-6	Development of cultural clichés in over-intensively used tourism areas							3,0	4,0	2,0	2,0	-	4,0
		Additional phenomena												
Environment	EN-1	Deterioration of the natural structure of soil in skiing areas												
	EN-2	Vegetation damages in skiing areas												
Economy	EC-1	increasing mobility of tourists (i.g. mobile-home tourists from Italy, France and Germany)								x				
	EC-1	Demand for wellness: relative decrease of the classical demands.								x				
	EC-3	Increase of job market especially in intensively developed touristy areas for locals for locals												
	EC-3	Increase of job market especially in intensively developed touristy areas for employees from outside												
	EC-5	IT booking for tourism services												

Pillar	Dimen-sion	Phenomenon	Delphi survey						DIAMONT partners					
			App. pr.	Av. pr.	HVPr	App. fut.	Av. fut.	HVFut	AMGI	UIBK	EURAC	UNCEM	ifuplan	CEMA-GREF
	EC-5	Development of non privative accommodation formula (leisure centres…)												

2.8 Weighting results: Impacts of climate change

Pillar	Dimen-sion	Phenomenon	Delphi survey						DIAMONT partners					
			App. pr.	Av. pr.	HVPr	App. fut.	Av. fut.	HVFut	AMGI	UIBK	EURAC	UN-CEM	ifuplan	CEMA-GREF
Envi-ronment		Impairment of protected areas in higher elevations due to higher pressure of winter tourism	51	2,7	4	74	3,23	4	3,0	4,0	3,3	3,0	2,0	4,0
	EN-1	Loss of biotopes and habitats in summit areas							2,0	1,0	2,5	4,0	3,0	5,0
	EN-1	Higher proportion of uncovered rocky slopes and loose material in consequence of melting glaciers and perma-frost soils							2,0	4,0	3,0	3,0	1,0	3,0
	EN-2	Changing species diversity due to migration (especially in summit areas) and replacement of mountain / Alpine species by more competitive species	28	2,21	2,5	60	2,8	3,29	2,0	5,0	2,5	3,0	3,0	5,0
	EN-2	Change of species compositions and structure of forests	28	2,21	2,5	65	2,83	3,36	3,0	4,0	2,0	3,0	3,0	3,0
	EN-2	High vegetation damages due to pest calamities, storms and snowloads	23	2,21	2,83	55	2,86	3,5	3,0	4,0	2,5	2,0	-	3,0
	EN-2	High vegetation damages due to the spread of more competitive but less resistant species in Alpine ecosys-tems							3,0	2,0	1,0	-	3,0	3,0
	EN-3	Emissions of GHG (transport, energy, industry, agricul-ture, waste management)							3,0	5,0	3,3	2,0	4,0	4,0
	EN-3	High emissions of chemical substances due to intensive preparation of pistes							2,0	3,0	2,5	-	2,0	2,0
	EN-4	Rise in annual number of extreme weather events: floods							3,0	5,0	3,0	3,0	3,0	4,0
	EN-4	Rise in annual number of extreme weather events: land-slides, mudflows							3,0	5,0	4,0	2,0	2,0	4,0

Pillar	Dimen-sion	Phenomenon	Delphi survey						DIAMONT partners					
			App. pr.	Av. pr.	HVPr	App. fut.	Av. fut.	HVFut	AMGI	UIBK	EURAC	UN-CEM	ifuplan	CEMA-GREF
	EN-4	Change of precipitation regime, e.g. more intensive rain-fall in winter time							2,0	4,0	2,5	3,0	-	4,0
	EN-4	Decrease in extent and duration of snow cover							2,0	5,0	3,3	1,0	-	5,0
	EN-4	Increasing amounts of melting water							2,0	2,0	2,0	1,0	-	4,0
	EN-4	Shrinking and disappearing of glaciers and decline of permafrost soils							2,0	5,0	3,8	3,0	1,0	5,0
	EN-4	Change of water discharge regime to a more balanced water discharge (especially in catchments covered largely by glaciers after a temporary increase of water discharge)							2,0	1,0	2,0	3,0	1,0	5,0
	EN-5	Rise in annual number of extreme weather events: storms							3,0	5,0	4,0	2,0	3,0	5,0
	EN-5	Change of temperature regime							1,0	5,0	3,0	3,0	-	5,0
	EN-5	Change in length of growing season							1,0	4,0	3,0	3,0	-	3,0
	EN-6													
	EN-7	Loss of landscape aesthetics							3,0	1,0	3,0	1,0	1,0	2,0
Economy	EC-1	Low numbers of ski areas offering summer activity							3,0	-	3,3	2,0	1,0	4,0
	EC-1	High efforts for preparing pistes in summer							-	4,0	3,0	2,0	1,0	4,0
	EC-1	Increase of artificial snowing							4,0	5,0	4,5	2,0	2,0	4,0
	EC-1	Economic crisis of skiing areas / ski resorts due to shorter winter seasons	47	2,53	3,75	66	3,15	3,83	3,0	4,0	3,3	2,0	3,0	4,0
	EC-1	Loss of stability of infrastructures (ski-lifts, landslide protection measures) fixed in the soil							3,0	2,0	1,5	2,0	2,0	3,0
	EC-1	Development of settlements and infrastructures in areas exposed to threats of natural hazards	38	2,52	3,75	81	3,3	3,75	3,0	4,0	1,5	3,0	3,0	4,0
	EC-2	Losses from weather and climate related events (due to increasing hazardous events combined with an inade-quate urban planning)							3,0	5,0	2,5	3,0	3,0	4,0
	EC-2	Increase of management costs due to the impacts of climate change (beetle infestations, damages by storms, snow loads, etc.)	36	2,42	2,67	54	2,97	3,17	4,0	4,0	2,5	3,0	3,0	3,0
	EC-3	Loss of jobs in the tourism sector (especially for winter tourism)							2,0	4,0	2,0	2,0	3,0	3,0

Pillar	Dimen-sion	Phenomenon	Delphi survey						DIAMONT partners					
			App. pr.	Av. pr.	HVPr	App. fut.	Av. fut.	HVFut	AMGI	UIBK	EURAC	UN-CEM	ifuplan	CEMA-GREF
	EC-4	Higher yield of intensively used agricultural areas due to higher temperature and increased concentration of carbon dioxide in the atmosphere							-	4,0	2,7	2,0	3,0	3,0
	EC-4	Difficulties in water supply and energy use of water due to lack of water (shrinking glaciers, changing precipitation regime)	26	2,07	3	64	2,98	3,86	2,0	2,0	3,5	3,0	2,0	4,0
	EC-4	High consumption of water needed for preparing pistes							3,0	3,0	3,5	4,0	2,0	3,0
	EC-4	Threat of the agriculture in valleys due to polluted water coming from melting glaciers							2,0	2,0	1,5	4,0	1,0	2,0
	EC-5	Further development of energy saving options for transport or for housing	45	2,53	3,25	83	3,32	3,62	3,0	4,0	4,3	3,0	4,0	4,0
	EC-5	Higher investment in GHG-reducing technologies	45	2,52	2,86	79	3,16	3,29	3,0	4,0	4,7	3,0	4,0	4,0
Society / Culture	SC-1													
	SC-2	Social disparities between people living in hazardous, and those living in secure zones being safe from natural hazards							1,0	3,0	1,7	3,0	1,0	2,0
	SC-3													
	SC-4	High safety risks of natural hazards (landslides, mudflows and floods) due to uncovered rocky slopes and loose material	57	2,75	3,25	85	3,35	3,67	3,0	4,0	2,5	3,0	2,0	3,0
	SC-4	Awareness of benefit from ample forest cover for natural hazards prevention	55	2,59	3	72	3,09	3,43	3,0	4,0	4,3	3,0	3,0	4,0
	SC-5													
	SC-6													
		Additional phenomena												
	SC-6	Awareness of climate change effects												
	SC-6	Changes in attitudes towards GHG emission reducing options and constraints they lead to.												

