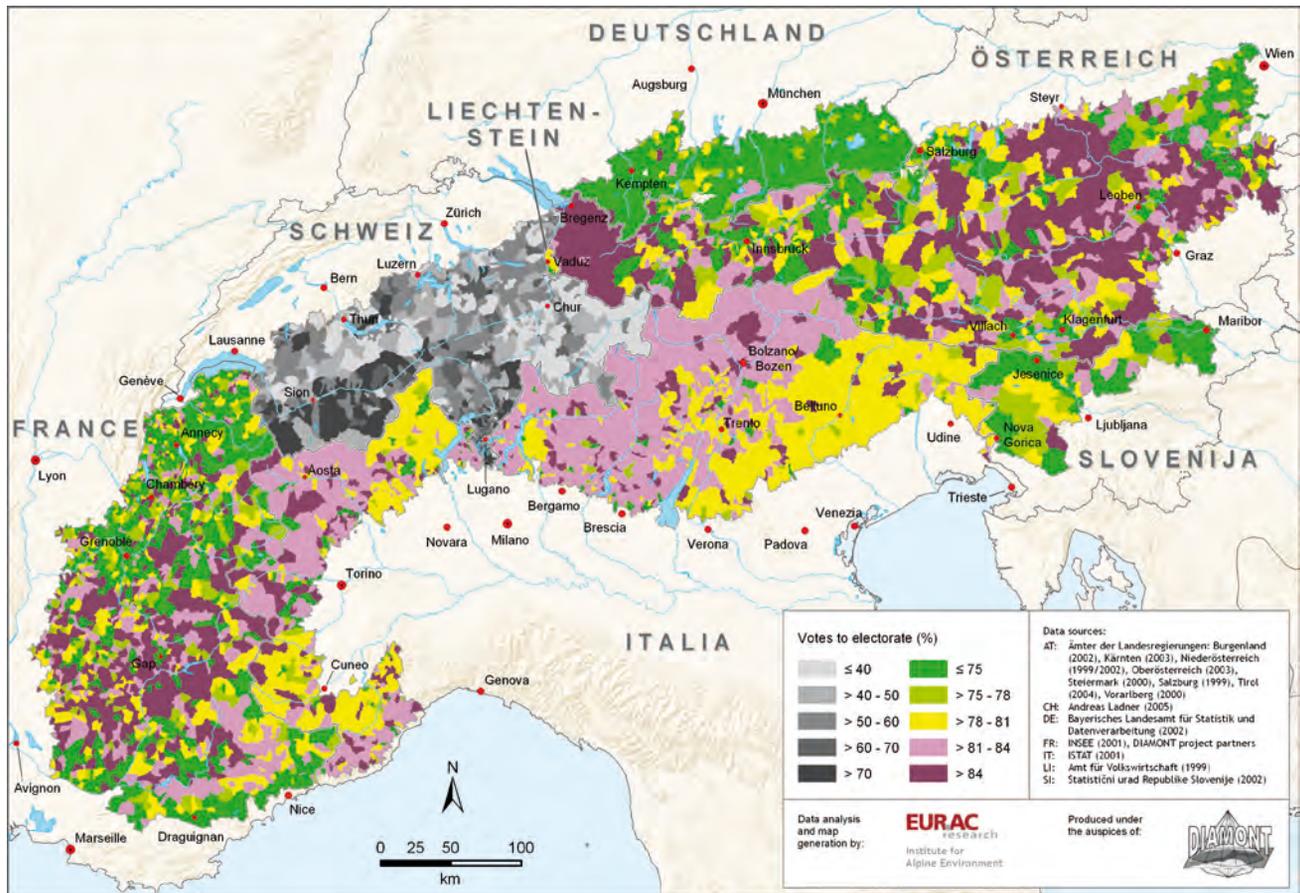


Mapping the Alps

Axel Borsdorf, Ulrike Tappeiner & Erich Tasser



Electoral turnout in local elections (Tappeiner et al. 2008: 138).

