COMPACT NO 02/2010

SPATIAL PLANNING IN CLIMATE CHANGE

A BACKGROUND REPORT OF CIPRA

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cc.alps in a nutshell

The Project “cc.alps – climate change: thinking one step further!” is organised by CIPRA, the International Commission for the Protection of the Alps, and financed by MAVA Foundation for Nature. Through the Project, CIPRA is helping to ensure that climate response measures in the Alpine region are in harmony with the principle of sustainable development.

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INTRODUCTION

Within the framework of the project “cc.alps - Climate Change: Think ahead!”, the International Commission for the Protection of the Alps (Commission Internationale pour la Protection des Alpes”, CIPRA) investigated climate protection measures in the Alps. CIPRA compiles information on climate protection activities and adaptation to climate change in the Alps (hereinafter referred to as climate measures) and analyses the impacts of these climate measures on the environment, economy and society. CIPRA‘s aim is to make the climate measures, which comply with the principles of sustainable development, accessible to a broader public and to warn the public of those climate measures that have negative effects on nature and the environment, but also on social cohesion and the economy.

The “cc.alps compact” series comprises several thematic publications that take a critical look at climate measures in the Alps. The series covers the following activities in addition to the subject of “spatial planning”: energy, construction and restoration, regional energy autarchy, transport, tourism, natural threats, nature protection, agriculture, forestry and water.

This issue of cc.alps-compact presents an overview of spatial planning-related measures in the Alps to ameliorate the effects of climate change and promote adjustments to it. The second chapter explains CIPRA‘s key concerns: If spatial planning is to play a key role in climate protection, a number of things have to change, because in the case of conflicts of goals regarding the interests of individual sectors, special interests and of utilization rationales, spatial planning is usually relegated to the backseat. Spatial planning and its instruments may contribute to securing swamps, forests and river zones as well as areas for the production of renewable energy sources. What is decisive, though, for spatial planning decisions with respect to spatial and settlement structures is to shift decision-making from the local to the regional level. Apart from the classic instruments of spatial planning, what is needed for negotiating spatial interests are new forms and models of collaboration.

In Chapter Three the detailed relations are analysed and described in depth, and in Chapter Four the author summarizes the most important findings and conclusions. Chapter Five presents exemplary projects for climate-friendly spatial planning measures in the Alps: for example, the spatial concept of Switzerland that contains elements to encourage transport-reducing settlement structures; the new guidelines for residential construction in Austria; intercommunal cooperation models for plant establishments, and the “Projet Village 2003-2013” in the French municipality of Les Gets. These examples show us how it can be done and encourage others to do the same. Chapter Six contains literature and background information for further reading.

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SPACES FOR CLIMATE PROTECTION

CC.ALPS: CIPRA DEMANDS ON SPATIAL PLANNING

The Alps are different. The Alpine range is characterized by special features that need to be taken into account in spatial development and climate protection.

The percentage of land that can be settled is very limited due to the natural landscape: in Tyrol, for example, it is only 8% of the land. It is mainly natural hazards that limit the amount of settlement space that can be populated permanently. The higher risk as a consequence of climate change is capable of restricting the space available for permanent settlement even further.

The settlement of the Alps is widely dispersed. For this reason, public services can only be provided incurring high costs, time, funding and personnel. In areas affected by a high rate of out-migration, it will become increasingly harder to guarantee services for everyone.

Forward-looking spatial planning prepares the way for a future in which fossil fuels such as petroleum and diesel will become increasingly scarcer. Rising energy prices are an additional burden for people who live in the rural peripheral regions of the Alps. Increasing commuting allowances do not help climate protection at all. Rather, the issue here is to make the rural areas fit for survival in the post-fossil fuel era.

In the rural peripheral areas twice as many people use cars as the main mode of transport as in cities. Automobile traffic can only be reduced if settlements have a minimum size and density and it is economically feasible to connect them to public transport networks.

CIPRA demands:

TAKE ACCOUNT OF RISKS!

According to all experts, climate change will raise natural hazards, avalanches and flooding. In order to prepare for this, all Alpine regions need to prepare binding risk plans. Building should not be permitted in risky zones; new building zones should only be permitted if there are risk plans and these do not contradict building.

HIGHER DENSITY INSTEAD OF SPRAWL!

Compact, densely built-up cities and towns have a lot of advantages. Mobility can be organized by public transport means and, moreover, it is economically feasible to offer environmentally friendly distance heating and cooling. Instead of rural sprawl that eats away at the landscape, densely built-up settlements should be promoted. Financial aid for businesses should favour locations that customers and employees can reach by public transport and where goods can be transported by rail.

REGIONAL CYCLES!

Regional markets and economies should be promoted, because they organize the production and consumption of goods using less environmentally-damaging transport. Subsidies should not be granted indiscriminately throughout regions. Instead, small centres that provide basic services to the surrounding areas should receive higher funding within the scope of revenue equalization among the territorial authorities. Regionalization lowers motorized transport and the emission of climate-damaging gases.

THINK IN LARGER SPATIAL DIMENSIONS!

Often, more than one municipality within a single valley works without coordinating its actions with the others and each pursues goals that serve only individual purposes. There is no coordination as regards climate protection at all. The scopes of competence need to be transferred from the smallest communal levels to a higher level. Geographically-related municipalities should plan spatial developments together and also have joint responsibility. Potential conflicts could be arbitrated by higher-ranking mediation bodies. Shrinkage scenarios must also be provided for, because it is obvious that there are areas in Alpine regions with population out-migration. This process needs to be accompanied intelligently and ameliorated socially.