2.9 Weighting results: Increasing generation of renewable energy[5]

Pillar	Dimension	Phenomenon	DIAMONT partners					
			AMGI	UIBK	EURAC	UN-CEM	ifuplan	CEMA-GREF
Environment	EN-1	Soil sealing by construction of energy plants	2,0	2,0	2,3	3,0	2,0	3,0
	EN-1	Loss of ecosystems of valleys and slopes due to backwater flooding for energy production	3,0	4,0	4,0	3,0	2,0	3,0
	EN-1	Change or loss of habitats for aquatic fauna and flora due to structural impact on rivers for the construction of energy plants	3,0	3,0	4,0	2,0	4,0	4,0
	EN-1	Loss of the passability of rivers for migrating animals due to structural impact on rivers for the construction of energy plants	3,0	3,0	3,5	3,0	4,0	3,0
	EN-1	Loss of habitats for aquatic fauna and flora due to low discharges caused by high water abstractions for energy production	3,0	3,0	4,0	3,0	4,0	4,0
	EN-1	Change of the structure of forests due to the increasing use of wood as biomass energy	1,0	2,0	2,3	2,0	3,0	3,0
	EN-1	Loss of ecosystems due to an expansion of (European) energy transmission infrastructure	2,0	2,0	2,0	2,0	3,0	3,0
	EN-2	Loss of aquatic species due to low discharges caused by high water abstractions for energy production	3,0	3,0	3,8	3,0	4,0	4,0
	EN-2	Changes in forest species composition due to the increasing use of wood as biomass energy	1,0	3,0	2,5	2,0	2,0	3,0
	EN-3	Emissions of air pollutants of energy plants based on fossil fuels	4,0	3,0	2,7	3,0	-	4,0
	EN-3	Emissions of air pollutants by end-users of energy	3,0	4,0	4,0	3,0	-	5,0
	EN-3	Immission of air pollutants (eutrophying, acidifying and toxic substances)	3,0	5,0	2,0	3,0	-	4,0
	EN-3	Emission of GHG	3,0	5,0	-	2,0	-	4,0
	EN-4	Impacts on Alpine water balance due to water transfers between catchments for hydro-energy production	2,0	4,0	4,7	4,0	2,0	3,0
	EN-4	Implementation of water quality management programmes	5,0	-	-	-	-	3,0
	EN-5	Change of climatic conditions in a local or regional scale in case of (extensive) backwater flooding	2,0	1,0	2,3	2,0	1,0	3,0
	EN-7	Damages of Alpine scenery due to wind energy installations	-	2,0	3,3	3,0	2,0	3,0
	EN-7	Damages of Alpine scenery due to an expansion of (European) energy transmission infrastructure	2,0	4,0	3,8	3,0	3,0	5,0
Economy	EC-1	High dependence of the Alpine energy sector from the European energy market and its liberalisation	3,0	4,0	3,0	4,0	-	5,0
	EC-1	Increasing demand of rapid available power (peak power) provided by hydropower stations partly due to increased share of technologies with fluctuating production	3,0	4,0	2,5	3,0	-	5,0

[5] The main trend „Increasing generation of renewable energy“ was not subject to the Delphi survey. Thus solely the results of the DIAMONT partners were considered.

Pillar	Dimen-sion	Phenomenon	DIAMONT partners					
			AMGI	UIBK	EURAC	UN-CEM	ifuplan	CEMA-GREF
	EC-1	High potential of (decentralised) uses of alternative energy sources	3,0	5,0	3,5	3,0	1,0	3,0
	EC-1	Increasing importance of regenerative energy	3,0	5,0	3,8	2,0	1,0	4,0
	EC-1	Increase in wood demand for the production of biomass energy	2,0	4,0	4,5	2,0	3,0	3,0
	EC-1	Great dependence of future silvicultural activities on the demand of biomass energy	4,0	3,0	4,5	2,0	3,0	3,0
	EC-1	Increasing importance of geothermal energy use	2,0	1,0	3,7	3,0	2,0	-
	EC-1	Increasing importance of wind energy use	3,0	2,0	3,8	2,0	2,0	3,0
	EC-1	Competitiveness of regenerative energies produced in the Alps	3,0	4,0	4,0	3,0	3,0	1,0
	EC-1	Decrease of economic importance of the energy sector (GDP)	2,0	2,0	1,0	2,0	-	1,0
	EC-1	Low economic importance of the production of renewable energy for the local and regional Alpine economy	4,0	2,0	1,7	2,0	-	4,0
	EC-1	Increasing economic importance of trading electricity	3,0	2,0	2,3	3,0	-	5,0
	EC-1	Increasing energy exportation from the Alps	4,0	3,0	2,0	2,0	-	3,0
	EC-1	Increasing importation of mainly cheap basic energy from outside the Alps	4,0	4,0	1,0	3,0	4,0	5,0
	EC-1	Importance of the energy production (biomass and solar energy) as additional income source for farmers	4,0	4,0	3,8	3,0	4,0	2,0
	EC-2	Prices for energy	4,0	4,0	4,0	3,0	-	4,0
	EC-2	Prices for fossil fuels	5,0	5,0	4,0	4,0	-	4,0
	EC-2	Financial incentives including tax privileges for supporting the production of renewable energy	5,0	4,0	4,5	2,0	5,0	4,0
	EC-2	Outflow of capital due to dominance of extra-Alpine companies in the energy sector	4,0	2,0	4,0	3,0	-	2,0
	EC-3	Decreasing importance of energy sector for the labour market	2,0	2,0	1,5	3,0	-	2,0
	EC-4	Difficulties for the production of hydroelectric energy due to changes of water balances as consequence of climate change	3,0	4,0	3,0	2,0	-	3,0
	EC-4	Consumption of energy	5,0	5,0	4,3	3,0	-	4,0
	EC-4	Disproportionately high consumption of energy (by tourist installations and transport)	3,0	4,0	4,0	-	-	4,0
	EC-4	New uses of the forests as an environment friendly resource (biomass, etc.)	3,0	4,0	4,3	3,0	3,0	4,0
	EC-5	Development of innovative projects for using renewable energy	5,0	4,0	4,5	3,0	4,0	4,0
	EC-5	Development of energy saving options for housing	5,0	4,0	4,8	3,0	5,0	4,0
Society / Culture	SC-5	Strong influence of local (and outside) energy corporations looking for high returns on local and regional decision making	3,0	2,0	3,0	-	3,0	2,0
	SC-6	Integration of power-saving building-standards in characteristic architecture	5,0	3,0	4,8	2,0	2,0	4,0