Introduction

At first glance it seems an easy task to create an atlas of the Alps. From their school days everybody remembers the map of the alpine countries as found in any Central European school atlas. Take a closer look and you begin to wonder: where exactly do the Alps begin? Where do they end? Does orography provide sufficient information on the spatial structure of the Alps? Are the Alps static or do they not rather experience a variety of changes in the nature of the land, the cultural landscape,

the demographic, economic and social structures? These issues have motivated the authors to create a set of maps that would answer such questions and encourage readers to study the enormous structural differences and the rapid spatial and social changes that affect the Alps in particular.

Nearly twenty years ago, the Alpine Convention started on the task of creating a monitoring and information system for the Alps, but because of political and data-technical problems this task has not been satisfactorily completed to date. One of the most serious

problems was the harmonization of data that have been defined in a variety of ways in the official statistics of individual Alpine states and moreover may have been gathered at different points in time. This atlas aims to support the efforts of the Alpine Convention to build up a coherent transnational basis of information for the entire Alpine Space.

The Atlas of the Alps (Tappeiner et al. 2008) was produced within the EU-financed project DIAMONT (Interreg IIIb, Alpine Space) with support of various national funding bodies (Federal Ministry for the Environment, Nature Conservation and Nuclear Safety, Germany; Bavarian State Ministry for the Environment, Health and Consumer Protection, Germany, Ministero delle infrastrutture e dei trasporti, Italy). It was a happy coincidence that this project united scientists who had been involved in creating the information systems in SUSTALP, GALPIS, and the Working Group on Environmental Objectives and Indicators with researchers and experts from Germany, France, Italy, Austria, Slovenia, and Switzerland. They all contributed to gathering the data as well as creating and interpreting the maps.

The Alps

The Alps are not only the highest inner-European mountain chain, crossing eight different countries; they also contain a large variety of landscapes, species and cultures. Usually one thinks of mountains as sparsely populated areas. In relation to the amount of land that is actually available for settlement or agriculture, however, they are among the most densely populated and the cultural heritage they preserve runs the whole gamut from ancient to contemporary. From the valleys to the mountain tops, a variety of flora and fauna patterns can be observed. The Alps are a hotspot of biodiversity and a complex ecosystem. Slope inclination and altitudinal climate gradients influence the natural dynamics of soil, topography and thus the typology of land use and habitat variety. The dominating environmental factors, such as water, snow and ice, provide freshwater

resources, but they also expose the hillsides and valleys to various dangers.

The population in the Alps does not only face natural hazards. Currently, like many other areas, the Alps are under threat from global changes. Globalization has brought about market disadvantages that have had severe social and economic effects and led to changes in land use. Political as well as market processes have resulted in abandoned hillsides and agglomeration processes in the valleys.

Agriculture, for example, is now practised on a grand scale in the lowlands and causes excessive use of nitrogen and deposits in the soil while irrigation causes its salinization. Biodiversity is threatened by landscape dissection and the encroachment of artificial areas. Political or economic structural changes, however, are not the only phenomena. Climate change also profoundly transforms alpine reality and can clearly be seen in the accelerating melting process of the glaciers. Its disastrous effects show up in a series of problems such as the lack of drinking water as rivers fed by glacier melt are no longer supplied adequately, and floods in the valleys after frequent storm rainfall. Increasing erosion exposes more and more regions to the risk of landslides.

We must now protect this natural and cultural landscape against degradation of any kind. To achieve this, it is essential to support sustainable development in this cultural and natural heritage of central Europe and by doing so to stimulate adequate political responses.

The Atlas

The maps cover the alpine arc as defined by the Alpine Convention. The texts were written in the languages spoken in the Alps, i.e. French, German, Italian and Slovenian, to respect the cultural variety of the alpine region and to make it accessible for all inhabitants of the Alps. In addition, all texts have also been translated into English for the international scientific community to benefit from the results. The map legends are in English to make them easier to read.