GIVE THE WILDERNESS A CHANCE!

Not all regions settled today will be retained. This would also have some advantages if people were to migrate out of some peripheral areas of the Alps in the coming generations. Biological diversity increases in areas in which natural forests are permitted to grow back, because permanent human settlements have been given up permanently. And this is directly useful for climate protection, because such areas bind more carbon dioxide (CO_2) than built-up areas. Therefore, they should be rewarded in revenue equalization, and the structural changes in the peripheral areas also be socially softened.

ENERGY CHANGE!

The Alps need to prepare for the time after the oil age. Renewable energy sources are crucial for climate protection – the future belongs to them. Forward-looking spatial planning must take this into account. It should consistently promote low-energy building methods, define climate neutral pilot regions and reserve enough areas for photovoltaic and wind power – but without damaging nature or landscape.

MAKE ROOM FOR THE SUN!

Building codes should define the location and orientation of buildings in such a manner as to optimally use the sun for heating, hot water production and electricity production. Whenever it harmonizes with landscape protection, zones should be marked for wind power and geothermal power.

TRUTH IN COSTS MUST PREVAIL!

The expense of developing building land that needs infrastructure for transport, technical and social facilities increases the greater the rural sprawl. The true costs must be borne by the property owners. The public sector should cease veiled subsidization of construction that is damaging to the climate.

3

CLIMATE CHANGE AND SPATIAL PLANNING

CLIMATE CHANGE HAS DIFFERING IMPACTS IN DIFFERENT GEOGRAPHICAL REGIONS

The Alpine regions are affected differently from southern or northern Europe, the northern part of the Alps differently from the southern part of the Alps, high-lying regions differently from low-lying regions. Above all, the small-scale effects of climate change have not yet been thoroughly investigated. It is evident that climate change is already in progress. The fluctuation margin of the possible global temperature increase by the year 2100 lies between 1.1 – 6.4 °C (IPCC, 2007). The Alpine area is likely to be more heavily affected than many other areas.

Therefore, preventing climate change must be one of the central objectives and tasks of spatial planning in the future. Spatial planning may have effects in terms of

- preventing emissions that affect the climate and
- binding gases (soil, plants) that affect the climate.

At the same time, spatial planning must react to the possible effects of climate change: avalanches, mudslides, rockfall, flooding, extreme weather events, etc. Danger zones suddenly extend to built-up areas; developed building land is exposed to higher, hard-to-assess risks that were not foreseeable at the time zoning decisions were made. Private insurance companies refuse to insure buildings in endangered areas, or raise premiums to such an extent that they become unaffordable.

It is therefore the task of spatial planning to anticipate hazards triggered by climate change, integrate them into planning and seek solutions for affected users. Spatial planning is a field of activity in which prevention and adaptation strategies are equally important. However, a differentiation must be made between plans and projects with spatial impact and spatial planning as such, since many important tools for the control of spatial development are not within the decision-making authority of spatial planning: revenue equalization between local authorities, land transfer tax regulations, tax subsidies for housing construction and business development. In these areas, spatial planning can formulate requests and demands, but is not in a position to realise them. In the Alpine area, the definition of competences differs from country to country and from region to region.

Figure 1:
Regional planning is called up on to respond to the growing threat posed by natural hazards.

In the following, an attempt is made to describe the avoidance and adaptation strategies that are within the immediate sphere of competence of spatial planning, pointing out key demands of spatial planning on tools and instruments outside its direct sphere of influence.

Figure 2:
Urban sprawl generates traffic and greenhouse gases that are harmful to the climate.

Spatial development is subject to regulation and control at various levels, supranational, national, regional and local. Basic principles, objectives and guidelines, which are often very general in nature and non-binding, are formulated at the supranational and national levels. The binding nature and the relevance of plans for the behaviour of enterprises, households and individuals within a space increase as the planning and decision-making level decreases. The most important spatial planning instruments are found at the regional and local levels. This is where conflicts of objectives and interests come to the fore, and these conflicts are the reason for the unfortunately wide gap between the expectations placed in spatial planning and the results actually achieved.

The Alpine region is not an administrative entity with common statistics; thus there are hardly any data for the Alpine region as a whole. The figures, data and research results used in the following were taken from Alpine countries, as it may be assumed that these data are transferable to the Alpine region overall.

3.1 SPATIAL PLANNING AND AVOIDANCE STRATEGIES

Spatial planning has a number of important competences as regards the implementation of avoidance strategies:

(1) Development of spatial and settlement structures that minimise distances travelled by car, enforce energy-saving development structures and building design, result in a coordination of settlement structures with district heating and cooling networks.

(2) Protection of real and potential sinks for climate-relevant gases by securing areas with high CO_2-binding capacity (e.g. moors, soils, forests, green areas), minimal expansion of surfaces sealed by buildings and infrastructure, enlargement of green areas by means such as renaturation, green roofs, planted yards, etc.

(3) Renewable energy zoning: windmills, photovoltaic, water power plants, biomass production.