Annex 3: Characterisation of main trends by phenomena – full list

3.1 Main trend "Local centres and fringes between competition and co-operation"

Pillar of SD	Dimension	Phenomenon	Indicator development
Environment	Structure	Soil sealing in areas, where open spaces are already rare	Substituted by the phenomenon "Increasing land take for infrastructure and settlement"; indicator(s) to be discussed
Environment	Structure	Fragmentation of natural biotopes by construction	Indicator(s) to be discussed
Environment	Structure	Loss of green corridors and open space	cp. "Lack of recreational areas"; Indicator(s) to be discussed
Environment	Structure	Loss of typical natural biotopes of Alpine valleys due to high competition of nature protection and agriculture with urban uses	Indicator(s) to be discussed
Environment	Structure	Loss of fertile soils of Alpine valleys due to high competition of agriculture with urban uses	Substituted by the phenomenon "Increasing competition of land use"; indicator(s) to be discussed
Environment	Structure	Layouts regulating space consumption	To be discussed in WP9
Environment	Species	Loss of species adapted to extensive non-fragmented areas	Not evaluated as being of high importance by experts and DIAMONT partners; substituted by the phenomenon "Declining species diversity"
Environment	Species	Declining species diversity	Indicator(s) to be discussed
Environment	Matter exchange	High contribution of agglomerations to the entire air emissions	Due to data availability substituted by "Air pollution in agglomeration, especially in valleys and basins"
Environment	Matter exchange	Air pollution in agglomeration, especially in valleys and basins	Indicator(s) to be discussed
Environment	Matter exchange	Pollution of groundwater caused by insufficient technical infrastructures and increasing traffic	Phenomenon controversially weighted by the partners; effects cannot be interpreted in a close cause-relationship
Environment	Matter exchange	Pollution of rivers by insufficient waste water treatment	Indicator(s) to be discussed
Environment	Water exchange	Loss of water absorbing capacity by soil sealing	Indicator(s) to be discussed
Environment	Water exchange	Loss of retention area and flooding area for rivers by infrastructural development and soil sealing	Substituted by the phenomenon "Increasing competition of land use"; indicator(s) to be discussed
Environment	Water exchange	Excessive exploitation of drinking water in the vicinity of agglomerations	Substituted by the phenomenon "High dependency on water importation"; indicator(s) to be discussed
Environment	Human health	Impairment of human health by air pollution	Not evaluated as being of high importance by experts and DIAMONT partners, effects cannot be interpreted in a close cause-relationship
Environment	Human health	Impairment of human health by noise	Indicator(s) to be discussed
Environment	Human health	Low healthiness of urban lifestyle	Indicator(s) to be discussed

Pillar of SD	Dimension	Phenomenon	Indicator development
Environment	Human health	Increasing interest paid to wooded areas in densely populated valleys for citizens oxygenation	Substituted by the phenomenon “Insufficient possibilities of recreation within the municipality”
Environment	Aesthetics	Lack of recreational areas	Indicator(s) to be discussed
Environment	Aesthetics	Damages of Alpine scenery due to uncontrolled urban sprawl	Substituted by the phenomenon “Loss of landscape diversity”; indicator(s) to be discussed
Environment	not assigned	In the suburb loss of environmental quality as a former rural quality	too general for being indicated
Economy	Economic performance and infrastructure	Expansion of urban regions	Will be discussed in the context of the delimitation of the urbanisation zones
Economy	Economic performance and infrastructure	Growing together of city and suburb	Substituted by the phenomenon “Increasing land take for infrastructure and settlement”; also aspects dealt in “Strong functional interrelation between municipalities” indicator(s) to be discussed
Economy	Economic performance and infrastructure	Expansion of areas used for settlements (especially one-family houses) and infrastructure in suburban areas	Substituted by the phenomenon “Increasing land take for infrastructure”; indicator(s) to be discussed
Economy	Economic performance and infrastructure	Expansion of areas used for settlements and infrastructure in suburban areas disproportionate to population growth	Substituted by the phenomenon “Coupling of economic and population growth to space consumption”; indicator(s) to be discussed
Economy	Economic performance and infrastructure	Coalescence of traditional villages into suburban areas	Not any more linked strongly enough with the reformulated main trend
Economy	Economic performance and infrastructure	Usage of hazardous zones (like valleys slopes, flood expansion fields, etc.) for construction	Added to the phenomenon “Increasing competition of land use”; Indicator(s) to be discussed
Economy	Economic performance and infrastructure	Development of high tech business parks (industrial and commercial areas, also combining of shopping and leisure activities) in urban areas	Not any more linked strongly enough with the reformulated main trend
Economy	Economic performance and infrastructure	Abandonment of previous industrial and warehouse sites in inner cities	Not evaluated as being of high importance by experts and DIAMONT partners and not any more linked strongly enough with the reformulated main trend
Economy	Economic performance and infrastructure	Retreat of agriculture in urban and suburban areas	Substituted by the phenomenon “Increasing competition of land use”; indicator(s) to be discussed
Economy	Economic performance and infrastructure	Concentration of economic power and entrepreneurial oriented decisions in agglomerations	Substituted by the phenomenon “High importance of branches of an urban economy”, indicator(s) to be discussed
Economy	Public and private financing	Concentration of capital market oriented decisions in agglomerations	Not evaluated as being of high importance by experts and DIAMONT partners and not any more linked strongly enough with the reformulated main trend
Economy	Public and private financing	Budget imbalances between core cities and sub-urbs (core cities offer extensive services for the whole agglomeration)	Substituted by the phenomenon “Financial squeeze of the municipality”; indicator(s) to be discussed

Pillar of SD	Dimension	Phenomenon	Indicator development
Economy	Public and private financing	Loss of buying power and income taxes in core cities in favour of the suburban areas	Not evaluated as being of high importance by experts and DIAMONT partners and not any more linked strongly enough with the reformulated main trend
Economy	Public and private financing	High costs for construction due to increasing costs for safety and security standards	Not evaluated as being of high importance by experts and DIAMONT partners, partly discussed within the phenomenon “Increasing competition of landuse”
Economy	Public and private financing	High real estate prices due to high competitiveness of land use	Added to the phenomenon “Increasing competition of land use”; indicator(s) to be discussed
Economy	Labour	Concentration of jobs in agglomerations	Substituted by the phenomena “Strong labour market” and “Unemployment”; indicator(s) to be discussed
Economy	Labour	Concentration of jobs in the tertiary sector in agglomerations	Substituted by the phenomenon “High importance of branches of an urban economy”; indicator(s) to be discussed
Economy	Labour	Lower decline of persons employed in metropolitan areas in comparison to rural and other urban areas	Substituted by the phenomenon “Strong labour market”; indicator(s) to be discussed
Economy	Labour	Autonomisation of suburban labour market	Not evaluated as being of high importance by experts and DIAMONT partners and not any more linked strongly enough with the reformulated main trend
Economy	Labour	Low qualification of labour force	Indicator(s) to be discussed
Economy	Production and consumption	Intensive commuter connections between core cities and suburbs	Substituted by the phenomenon “Increasing land take for infrastructure and settlement”; also aspects dealt in “Strong functional interrelation between municipalities” indicator(s) to be discussed
Economy	Production and consumption	High quantity of waste accumulation	Substituted by the phenomenon “High waste generation”; Indicator(s) to be discussed
Economy	Production and consumption	High quantity of waste water accumulation	Not evaluated as being of high importance by experts and DIAMONT partners
Economy	Production and consumption	High dependency on water importation	Indicator(s) to be discussed
Economy	Innovation, technology and information	Generating technical and scientific innovations in metropolitans	Substituted by the phenomenon “Low importance of branches of a high added value and high innovative potentialities”; Indicator(s) to be discussed
Economy	Innovation, technology and information	Generating social and cultural innovations in metropolitans	Substituted by the phenomenon “High potential for social interactions”; Indicator(s) to be discussed
Economy	Innovation, technology and information	High density of communication infrastructure	Indicator(s) to be discussed
Society / Culture	Population	High part of the Alpine population living in towns	Substituted by the phenomenon “High attractiveness of town as place of residence”; Indicator(s) to be discussed
Society / Culture	Population	High density of population in urban areas	Added to the phenomena “High potential for social interactions”; Indicator(s) to be discussed