Thematically, the maps focus on ecological and socio-economic structures and processes in the Alps. This is intended as it has been pointed out repeatedly that the biggest information deficits exist in precisely these areas. The maps should provide deeper insights into the challenges connected with global change (climate change, political, economic and cultural globalization). Adaptive strategies for facing future issues must be based on sound data on the current structures and on a documentation of processes that are already under way.

On analysing the maps new spatial patterns emerge. Sometimes the contrast between the Western and Eastern and sometimes between the Northern, Central and Southern Alps is clearly visible. Often the cultural and historic contrasts of the big language groups in the Alps come through as well. Some maps, however, do not present such clear structures. In these maps, the spatial pattern may be influenced by the different structures of rural and urban, agrarian, industrial or tourist communities, as well as by the size of a municipality. Voter turnout is a case in question: at national level, i. e. for parliamentary elections, there are clear regional differences within the alpine region. Voter turnout in local elections, however, shows a completely different picture, which can only be explained with reference to the types of municipalities, e. g. urban versus rural. Then a fairly simple structure emerges: the more remote a community, the higher the voter turnout (Fig. 1).

Harmonization

It is a challenging task to harmonize data. In the Alps – as well as in the whole of Europe – most data collection is organized nationally, even in joint projects. This means that each country has some leeway in interpreting a common concept or that it defines some terms differently from other countries. All definitions must therefore be carefully checked and compared to assess whether the data of individual countries are comparable or not. If they are not, the values must be harmonized, which may mean minor inaccuracies.

The concept of economic activity may serve as an example. In principle, all countries of the Alpine Space have the same concept of economically active (= employed) persons. It roughly follows the labour force concept of the International Labour Organization (ILO) and defines “economically active” as meaning persons gainfully active in the period studied. These can be self-employed, employed but also family workers.

How employment is counted, however, can differ despite a common understanding. In 1990, in Italy all persons were counted who had worked for more than one hour in the reporting week, whilst in Switzerland the minimum working time was six hours, excluding numerous minimally employed from the group of the economically active. Direct comparisons between these two countries are thus not possible: per definition Italy has more economically active people than Switzerland, after harmonization the differences turn out to be minimal.

However, the trend towards homogeneity means considerable changes in the national statistics over time, which makes it more difficult to measure changes between two points in time, e. g. between the last two census years 1990 and 2000.

Education is another striking example of the difficulties in comparing national data. In the atlas, it was intended to work out the rate of people with A-levels (secondary school qualification for entering university) and university graduates as well as the proportion of people who have not completed compulsory education. There are international systematics that theoretically enable a comparison, but the data are not necessarily gathered or provided according to this system. Thus it is currently not possible to obtain comparable figures for people with A-level qualifications. In Italy, people with A-levels are counted in with people who, after compulsory education, have attended a 2–3 year school course that ends without A-levels. In Switzerland, one would have to include people with a “vocational Matura school-leaving certificate” (Berufsmaturität), but these were not counted as people with A-levels in the year 2000 census. On top of that, there are no data on this

for Germany, so we had to leave this indicator out of the atlas.

An additional problem is the fact that within the Alps two different traditions prevail. The dualist education system in Germany, Austria, Switzerland and some Italian provinces envisages not only a school career up to A-levels but also a vocational career within an apprenticeship. In France, Italy and Slovenia, this is only available to a limited degree and the higher vocational schools play a much less important role than in other countries. This tradition alone makes it more likely in Italy and France that in the absence of good alternatives people opt for taking A-levels.

Indicator definition and scale

Defining and calculating indicators of sustainable regional development i.e. for economy, society and environment, presented another challenge. On the one hand, these indicators relate to selected phenomena of sustainable development such as population dynamics, gender integration or the diversity of cultural landscapes, and on the other, to regions of similar economic, social or environmental structure within the Alpine Space. Special emphasis was put on sustainable spatial management in the Alps.