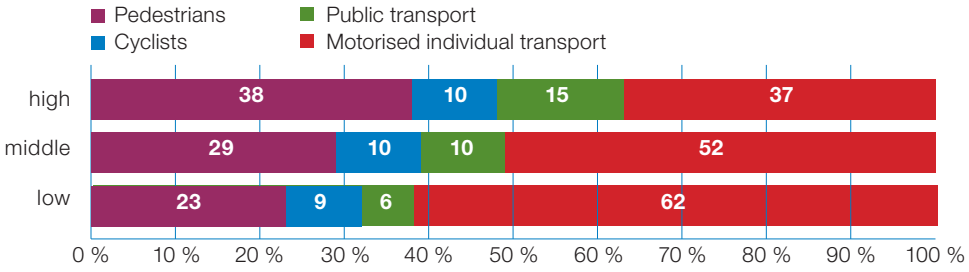
3.1.1 LARGE-SCALE DESIGN OF TRAFFIC-REDUCING SETTLEMENT STRUCTURES

The goal of organising the spatial distribution of inhabitants, workplaces, shopping and leisure time facilities in a manner that reduces traffic to a minimum requires measures at both the regional and the local level. Activity patterns need to be designed in a way to keep the routes between destinations as short as possible, while at the same time securing easy access by public transport at reasonable costs.

Numerous mobility studies provide clear evidence of the correlation between spatial structures and traffic development:

Figure 3:

Modal split of distances travelled by urbanity classes in Germany in 2002.

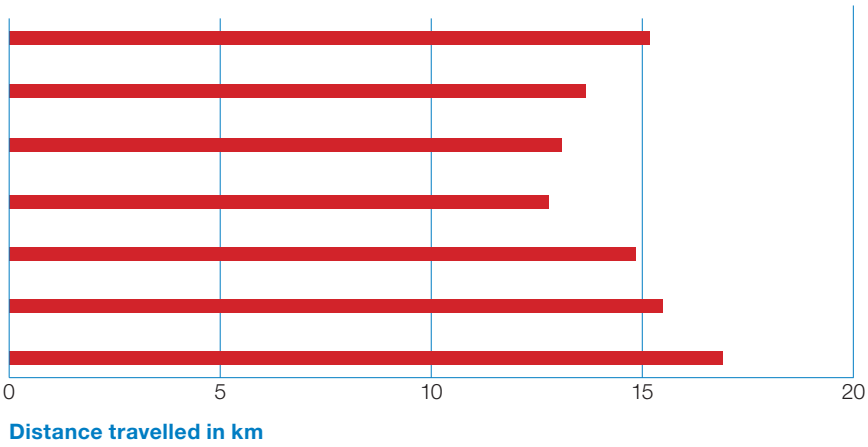


Source: Oeltze S., Bracher T. u. a. (2007): Mobilität 2050 – Szenarien der Mobilitätsentwicklung unter Berücksichtigung von Siedlungsstrukturen bis 2050

In small urbanised areas, the share of motorised individual transport (MIT) is almost double that of highly urbanised areas. The average distances travelled by means of motorised individual transport also depend on the spatial structure:

Figure 4:

Average distances travelled by means of motorised individual transport by municipality size in Germany in 2002.

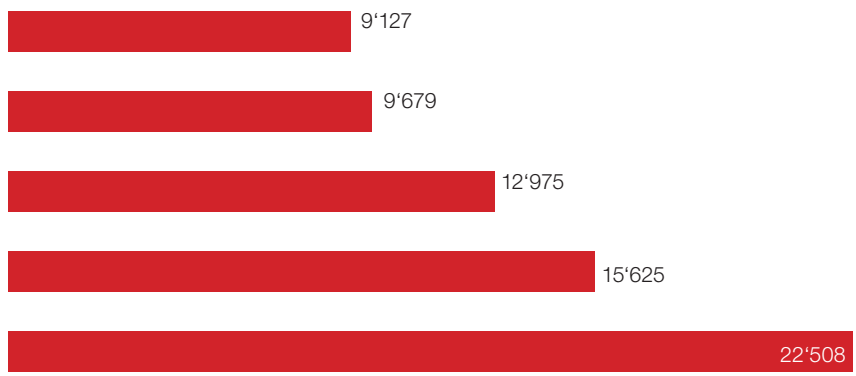


Source: Oeltze S., Bracher T. u. a. (2007): Mobilität 2050 – Szenarien der Mobilitätsentwicklung unter Berücksichtigung von Siedlungsstrukturen bis 2050

Average MIT distances are the longest in small rural communities and the shortest in towns with 20,000 to 100,000 inhabitants. Many Alpine towns lie in this category. The significance of settlement structures in terms of car traffic volumes is best shown by an illustration of distances covered by car per household:

Figure 5:

Settlement structure and average distances travelled by private car per household in km/year in Germany.



Source: Hautzinger N., Heidemann D. Krämer B. (1999): Räumliche Struktur der Pkw-Fahrleistung in der Bundesrepublik Deutschland – Fahrleistungsatlas – Institut für angewandte Verkehrs- und Tourismusforschung e. V. (IVT), i. A. d. Bundesamtes für Bauwesen und Raumordnung (BBR), Bonn.

Figure 6:
Urban development structure with low-impact traffic based on a decentralised concentration.

Distances covered by car per household are perceptibly lower in the densely built-up core cities with predominantly multi-storey residential buildings than in the affluent areas outside core city boundaries, which are characterised by a high share of single-family homes. Even higher are distances covered by car per household in low-density areas that are not in the immediate vicinity of large centres.