Pillar of SD	Dimension	Phenomenon	Indicator development
Society / Culture	Population	Immigration of extra-Alpine population due to high attractiveness of the Alpine agglomerations (e.g. due to their attractive landscape)	Substituted by the phenomenon “High attractiveness of town as place of residence”; Indicator(s) to be discussed
Society / Culture	Population	High potential for social interactions	Indicator(s) to be discussed
Society / Culture	Population	Immigration out of peripheral rural areas due to high attractiveness of the agglomerations for the population searching for a more urban lifestyle	Substituted by the phenomenon “High attractiveness of town as place of residence”; Indicator(s) to be discussed
Society / Culture	Population	Selective migration from the core cities to the agglomeration communities	Substituted by the phenomenon “Population growth in the core cities”; Indicator(s) to be discussed
Society / Culture	Social equity and family	Concentration of deprived people in the core cities, concentration of the middle and upper class in the communities in suburban areas	Not evaluated as being of high importance by experts and DIAMONT partners and not any more linked strongly enough with the reformulated main trend
Society / Culture	Social equity and family	Loss of social cohesion as a former rural quality in the suburb	Not any more linked strongly enough with the reformulated main trend
Society / Culture	Social equity and family	Gender inequity	Indicator(s) to be discussed
Society / Culture	Income and wealth	Increase of households with an income higher than the average in the suburban areas	Not evaluated as being of high importance by experts and DIAMONT partners and not any more linked strongly enough with the reformulated main trend
Society / Culture	Public services and security	Concentration of public and private service provision in agglomerations	Substituted by the phenomena “Bad provision of educational services”, “Bad provision of public transport”, ”Bad provision of business related services”; indicator(s) to be discussed
Society / Culture	Public services and security	Development of new services activities polarizing in cities peripheries	Not any more linked strongly enough with the reformulated main trend
Society / Culture	Social participation and freedom	Concentration of political decisions and control in agglomerations	Substituted by the phenomena ”Bad provision of central and administrative functions”; indicator(s) to be discussed
Society / Culture	Social participation and freedom	Low participation in democratic processes	Indicator(s) to be discussed
Society / Culture	Social participation and freedom	Urban renewal	Indicator(s) to be discussed
Society / Culture	Culture	In the suburban area loss of cultural traditions as a former quality of rural areas	Not evaluated as being of high importance by experts and DIAMONT partners and not any more linked strongly enough with the reformulated main trend
Society / Culture	Culture	Loss of identity caused by transformation of the cultural landscape and the coalescence of traditional villages and suburban areas	Not evaluated as being of high importance by experts and DIAMONT partners and not any more linked strongly enough with the reformulated main trend
Society / Culture	Culture	Low interest in cultural attractions	Indicator(s) to be discussed
Society / Culture	Culture	Increasing cultural relevance	Indicator(s) to be discussed

Pillar of SD	Dimension	Phenomenon	Indicator development
	not assigned	Marginalisation of small and medium-size cities	Dealt in the overall context of the main trend
	not assigned	Setting up planning documents including cities peripheries	To be discussed in WP9
	not assigned	Inclusion into metropolises commuters catchments	Will be discussed in the context of the delimitation of the urbanisation zones
	not assigned	Revitalisation of city centres	Not any more linked strongly enough with the reformulated main trend
		Additional phenomena (not weighted by partners)	
	not assigned	Urban decline, shrinking	Dealt in the overall context of the main trend
	not assigned	Vacuum of urban development strategies after the collapse of central city theory	To be discussed in WP9
Society / Culture	Culture	Globalised architecture	Very difficult to be indicated.
Economy	Production and consumption	Recycling of urban material	Being of minor importance in comparison with other phenomena
Phenomenon of minor importance (weighting results)			
Phenomenon controversially weighted (weighting by partners)			
Phenomenon of future importance (weighting 3rd round)			
Phenomenon of high importance (weighting results)			
New phenomenon formulated after revision of main trend formulation (without weighting results)			

3.2 Main trend “Congestion of transport system”

Pillar of SD	Dimension	Phenomenon	Indicator development
Environment	Structure	Soil sealing by construction of infrastructure	Substituted by the phenomenon “Increasing land take for infrastructure and settlement”; indicator(s) to be discussed
Environment	Structure	Loss of fertile soils of Alpine valleys by construction of infrastructure	Not evaluated as being of high importance by experts and DIAMONT partners
Environment	Matter exchange	Pollution of soil nearby the streets (e.g. by safety salt, mineral oils)	Indicator(s) to be discussed
Environment	Structure	Fragmentation of natural biotopes by construction of infrastructure	Indicator(s) to be discussed
Environment	Species	Loss of species adapted to extensive non-fragmented areas	Not evaluated as being of high importance by experts and DIAMONT partners, not any more linked strongly enough with the reformulated main trend: effects cannot be interpreted in a close cause-relationship
Environment	Structure	Loss of typical natural biotopes by construction of infrastructure	Not evaluated as being of high importance by experts and DIAMONT partners, not any more linked strongly enough with the reformulated main trend: effects cannot be interpreted in a close cause-relationship
Environment	Water exchange	Loss of retention area and flooding area for rivers by traffic infrastructure	Not evaluated as being of high importance by experts and DIAMONT partners, not any more linked strongly enough with the reformulated main trend: effects cannot be interpreted in a close cause-relationship