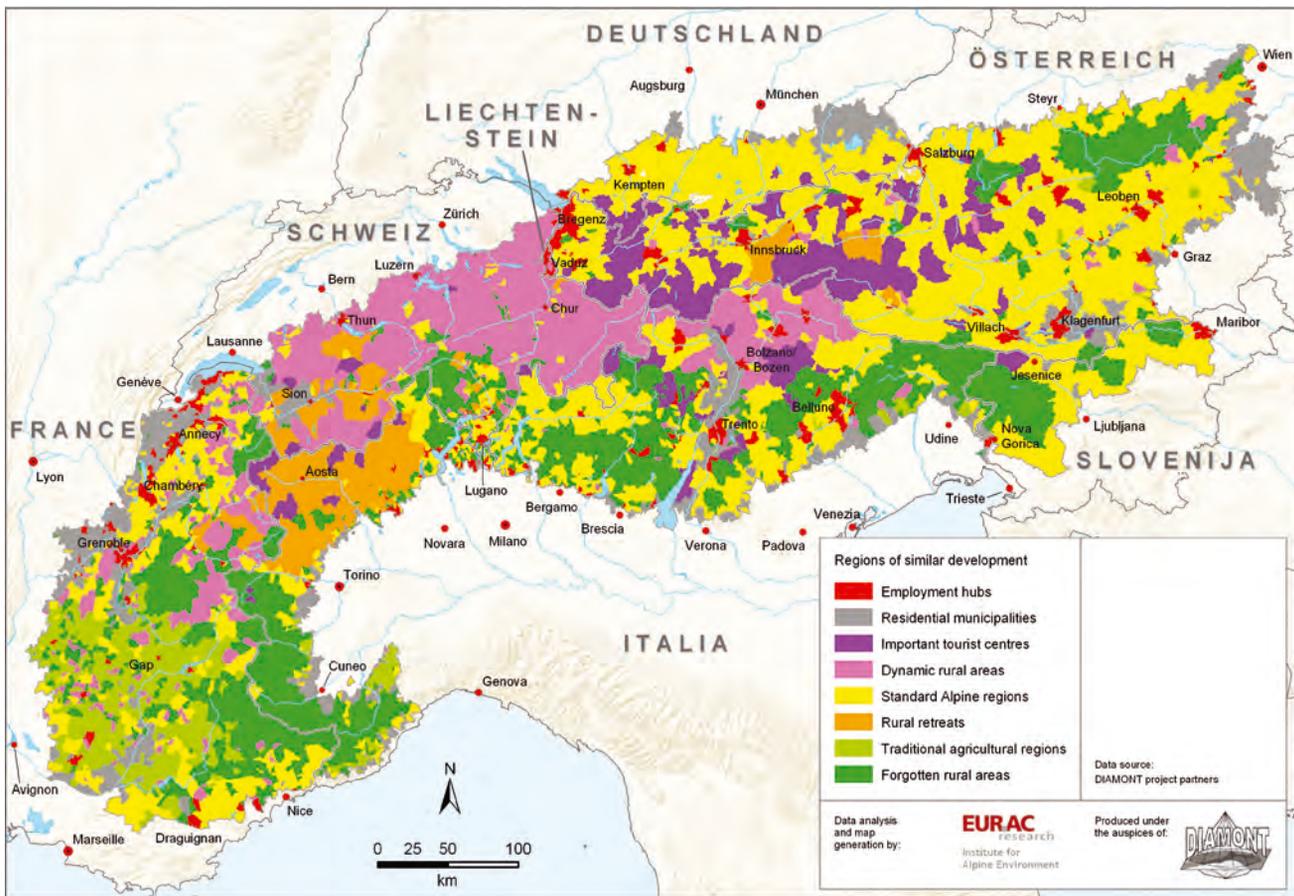
In selecting the indicators to be used in the atlas we were able to build on numerous existing studies on the subject. First and foremost among these was the UN Commission on Sustainable Development, one of the first institutions to explore the theme of sustainable development and how to measure it in depth. Soon after, the EU picked up on the topic and is increasing its efforts towards sustainable development, among other things by making detailed lists of indicators available. Such pan-European thinking is complemented by national strategies for sustainable development which also provide a rich pool of information.