In a society based on the division of labour and characterised by a growing individualisation of needs and wants, the goal of achieving traffic-reducing settlement structures can only be reached with settlements answering to minimum size and density requirements. Numerous studies show that the «decentralised concentration» concept is the ideal vehicle to reach this goal. As the example of the Frankfurt am Main region illustrates, an optimised allocation of living and working infrastructure based on future settlement growth within a concept of decentralised concentration enabled a reduction of distances travelled by automobile (person kilometres) by 63% as compared to the trend for the year 2025 (Motzkus 2002).

The significance of settlement structures on car traffic volumes is also evidenced by Austrian consumer survey data: owing to the higher density of cars and more extensive car use, transport expenses of households in sparsely populated regions exceed those of households in more densely populated areas by about one third.

Household spending in the sub-category «Public transport», by contrast, is the highest in densely populated areas. Optimising the large-scale distribution of inhabitants, jobs and other spheres of activity hence opens up a huge potential for avoiding individual car traffic and thus reducing climate-effective emissions.

Exploiting this potential would require a policy aimed towards the development of small and medium-sized towns instead of decentralised village structures with inadequate public transport connections and located far away from job centres. These demands are not solely directed to spatial planning as such, but also to the relevant sectoral policies (e.g. financial, economic, housing policy):

(1) Revenue equalization

In Austria, the systems of revenue equalization between local government authorities differ from Land to Land. Arrangements must therefore be considered individually for each Land. Whatever the case, locations that offer comprehensive services for their environs should receive higher allocations in the process of revenue equalization among local government authorities. However, revenue equalization is a negotiation process that is conducted by the financial departments of the local government authorities and is thus a politically sensitive matter.

(2) Housing subsidies and homeowner allowances

This is a controversial instrument, both politically and in terms of content,

Figure 7:
Second homes are a principal cause of urban sprawl, especially in tourist resorts.

Figure 8:
Low levels of building density are synonymous with subsidising climate change.

and in some countries, it has been scaled back (Switzerland) or even abolished (Germany). Other countries prefer targeted support programs in housing policy (France). This method can be used very effectively as a means of influencing residential location development.

(3) Public sector investments in the development of business locations and business development

Municipalities often compete for businesses. This leads to plant and businesses being set up at locations far away from railway connections and reachable only by car. The development of business locations can be made contingent on a sustainable organisation of mobility wherever public sector infrastructure investments (or subsidies) are involved.

(4) Controlling the construction of second homes

The proliferation of second homes is an issue of special relevance in the Alpine region. While just under 12% of all residential units are second homes on a general Swiss average, this share rises to 25-40% in the large Alpine tourist cantons (Grisons, Valais, Ticino). In communities with very intensive tourism, second homes often account for more than 50% of total residential units (Mühlinghaus 2006).

Second homes are an important component of the range of tourism products and services, but their capacity utilisation reaches a mere 10% to 15% (Mühlinghaus 2006). At the same time, they compete with commercial accommodation providers and their contribution to regional value added is low. In terms of their climate relevance, these so-called «cold» beds have an impact mainly in so far as the increasing development of the rural landscape gives rise to soil sealing and additional traffic. Regional planning has practically no functioning intervention instruments at present, because existing regulations are easily bypassed or set aside (Seidenberger 2006, c.f. also Chapter 2.1.2).

(5) Better visibility of true costs and implementation of the costs-by-cause principle in the provision of transport and technical infrastructure

A number of studies provide evidence that the development costs of traffic, technical and social infrastructure increase markedly with lower building density and the greater the settlement sprawl into the countryside. The true costs, however, are borne only in part by the beneficiaries of the infrastructure. On the Austrian average, only about 37% of the investment costs of road, water supply and sewage systems are borne by their actual users (Doubek 1999).

16% of these costs are paid by the municipality, which is responsible through zoning and development planning for the settlement sprawl into rural landscapes. The major share of these costs, namely almost 50%, is borne by the federal and Land governments. Moreover, federal and Land governments pay 82% of the costs of social infrastructure (transport support for children, school transport and home care services), while the

municipalities and the clients each pay for only 9% (Doubek et al 2001).

For Switzerland, a study compiled by Ecoplan (Ecoplan 2000) shows that the spatially dispersed sprawl of low-density settlements gives rise to costs per head for water supply, wastewater disposal, transport and electricity supply infrastructure that are up to three times higher than in densely populated settlements with inward development. Also in Switzerland, the systems of fees and charges in many cases do not yet sufficiently account for the originators of the costs, and the latter are therefore subsidized by the inhabitants of densely populated areas.

A recent German research project reported similar results for Germany (Dittrich-Wesbauer et al 2008). The follow-up costs for the development of dispersed low-density settlements in part even exceed the production costs, but can hardly be allocated to the originator of the costs.

Hence, the inhabitants of less densely populated areas are subsidized from two sources: firstly from general tax funds, secondly by the inhabitants of densely populated areas, because the systems for calculating the fees and charges for public services (water, sewage, energy) fail to take the specific settlement conditions into account. The higher costs of supply in thinly populated areas are distributed among all consumers. These framework conditions encourage and promote urban and rural sprawl and essentially translate into a subsidy for climate change.