Pillar of SD	Dimension	Phenomenon	Indicator development
Environment	Matter exchange	Immission of transport specific air pollutants (eutrophying, acidifying and toxic substances)	Indicator(s) to be discussed
Environment	Matter exchange	Air pollution in steep-sided valleys on transit routes	cp. "Bad air quality" - no further aspects could be discussed
Environment	Human health	Impairment of human health by air pollution	Indicator(s) to be discussed
Environment	Energy balance	Emission of noise	Only discussed in the context of the phenomenon “Impairment of human heath by noise”
Environment	Species	Impairment of the fauna by noise	Very difficult to be indicated
Environment	Human health	Impairment of human health by noise, Immission of noise	Indicator(s) to be discussed
Environment	Aesthetics	Damages of Alpine scenery due to traffic infrastructure	Very difficult to be indicated
Environment	not assigned	Decreasing negative effects of transport by the extension of railway transport network	Too general for defining indicators, important aspects will be dealt in the context of other phenomena
Economy	Economic performance and infrastructure	Increase of transport infrastructure, especially extension of the high-ranking road network	Substituted by the phenomena “Increasing land take for infrastructure and settlement” and “High density of high-ranking road network”; Indicator(s) to be discussed
Economy	Economic performance and infrastructure	Modernisation of railway transport network (high speed connections)	Not evaluated as being of high importance by experts and DIAMONT partners, not any more linked strongly enough with the reformulated main trend
Economy	Economic performance and infrastructure	High competition of infrastructural demands of transport with other space demands (in particular in regions of highly dynamic development)	Substituted by the phenomenon “Increasing competition of land use”; Indicator(s) to be discussed
Economy	Economic performance and infrastructure	Increasing competitiveness of public transport due to increasing energy costs	Not evaluated as being of high importance by experts and DIAMONT partners, indicator related to this issue could be only suitable to describe general frame conditions of development
Economy	Economic performance and infrastructure	Economic prosperity in the vicinity of supra-regional transit corridors (activity and prosperity)	Indicator(s) to be discussed
Economy	Economic performance and infrastructure	Change in the structure of freight transport towards smaller loads of more valuable goods instead of transport of high loads	Not evaluated as being of high importance by experts and DIAMONT partners, indicator related to this issue could be only suitable to describe general frame conditions of development
Economy	Economic performance and infrastructure	Strong economical linkages between businesses inside and outside the Alps	Not evaluated as being of high importance by experts and DIAMONT partners, indicator related to this issue could be only suitable to describe general frame conditions of development
Economy	Public and private financing	High costs for the implementation and maintanance of traffic infrastructure in the mountains	Substituted by the phenomena “High investments in infrastructure” and “Unbalanced investments of different transport modes”; Indicator(s) to be discussed

Pillar of SD	Dimension	Phenomenon	Indicator development
Economy	Public and private financing	Concentration of infrastructural investments on the extension of the high-ranking transport network	Investments for infrastructure are often not steered by the communities so that community-related indicators would evoke faulty interpretations
Economy	Public and private financing	Increasing petrol prices	Is more or less a background information for the interpretation of developments, indicator would not be suitable to identify spatial differentiations
Economy	Public and private financing	Increasing taxes and fees for transport (for motor-cars and tolls)	Is more or less a background information for the interpretation of developments, indicator would not be suitable to identify spatial differentiations
Economy	Public and private financing	User costs (prices) of public transport	Not evaluated as being of high importance by experts and DIAMONT partners, not any more linked strongly enough with the reformulated main trend
Economy	Public and private financing	Increase of private-public initiatives in transit traffic	Not evaluated as being of high importance by experts and DIAMONT partners, not any more linked strongly enough with the reformulated main trend
Economy	Labour	*no phenomena found*	
Economy	Production and consumption	Increase of the level of motorisation	Is more or less a background information for the interpretation of developments, indicator would not be suitable to identify spatial differentiations
Economy	Production and consumption	Emission of transport specific air pollutants (eutrophying, acidifying and toxic substances)	Indicator(s) to be discussed
Economy	Production and consumption	Increasing importance of traffic emissions in comparison to other emissions of domestic fuels and industry	Indicator(s) to be discussed
Economy	Production and consumption	Increase of Alpine transit (freight and passengers)	Substituted by the phenomena “Congestion of transport system” and “Increase of road transport”; Indicator(s) to be discussed
Economy	Production and consumption	Increase of cross border transit (freight and passengers)	Substituted by the phenomena “Congestion of transport system” and “Increase of road transport”; Indicator(s) to be discussed
Economy	Production and consumption	Congestion of transport system	Indicator(s) to be discussed
Economy	Production and consumption	Increase of freight transport (road and railways)	Covered by " Congestion of transport system” (freight and passengers)"
Economy	Production and consumption	Increasing transport of semi-finished products	An indicator related to this issue could be only suitable to describe general conditions if development
Economy	Production and consumption	Increase of individual traffic (kilometres and covered distances per person)	An indicator related to this issue could be only suitable to describe general conditions if development
Economy	Production and consumption	High likeliness of traffic jams	Indicator(s) to be discussed
Economy	Production and consumption	Change of modal split in favour of railway transport (due to extension of railway high speed net-work)	Not evaluated as being of high importance by experts and DIAMONT partners, not any more linked strongly enough with the reformulated main trend

Pillar of SD	Dimension	Phenomenon	Indicator development
Economy	Production and consumption	Changes of modal split of travel to work displacements in favour of public transport	Not evaluated as being of high importance by experts and DIAMONT partners, not any more linked strongly enough with the re-formulated main trend
Economy	Production and consumption	Strong concentration of traffic on a few high-ranked corridors	Substituted by the phenomenon “Congestion of transport system”; Indicator(s) to be discussed
Economy	Production and consumption	Disturbance of inner-Alpine traffic by intensive use of transport network for transalpine traffic	Not evaluated as being of high importance by experts and DIAMONT partners, not any more linked strongly enough with the re-formulated main trend
Economy	Innovation, technology and information	Progresses in the development of new automotive technologies (e.g. reduction of emissions)	An indicator related to this issue could be only suitable to describe general frame conditions of development
Economy	Innovation, technology and information	Progress in the development of technical possibilities for achieving optimal traffic management	Not evaluated as being of high importance by experts and DIAMONT partners, to be To To be discussed in WP9
Economy	Innovation, technology and information	Development of alternatives to individual car transport (train + bike, car sharing, regional transport cards, etc.)	An indicator related to this issue could be only suitable to describe general frame conditions of development
Economy	Innovation, technology and information	High influence of e-commerce on freight transport and of IT-communication technology on personal displacements	Not evaluated as being of high importance by experts and DIAMONT partners, not any more linked strongly enough with the re-formulated main trend
Economy	Innovation, technology and information	Adaptions in vehicles to reduce GHG-emissions	An indicator related to this issue could be only suitable to describe general frame conditions of development
Economy	Innovation, technology and information	Development of transport saving options meeting current needs (e-commerce, IT)	Not evaluated as being of high importance by experts and DIAMONT partners; indicator related to this issue could be only suitable to describe general frame conditions of development
Society / Culture	Population	Concentration of population in the vicinity of supra-regional transit corridors	Substituted by the phenomenon “Low attractiveness as space of living”; Indicator(s) to be discussed
Society / Culture	Population	Concentration of population in settlements served by public transport	Not any more linked strongly enough with the reformulated main trend
Society / Culture	Social equity and family	Increasing social differences in mobility	Not evaluated as being of high importance by experts and DIAMONT partners, not any more linked strongly enough with the re-formulated main trend
Society / Culture	Income and wealth	*no phenomena found*	
Society / Culture	Public services and security	High dependence of private and public provision on infrastructural facilities	cp. "Good public and private service provision in the vicinity of supra-regional transit corridors" - no further aspects could be discussed
Society / Culture	Public services and security	Attractiveness (frequency, comfort and prices) of public traffic	Not evaluated as being of high importance by experts and DIAMONT partners
Society / Culture	Public services and security	Good public and private service provision in the vicinity of supra-regional transit corridors	Not evaluated as being of high importance by experts and DIAMONT partners