Not only international organizations, institutions and countries, but also research groups have grappled with the topic and suggested as well as implemented in-

dicators for measuring sustainability. Within the MARS project, an indicator system for monitoring sustainable development on NUTS 2 level across the Alpine Space was developed (BAK Basel Economics 2005); Tappeiner et al. (2003) analysed agrarian structures within the Alps on the basis of municipal data as part of the EU project SUSTALP; Perlik (2001), also on the basis of municipal data, investigated urbanization in the Alps for an area that included the Alps as well as a peri-alpine belt with the metropolitan areas of Munich and Milan; and Pfefferkorn et al. (2005), in the course of the REGALP project, developed indicators at municipal level to characterize changes in the cultural landscape for the entire Alpine Space. A number of projects had produced detailed studies of individual countries and could serve as reference for that country. These include RAUMALP, which developed a comprehensive web-based GIS for Austria (<http://www.galpis.at>; Borsdorf 2005), sustainability monitoring for South Tyrol, also web-based, which makes more than 70 sustainability indicators available at municipal level (Tappeiner et al. 2007), and FUNAlpin, which developed 20 sustainability indicators for selected test regions in Switzerland (Siegrist et al. 2007).

The studies mentioned above and many others are based on the so-called “three pillars” model of sustainability. This model starts from the assumption that sustainable development can only be achieved if environmental, social and economic objectives are implemented concurrently and with equal weighting in such a way as to maintain the livelihood for future generations. Based on this model, themes that are relevant for sustainability were chosen for each pillar. In the social area, this could, for instance, be demographics or education. This system is rounded off with another level, i.e. that of the indicators, which are used to quantify and measure the thematic areas.

However, most studies refer to regions (NUTS 2 or 3), while for *Mapping the Alps* we chose the municipality (NUTS 5) as the unit to be studied in order to get a closer look at spatial variability.



Regions of similar development (Tappeiner et al. 2008: 272).

In order to identify regions of similar development in the Alps, a cluster analysis was carried out using selected indicators (Fig. 2). The indicators cover all areas of sustainability in equal measure. The analysis yielded eight clearly delimited development structures, which can briefly be described as follows:

Employment hubs: positive commuter balance, good transport infrastructure, existence of business parks, industrial facilities and shopping centres.

Residential municipalities: often in the vicinity of employment hubs. Out commuting, low land prices, good transport infrastructure.

Important tourist centres: well developed accommodation facilities, good employment situation in the service sector, functioning agricultural sector, intact cultural landscape.

Dynamic rural areas: rural location, dynamic labour market. Influence of the tourism sector, relatively high occupation rates of women and elder people.

Standard alpine regions: no outstanding features, average values of all indicators. Low tourist intensity, decline of agriculture, negative commuter balance. Balanced migration and birth rates.

Rural retreats: good transport links, long distance commuting. Decrease of agriculture in recent years, large natural spaces with little fragmentation and a highly diverse landscape.

Traditional agricultural regions: overaging, poor transport infrastructure. No retreat of agriculture, but extensive farming. Rich traditional landscape. Poor employment situation in the service sector.

Forgotten rural areas: distinct overaging, sharp decline in farming, poor transport infrastructure. Passive spaces threatened by depopulation.

Outlook

Not all phenomena of the alpine region can thus be represented spatially. It would be very useful if the database and its underlying geographical information system could be represented in an open-access web-based geoinformation system. As could be demonstrated in an earlier project (GALPIS-Web), this is feasible and has been well received by both the public and the scientific community. So it may be hoped that another such system will be made available to enhance public information on the spatial structures and development trends within the alpine arc.

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