The behaviour of the actors under these framework conditions is rational. The rural municipalities endeavour to retain inhabitants and jobs and attract new ones by providing an excessive offer of cheap building land, as tax and financial equalization revenues as well as the economic viability of technical and social infrastructure depend on the number of inhabitants and jobs. This approach works as long as a well-developed road network and cheap fuel ensures that urban centres remain within easy reach; but settlements continue to sprawl, distances travelled by car are still rising and greenhouse gas emissions increasing.

This gives rise to a central conflict of spatial policy objectives: objectives like maintaining rural community structures, preventing migration from rural areas, population drain and depletion necessarily clash with climate policy objectives as long as car traffic is one of the major causes of climate change and there is no overall coverage with adequate public transport services (c.f. also compact Transport).

3.1.2 COMPACT DESIGN OF SETTLEMENTS

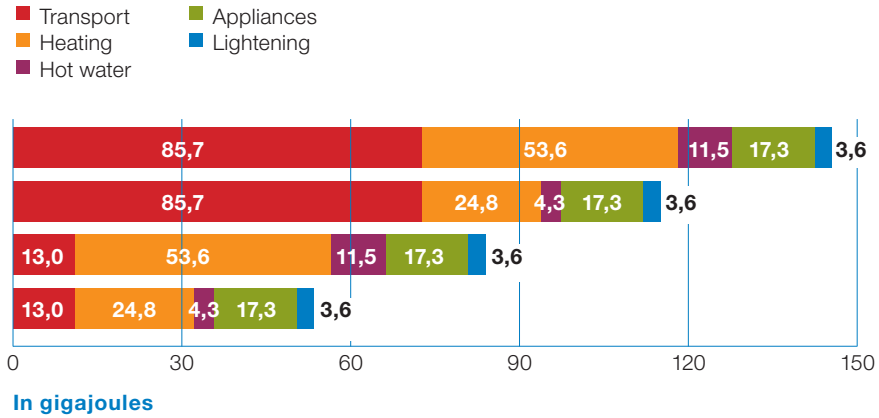
The adverse effects of dispersed settlement structures, which are disadvantageous both in climate policy and macroeconomic terms, are further aggravated by unorganized building structures like the detached single-family houses, car-oriented shopping centres and greenfield business locations. The largest avoidance potential and the lion's share of synergies with other sustainability goals can be unlocked by compact settlement structures, high densities, structures oriented on the availability of public

transport, a good mix of functions and an energy-optimised arrangement of buildings:

- they generate less car traffic and thus fewer climate-impacting emissions;
- costs for technical and social infrastructure are substantially lower; they comply with the requirement of economical use of unsealed land,
- the preservation of agricultural land and CO_2 sinks;
- they help to reduce the energy consumption of buildings and hence climate-impacting emissions.

The comparison below shows the marked difference made by a dense, well-mixed settlement structure in which inhabitants are not compelled to use cars:

Figure 9:
Annual energy consumption of households.



Source VCÖ (2005): Fokus Energieeffizienz im Verkehr. Wien

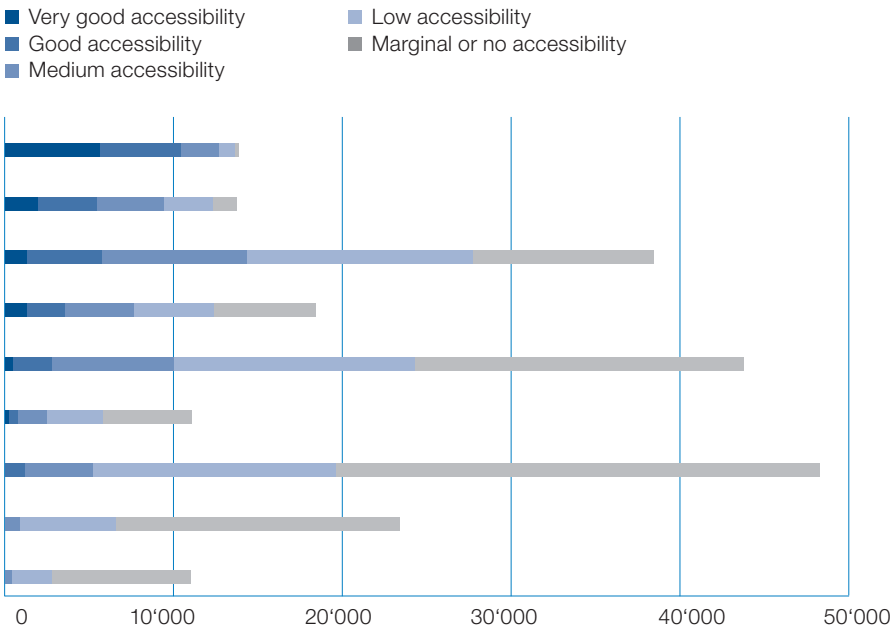
A household in a low-energy house located in the open countryside generates more CO_2 emissions if mobility consumption is taken into account than a household in a traditional house if the location permits the inhabitants to do without a car.

Motorisation was the key factor that first triggered the urban and rural sprawl of single family homes and the «remote supply» instead of «local supply» with basic services. Between 1830 and 1950, the settlement area per resident remained almost constant (Doubek 2002).