Pillar of SD	Dimension	Phenomenon	Indicator development
Society / Culture	Public services and security	Traffic accidents	There is no direct relationship between congestion of infrastructure and frequency of accident; not evaluated as being of high importance by experts and DIAMONT partners
Society / Culture	Social participation and freedom	Opposition of the political and ecological sectors to infrastructure development	Indicator(s) to be discussed
Society / Culture	Social participation and freedom	High individualisation of society and importance of personal freedom expressed by unlimited mobility	An indicator related to this issue could be only suitable to describe general frame conditions of development
Society / Culture	Culture	Mixing of different cultural backgrounds due to high personal mobility	Not any more linked strongly enough with the reformulated main trend
	not assigned	Efforts to limit traffic flows in sensitive areas	To be discussed in WP9
		Additional phenomena (not weighted by partners)	
Economy	Production and consumption	Change of modal split in favour of railway transport of persons (due to extension of railway high speed network)	Covered by "Increase of Alpine transit (freight and passengers)" and "Increasing inneralpine traffic (freight and passengers)"
Economy	Production and consumption	Change of modal split in favour of railway freight transport (due to extension of railway high speed network)	Covered by "Increase of Alpine transit (freight and passengers)" and "Increasing inneralpine traffic (freight and passengers)"
Economy	Innovation, technology and information	High influence of IT-communication technology on personal displacements	Not any more linked strongly enough with the reformulated main trend
Economy	Innovation, technology and information	Increase in transport of hazardous substances	Not any more linked strongly enough with the reformulated main trend
Economy	Innovation, technology and information	Increasing importance of local acceptance of transport projects	Not any more linked strongly enough with the reformulated main trend
Phenomenon of minor importance (weighting results)			
Phenomenon controversially weighted (weighting by partners)			
Phenomenon of future importance (weighting 3rd round)			
Phenomenon of high importance (weighting results)			
New phenomenon formulated after revision of main trend formulation (without weighting results)			

3.3 Main trend "Innovation and competitiveness - Modernisation of agriculture in favoured areas"

Pillar of SD	Dimension	Phenomenon	Indicator development
Environment	Structure	Soil sealing by construction of industrial plants and for agricultural businesses	Not evaluated as being of high importance by experts and DIAMONT partners, not any more linked strongly enough with the reformulated main trend
Environment	Structure	Loss of typical natural biotopes of Alpine valleys	important phenomenon but difficult to be interpreted in a direct relationship to land use change in agriculture

Pillar of SD	Dimension	Phenomenon	Indicator development
Environment	Structure	Loss of characteristic small-sized landscape elements	Indicator(s) to be discussed
Environment	Structure	Loss of soils and soil functions as a consequence of land melioration in the Alpine valleys	Not evaluated as being of high importance by experts and DIAMONT partners, relevance nowadays in the Alps doubtful
Environment	Structure	Physical degradation of soil by use of heavy machinery	Not evaluated as being of high importance by experts and DIAMONT partners; very difficult to be indicated
Environment	Structure	Physical degradation of soil by intensive pasturing	Not evaluated as being of high importance by experts and DIAMONT partners, not any more linked strongly enough with the reformulated main trend: effects cannot be interpreted in a close cause-relationship
Environment	Water exchange	Change of local water regime due to irrigation or change of traditional irrigation systems	Substituted by the phenomenon “Increase of water consumption”; Indicator(s) to be discussed
Environment	Matter exchange	Emission of air pollutants by intensive agriculture (livestock farming and machine-use)	Indicator(s) to be discussed
Environment	Matter exchange	Immission of air pollutants (eutrophying, acidifying and toxic substances)	Not evaluated as being of high importance by experts and DIAMONT partners, allocation of immissions to different sources seems difficult (especially for nitrogen oxides, not for special toxics from pesticides and ammoniac); emission seems sufficient
Environment	Matter exchange	High livestock density	Indicator(s) to be discussed
Environment	Matter exchange	Soil pollution due to high part of specialized and very intensive cultures with high input of fertilizers and pesticides	Very difficult to be indicated
Environment	Matter exchange	Water pollution due to high part of specialized and very intensive cultures with high input of fertilizers and pesticides	Substituted by the phenomenon “Decreasing river water quality”; Indicator(s) to be discussed
Environment	Structure	Loss of structural diversity due to the abandonment of traditional landscape management methods and intensification processes	Indicator(s) to be discussed
Environment	Species	Loss of species biodiversity due to the abandonment of traditional landscape management methods and intensification processes	Indicator(s) to be discussed
Environment	Species	Loss of diversity of rare breeds and seeds	Indicator(s) to be discussed
Environment	Aesthetics	Loss of landscape aesthetics by agricultural intensification	Not evaluated as being of high importance by experts and DIAMONT partners; very subjective interpretation, not suitable to describe the main trend; some intensively used areas are even used in tourism as attractions like the fruit tree plantations (e.g. at bloom)
Economy	Economic performance and infrastructure	Economic decline of farming	Indicator(s) to be discussed

Pillar of SD	Dimension	Phenomenon	Indicator development
Economy	Economic performance and infrastructure	High share of full-time farms	Indicator(s) to be discussed
Economy	Economic performance and infrastructure	Higher inputs in intensified modern agriculture	Indicator(s) to be discussed
Economy	Economic performance and infrastructure	High pressure of competition of Alpine agricultural production with non-Alpine agricultural production	Not any more linked strongly enough with the reformulated main trend: modernised agriculture in the Alps generally is located in advantageous areas which are not per se disadvantaged compared to extra-alpine areas; alpine agriculture not only competes with extra-alpine, but also with inner-alpine production
Economy	Economic performance and infrastructure	High economic expectations to this type of agriculture (due to higher costs for transport and higher competitiveness of land use with non-agricultural e.g. urban uses)	Not evaluated as being of high importance by experts and DIAMONT partners
Economy	Economic performance and infrastructure	High level of specialisation of entrepreneurs, specialisation on highly profitable agricultural production (e.g. fruits and wine)	Not evaluated as being of high importance by experts and DIAMONT partners
Economy	Economic performance and infrastructure	Production of niche products (e.g. delayed maturation of fruits)	phenomenon controversially weighted; not suitable to describe modernisation, because niche production can be modern or not
Economy	Economic performance and infrastructure	High contribution of the agricultural sector to the local or regional GDP	Substituted by the phenomenon “Low importance of agricultural job market”; Indicator(s) to be discussed
Economy	Economic performance and infrastructure	Increasing importance of little and more flexible businesses	Not evaluated as being of high importance by experts and DIAMONT partners, not any more linked strongly enough with the reformulated main trend: effects cannot be interpreted in a close cause-relationship
Economy	Economic performance and infrastructure	Concentration of businesses alongside the transit corridors and important inner-Alpine traffic routes	Not evaluated as being of high importance by experts and DIAMONT partners, not any more linked strongly enough with the reformulated main trend: effects cannot be interpreted in a close cause-relationship
Economy	Innovation, technology and information	High spatial concentration of agricultural businesses in naturally / climatically favoured areas	Dealt in the overall context of the main trend
Economy	Economic performance and infrastructure	Competition between municipalities to attract new firms, businesses	Not evaluated as being of high importance by experts and DIAMONT partners, not any more linked strongly enough with the reformulated main trend: effects cannot be interpreted in a close cause-relationship
Economy	Public and private financing	High influence of high capitalised large scale entrepreneurs (partly situated outside the Alps, but with branches within in the Alps)	Not evaluated as being of high importance by experts and DIAMONT partners, not any more linked strongly enough with the reformulated main trend: effects cannot be interpreted in a close cause-relationship