In Switzerland, the population increased by 7.7% from the end of the 1970s to the mid-1990s while the settlement area expanded by 13.3% (BFS 2001). The main reasons for the area increase were single and two-family homes (30.1% of the increase) and space used for traffic (23.4%). This development is likely to continue because almost 25% of the land zoned for building in Switzerland has not yet been built up. The main part of these still undeveloped areas is zoned for housing purposes and the largest share of these areas is located in rural communities. Furthermore, large areas of land zoned for building are often located in unsuitable locations (ARE 2007).

Figure 10:

Accessibility of land zoned for building by public transport in Switzerland.



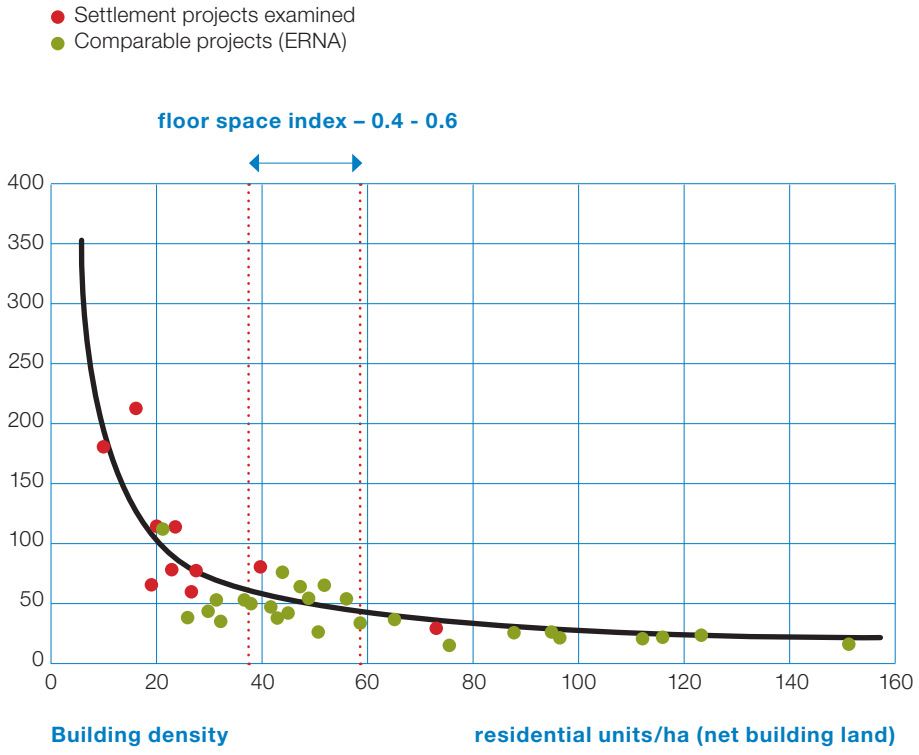
Source: Bundesamt für Raumentwicklung ARE (2007): Bauzonenstatistik 2007. Bern

In Germany, the settlement and traffic area per resident increased from 498 m^2 at the beginning of the 1990s to 569 m^2 (+ 14.3%) by 2007. The share of high-land consumption of single and two-family homes in the total area occupied by new residential buildings surged from 39.6% (1995) to 66% (2007)!

Numerous empirical surveys evidence the correlation between building density, building structure and soil sealing.

Figure 11:

Correlation between building density and size of developed area.



Source: Dittrich-Wesbauer A., Krause-Junk K, Osterhage F. (2008): Kosten und Nutzen der Siedlungsentwicklung. Hrsg.: Institut für Landes- und Stadtentwicklungsforschung und Planersocietät. Dortmund

The demand for development land increases strongly as of a floor area ratio (total floor area/site area) of 0.4 to 0.6 (estates of terraced houses). Detached housing estates have a floor area ratio of 0.1 to maximum 0.4 and are thus characterised by very high land consumption for internal development.

Building density is also a decisive factor for the affordability of distant heating and cooling systems (heating in winter, cooling in summer), which contribute substantially to improving the efficiency of power plants.

The position, alignment and orientation of the buildings are very important from the viewpoint of passive and thermal solar energy utilisation and the use of photovoltaics.

A compact design of building structures is assessed as positive without qualification not only as per climate-related considerations, but also from the viewpoint of economic and social sustainability:

- Macroeconomic costs involved in the development of traffic, technical and social infrastructure are reduced.
- Energy production facilities and public transport systems can be operated more efficiently and at lower cost.
- Costs for public sector infrastructure are distributed in a socially more equitable and fairer manner.

In contrast to development planning of large-scale settlement structures (see Chapter 3.1.1), spatial planning has the necessary instruments to influence development structures: Regional development programmes including definition of settlement boundaries, land use planning and zoning, urban land use planning and development planning.

In all Alpine countries, a clear mandate for a space-minimizing design of settlement structures can be derived from policy definitions at the national and supra-regional level.

In the protocols concerning «Spatial planning and sustainable development» and «Soil protection» for the implementation of the Alpine Convention, the Alpine countries declare their commitment to the «prudent and rational land use» by «space-saving and soil-conserving building». Inward settlement development is to be promoted and outward expansion of residential areas restricted. Some countries have even defined binding and non-binding quantitative goals:

- Germany: Reduction of land consumption for residential settlements from 90 ha in 2002 to 30 ha in 2020 (binding).
- Switzerland: The settlement area is to stabilize at 400 m^2/per resident (non-binding).
- Austria: Reduction of land consumption for residential settlements to 10% of the 2002 level by 2010 (binding).

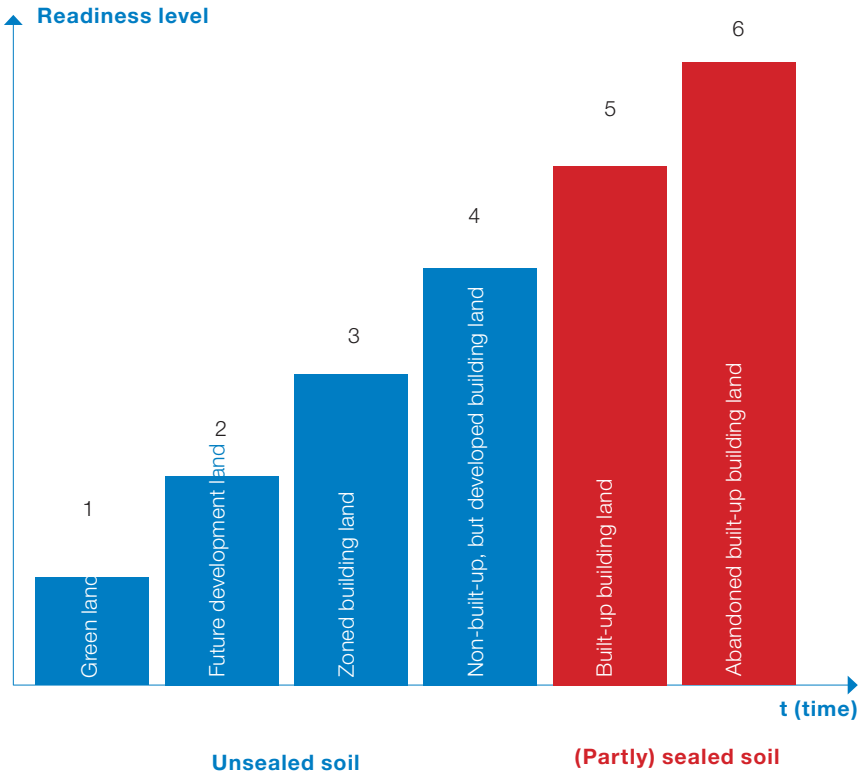
But these objectives will not be attained and will even be missed outright

Figure 12:
Compact settlement structures are not just beneficial in terms of climate policy; they also have an unreservedly positive effect on economic and social sustainability.

despite these basic and in some cases binding commitments (regional planning laws, government resolutions). Rather, the dynamics in the opposite direction have actually increased in some areas as the figures above show.

There is no lack of concrete measures developed and put up for discussion by science and expert bodies. More than seventy measures covering all intervention levels of the so-called «building land steps» are ready for implementation. A coordinated set of regulatory policies and measures, monetary instruments and awareness-enhancing activities will be required across all these levels to attain the objectives of prudent and rational land use (Weber 2009):

Figure 13:
Intervention levels for space-minimizing spatial development.



Source: Weber G. (2009a): Raumplanerische Interventionen – neue Orientierungen im Labyrinth der Möglichkeiten. In: Forum Wissenschaft & Umwelt (Hrsg.): Wissenschaft & Umwelt 12/2009.

Below, possible measures are listed by way of example:

(1) Regulatory instruments

- Time limits on the utilisation of designated building land combined with rezoning to green land.
- Mobilisation of unused building land by means of land use contracts.
- Definition of building densities in land use plans.

(2) Monetary instruments

- Higher subsidies for space-minimizing residential buildings, reduction or abolition of housing subsidies and first-home buyer allowances for single family homes.

- Introduction of cost-covering development and maintenance contributions for developed but unused building land.
- Introduction of land-use certificates: the municipalities are given limited rezoning rights and these can be traded on a building land exchange (Seidl et al. 2009).
- Introduction of a tax on value added (levy on value added): the tax on value added is contractually fixed between the land owner and the municipality. Up to a predetermined share (in Switzerland up to a maximum of 60% based on a Federal Supreme Court ruling), the increase in value due to a rezoning of land can be levied by the municipality. The Canton of Basel City for instance levies 50%.

(3) Raising awareness and information

- Documentation of development costs for land rezoned as building land by the municipalities.
- Documentation of minimum availability of public transport for land rezoned as building land.
- Establishment of a register of vacant building land, management of vacant sites.
- Preparation of information material and awareness raising measures for local political representatives.

Why have targets set by political bodies and the proposals of experts so far failed to have an effect? There are two central causes:

(1) The macroeconomic, ecological and climate-related costs of a space-intensive settlement sprawl are pitted against numerous individual benefits and interests.

(2) The bulk of important land use policy decisions are taken at the small-scale local government level. On this level individual benefits and interests override macroeconomic and global (warming) considerations.

Individual benefits and interests are factors taken into account on both the demand and the supply side of land:

Demand:

- The free-standing single family home, villa or chalet are the preferred type of home in large parts of the Alpine region.
- Second homes in attractive landscapes allow combining capital investment and wealth formation objectives with opportunities for additional earnings and personal benefits.
- The declining demand for agricultural land entails higher availability of cheap building land in greenfield locations.
- The accessibility of central institutions, facilities and jobs by car (well developed road network, cheap fuel, increasing motorisation) allows people to build in locations away from existing compact building structures.