Pillar of SD	Dimension	Phenomenon	Indicator development
Economy	Public and private financing	High dependence of agriculture by refunds	Indicator(s) to be discussed
Economy	Labour	Loss of agricultural workplaces due to mechanisation and industrialisation (1st sector)	Substituted by the phenomenon “Low importance of agricultural job market”; Indicator(s) to be discussed
Economy	Labour	Spatial concentration of jobs in the 2nd sector	Not evaluated as being of high importance by experts and DIAMONT partners, not any more linked strongly enough with the reformulated main trend: effects cannot be interpreted in a close cause-relationship
Economy	Labour	Creation of new workplaces by food processing industries	Substituted by the phenomenon “Low importance of agricultural job market”; Indicator(s) to be discussed
Economy	Labour	Low qualification of labour force	Indicator(s) to be discussed
Economy	Production and consumption	Regional economy becoming more and more independent of regional demand	Not evaluated as being of high importance by experts and DIAMONT partners
Economy	Production and consumption	High need of energy and water by industrialized agriculture	Substituted by the phenomenon “Increase of water consumption”; Indicator(s) to be discussed
Economy	Production and consumption	Improvement of agricultural production conditions in valleys and basins due to warming in consequence of climate change	not evaluated as being of high importance by experts and DIAMONT partners, not linked strongly enough with the reformulated main trend: effects will probably emerge in the future
Economy	Production and Consumption	Stronger integration of agriculture in food processing industries	Not evaluated as being of high importance by experts and DIAMONT partners
Economy	Innovation, technology and information	Technical improvements for more efficient consumption of resources (energy, water, raw material)	Not evaluated as being of high importance by experts and DIAMONT partners
Economy	Innovation, technology and information	Obstruction of innovation due to the strong orientation on traditional occupations	Not evaluated as being of high importance by experts and DIAMONT partners, not any more linked strongly enough with the reformulated main trend: not important for modernised agriculture
Economy	Innovation, technology and information	Innovative potential in agriculture due to combination of traditional and modern forms of production	Dealt in the overall context of the main trend
Economy	Innovation, technology and information	Concentration of high innovative activities in already favoured areas and only in micro-territories	Dealt in the overall context of the main trend
Economy	Innovation, technology and information	Use of GMO (genetically modified organism)	not evaluated as being of high importance by experts and DIAMONT partners
Economy	Innovation, technology and information	Development of environment friendly agriculture techniques (organic farming, etc.)	Indicator(s) to be discussed
Economy	Innovation, technology and information	Development of controlled labels, certifications or "designation of origin" with systematic control of quality	Indicator(s) to be discussed
Economy	Innovation, technology and information	New opportunities to develop niche activities	To be discussed in WP9

Pillar of SD	Dimension	Phenomenon	Indicator development
Economy	not yet assigned	Involvement of local governments in economic development projects	To be discussed in WP9
Society / Culture	Population	Unfavourable age structure of farm holders	Indicator(s) to be discussed
Society / Culture	Social equity and family	Concentration of the non-Alpine population in innovative and well paid jobs	Not evaluated as being of high importance by experts and DIAMONT partners
Society / Culture	Social equity and family	Gender inequity	Indicator(s) to be discussed
Society / Culture	Income and wealth	Low income of farmers	Indicator(s) to be discussed
Society / Culture	Social participation and freedom	Loss of entrepreneurial participation of the Alpine producers and service providers, transfer of decision competences to extra-Alpine companies	Not evaluated as being of high importance by experts and DIAMONT partners, not any more linked strongly enough with the reformulated main trend
Society / Culture	Culture	Loss of traditional land use practices in valley bottoms and basins	Indicator(s) to be discussed
Phenomenon of minor importance (weighting results)			
Phenomenon controversially weighted (weighting by partners)			
Phenomenon of future importance (weighting 3rd round)			
Phenomenon of high importance (weighting results)			
New phenomenon formulated after revision of main trend formulation (without weighting results)			

3.4 Main trend “Increasing generation of renewable energy”

Pillar of SD	Dimension	Phenomenon	Indicator development
Environment	Structure	Soil sealing by construction of energy plants	Not evaluated as being of high importance by experts and DIAMONT partners
Environment	Structure	Loss of ecosystems of valleys and slopes due to backwater flooding for energy production	Indicator(s) to be discussed
Environment	Structure	Loss of habitats for aquatic fauna and flora due to low discharges caused by high water abstractions for energy production	Substituted by the phenomenon “Disturbance of natural water discharge regime”; Indicator(s) to be discussed
Environment	Structure	Loss of the passability of rivers for migrating animals	Not evaluated as being of high importance by DIAMONT partners, but one of the most significant impacts of hydropower, substituted by the phenomenon “Loss of structural qualities of water bodies”; Indicator(s) to be discussed.
Environment	Species	Loss of aquatic species due to low discharges caused by high water abstractions for energy production	Not evaluated as being of high importance by experts and DIAMONT partners; very difficult to be indicated
Environment	Structure	Change of forest structure due to the increasing use of wood as biomass energy	Substituted by the phenomenon “Intensified use of forests”; Indicator(s) to be discussed
Environment	Species	Changes in forest species composition due to the increasing use of wood as biomass energy	Not evaluated as being of high importance by experts and DIAMONT partners; difficult to link phenomenon to biomass energy generation

Pillar of SD	Dimension	Phenomenon	Indicator development
Environment	Matter exchange	Emissions of air pollutants of energy plants based on fossil fuels	Phenomenon fails to unambiguously reflect the share of generation and use of renewable energy; furthermore data availability is very limited, only installations subject to licensing can be considered; Indicator(s) to be discussed
Environment	Matter exchange	Emissions of air pollutants by end-users of energy	
Environment	Matter exchange	Emission of GHG	
Environment	Matter exchange	Immission of air pollutants (eutrophying, acidifying and toxic substances)	Not evaluated as being of high importance by experts and DIAMONT partners, nevertheless energy-related pollutants can be identified, but interpretation on percentage of renewable energies is not possible; Indicator(s) to be discussed
Environment	Water exchange	Impacts on Alpine water balance due to water transfers between catchment areas for hydro-energy production	Partly dealt within other phenomena
Environment	Water exchange	Implementation of water quality management programmes	To be discussed in WP9
Environment	Water exchange	Disturbance of water discharge regime	Indicator(s) to be discussed
Environment	Energy balance	Change of climatic conditions on a local or regional scale in case of (extensive) backwater flooding	Not evaluated as being of high importance by experts and DIAMONT partners
Environment	Aesthetics	Damages of Alpine scenery due to wind energy installations	Indicator(s) to be discussed
Environment	Aesthetics	Damages of Alpine scenery due to an expansion of (European) energy transmission infrastructure	Indicator(s) to be discussed
Environment	Human health	*no phenomena found*	
Economy	Economic performance and infrastructure	High dependence of the Alpine energy sector from the European energy market and its liberalisation	Fails to identify regional differences
Economy	Economic performance and infrastructure	Increasing demand of surge power provided by pump storage water plants as a result of increased share of renewable power generation with fluctuating availability (solar, wind)	Indicator(s) to be discussed.
Economy	Economic performance and infrastructure	High potential for (decentralised) uses of alternative energy sources	Substituted by the phenomenon “Increasing use of decentralized alternative energy sources”; Indicator(s) to be discussed
Economy	Economic performance and infrastructure	Increasing importance of regenerative energy	Substituted by the phenomenon “High installed capacity for generating renewable energy”; Indicator(s) to be discussed
Economy	Economic performance and infrastructure	Increase in wood demand for the production of biomass energy	Substituted by the phenomenon “Increasing demand for biomass residues”; Indicator(s) to be discussed

Pillar of SD	Dimension	Phenomenon	Indicator development
Economy	Economic performance and infrastructure	Great dependence of future silvicultural activities on the demand of biomass energy	Substituted by the phenomenon “Intensified use of forests”; Indicator(s) to be discussed.
Economy	Economic performance and infrastructure	Increasing importance of geothermal energy use	Substituted by the phenomenon “High installed capacity for generating renewable energy ”; Indicator(s) to be discussed
Economy	Economic performance and infrastructure	Increasing importance of wind energy use	Substituted by the phenomenon “High installed capacity for generating renewable energy ”; Indicator(s) to be discussed
Economy	Economic performance and infrastructure	Competitiveness of regenerative energy produced in the Alps	Not evaluated as being of high importance by experts and DIAMONT partners
Economy	Economic performance and infrastructure	Decrease of economic importance of the energy sector (GDP)	Not evaluated as being of high importance by experts and DIAMONT partners
Economy	Economic performance and infrastructure	Low economic importance of the production of renewable energy for the local and regional Alpine economy	Not evaluated as being of high importance by experts and DIAMONT partners
Economy	Economic performance and infrastructure	Economic importance of trading electricity	Not evaluated as being of high importance by experts and DIAMONT partners
Economy	Economic performance and infrastructure	Increasing energy exportation from the Alps	Fails to identify regional differences
Economy	Economic performance and infrastructure	Increasing importation of mainly cheap basic energy from outside the Alps	Partly discussed in the context of the phenomenon “Increasing energy self sufficiency”; Indicator(s) to be discussed
Economy	Economic performance and infrastructure	Importance of the energy production (biomass and solar energy) as additional income source for farmers	Indicator(s) to be discussed.
Economy	Public and private financing	Prices for energy	Fails to identify regional differences
Economy	Public and private financing	Prices for fossil fuels	Fails to identify regional differences
Economy	Public and private financing	Financial incentives including tax privileges for supporting the production of renewable energy	Fails to identify regional differences
Economy	Public and private financing	Outflow of capital due to dominance of extra-Alpine companies in the energy sector	Issue of external control over local decision making not relevant in this context of the reformulated main trend
Economy	Public and private financing	Increasing demand for biomass residues	Indicator(s) to be discussed

Pillar of SD	Dimension	Phenomenon	Indicator development
Economy	Labour	Decreasing importance of energy sector for the labour market	Substituted by the phenomenon “High importance of energy generating for the job market”; Indicator(s) to be discussed
Economy	Production and consumption	Difficulties for the production of hydroelectric energy due to changes of water balances as consequence of climate change	Not applicable on a regional scale
Economy	Production and consumption	Consumption of energy	Not any more linked with the reformulated main trend
Economy	Production and consumption	Disproportionately high consumption of energy (by tourist installations and transport)	Not any more linked with the reformulated main trend
Economy	Production and consumption	New uses of the forests as an environment friendly resource (biomass, etc.)	Indicator(s) to be discussed
Economy	Innovation, technology and information	Development of innovative projects for using renewable energy	Substituted by the phenomenon “Importance of energy generating for the job market”; Indicator(s) to be discussed
Economy	Innovation, technology and information	Development of energy saving options for housing	Energy efficiency not part of the main trend.
Economy	Innovation, technology and information	Increasing quality standards for generation of renewable energy	Indicator(s) to be discussed
Society / Culture	Population	*no phenomena found*	
Society / Culture	Social equity and family	Gender inequity	Indicator(s) to be discussed.
Society / Culture	Income and wealth	*no phenomena found*	
Society / Culture	Public services and security	*no phenomena found*	
Society / Culture	Social participation and freedom	Strong influence of local (and outside) energy corporations looking for high returns on local and regional decision making	Issue of external control over local decision making not relevant in this context
Society / Culture	Culture	Integration of energy-efficient building-standards in characteristic architecture	Not any more linked with the reformulated main trend
Phenomenon of minor importance (weighting results)			
Phenomenon controversially weighted (weighting by partners)			
Phenomenon of future importance (weighting 3rd round)			
Phenomenon of high importance (weighting results)			
New phenomenon formulated after revision of main trend formulation (without weighting results)			

Annex 4: Functions of the DIAMONT database

In the framework of DIAMONT a web-based database was installed and developed in order to facilitate the exchange of knowledge and data between the partners. The XML-based DIAMONT database (in the following referred to as “database”) is administrated by the Bavarian State Ministry of the Environment, Health and Consumer Protection (BayStMUGV) and located on the respective servers. The database can be accessed at www.diamont.bayern.de by Diamont partners equipped with user name and password.

The database allows different functionalities and operations, which are displayed in the menu bar at the top of the page. The menu is changeable and varies according to the position of the user within the database.

It has to be regarded that not all functions are available to all users (leaving aside the database administrator). So the functions of editing and deleting database entries are permitted only to the creator of the entry. However, as the database should be able to facilitate the discussion of indicators, variables and phenomena, all partners have permission to use the fields ‘Comments’ in the formsheets of the respective class. Concerning the class variables, the fields provided for giving information on data availability are open to the partners of the respective countries.

The functions listed and described below are the same across the various classes. From left to right:

Home: Returns the user to the main navigation page for selecting the classes

Classes (pull-down menu): Allows the navigation between the different classes in the database.

List documents: Lists all documents of the current class. The documents can be viewed by double-clicking the underlined entry.

New document: Opens a form sheet for creating a new document. The form sheet can be left using the buttons ‘Update document’ respectively ‘leave edit mode WITHOUT creating a new document’. For the class ‘Indicators’, explanatory documents (e.g. Word, Excel, Portable documents (pdf)) can be attached and uploaded to the database.

Delete: Enables the deletion of database entries. This function is only permitted to users owning respective rights, normally these are the administrator and the creator of the entry.

Edit: Allows the adoption of database entries. This function is only permitted to users owning respective rights, normally these are the administrator and the creator of the entry.

Versions: The database stores all previous versions of edited datasets for a possible restoration of the dataset. The database automatically stores the editing user and the date of edition.

Search: Allows to search the classes for specific entries within determined fields or as full text search within all the documents. In some classes the search results can optionally be displayed in form of a tree structure in a separate window. This allows an easier navigation through the database entries and thereby search results are kept visible for later use.