Supply:

The municipalities are interested in population growth and creating jobs

as the inflow of direct revenues (taxes, fees and charges) and indirect revenues (equalization payments) depends on these factors. Municipalities competing with each other dedicate building land largely in compliance with individual demands and above and beyond actual local requirements.

Building land is designated in the interest of agricultural enterprises:

- to allow for settlements with heirs who have renounced succession rights and for the construction of parental homes (dwellings for retired farmers);
- to allow for capital procurement and solving financial problems (higher sales prices for building land, collateral for mortgages).

In small communities, in particular, the proximity of the actors gives rise to incompatibilities and conflicts of interests. Unsuitable locations are rezoned as building land, new rezonings are approved even though sufficient reserves are still available. Considering the complex constellation of different interests and individual benefits involved at the small-scale decision-making level, it is hardly surprising that no «common ground» can be found to realise overall objectives. Reassigning competences to the higher spatial planning level, however, would imply a serious interference in the municipalities' sphere of competences. This is where democratic conflicts of interest come into play.

Figure 14:
Area-based solar thermal collectors pose new challenges to regional planning.

In Switzerland, the «People's initiative for man and nature» (the so-called «landscape initiative») emerged in 2007 in response to the failure of spatial planning policy. Its objective is to enforce a constitutional guarantee that the overall size of land designated for building will not be expanded for a period of 20 years. Whatever its outcome, this initiative has helped to enhance public discussion of this topic and increase pressure on political decision makers.

3.1.3 PROVISION OF SPACE FOR SOURCES OF RENEWABLE ENERGY

The provision of space for renewable sources of energy such as windmills, photovoltaic facilities, water power plants as well as biomass is a new task for spatial planning. The following activities of spatial planning and land use planning can support the regionalised supply of energy from renewable sources:

- Legal anchoring of climate protection and energy security in spatial planning law to legitimate regional and local activities.
- Adapting building codes and regulations to ensure optimum utilisation of solar energy in new building and building refurbishment.
- Preparing an improved basis for decisions regarding site assessments for energy production plants.
- Determining concrete locations of energy production plants in legally binding plans.
- Cooperation / coordination in drafting regional / local energy concepts / energy policy mission statements.
- Compiling criteria for decision-making in the case of disputes over land use and conflicts of interest with other protection goals.

3.2 SPATIAL PLANNING AND ADAPTATION STRATEGIES

Spatial planning must also contribute to the implementation of measures to adapt to climate changes that cannot be stopped and have become unavoidable. The role of spatial planning, the type of measures, the mode of interaction with other sectors are currently being studied and discussed in research projects for the Alpine area (e.g. CLISP – Climate Change Adaptation by Spatial Planning). Spatial planning can and must make essential contributions with respect to the following effects of climate change:

(1) Dealing with new and aggravated climate-related natural hazards on the basis of hazard zone plans / hazard maps. This includes the following measures:

- Rezoning of building land located in new hazard zones
- Securing of areas for additional protective measures: expanding water retention areas, flood dams, avalanche protection and torrent control)
- Specifying hazard protection regulations in building regulation plans: e.g. roof inclinations, roof loads, prohibition zones for storage and use of hazardous substances in basements and ground floors

(2) Prevention of heat islands in densely built-up core cities. This includes the following measures:

- Study and formulation of basic microclimatic conditions in the context of new planning for large-scale development areas
- Securing large-scale fresh-air corridors
- Securing green areas of sufficient size, promotion of green roofs, planting of inner courtyards, facades and roadside areas

Climate change as a risk factor requires a fundamentally new approach to hazard zone planning. In the future, plans for hazard zones must be conceived as risk zone plans. The probability that a hazard will actually occur cannot be assessed. Risk premiums for climate change must be negotiated (see Chapter 5.5). Planning decisions can no longer be based on past experience. This requires a social dialogue in which spatial planning is involved as one of many actors (see also compact Natural Hazards).

As regards the implementation of adaptation measures to climate change, spatial planning still faces a number of challenges:

- Existing climate models still fail to permit regional and small-scale assessments regarding the effects of climate change. However, in the case of conflicts of interests legally binding decisions require substantiation by well-founded expert opinions. For this reason, hazard zones are still defined on the basis of actual disaster records (30-year flood ing records, etc.).

- Hazard zone and risk plans are compiled by experts and then incorporated into land use planning. But for many areas there are still no hazard zone plans (e.g. Switzerland: avalanches 90%, water 50%, mudslides 40%).

- Preventive protection measures (e.g. water retention areas) must be implemented in areas and by communities, which do not benefit from these measures but rather experience disadvantages (restrictions on use, costs). What is needed are regional concepts at a level that extends across communities and which provide for an equitable trade-off between costs and benefits. However, generally applicable models are still lacking (see also Chapter 3.4).

Figure 15:
Regional planning is called upon to take greater consideration of the threat posed by natural hazards.

In recent years it was mainly due to flood disasters that regional planning laws were amended and hazard zone plans have become a more or less a binding standard in building land zoning processes (e.g. Switzerland, South Tyrol/Alto Adige, Bavaria, Upper Austria, etc.). In the Protocol on the Implementation of the Alpine Convention Relating to Spatial Planning and Sustainable Development the Alpine nations also entered a contractual commitment «to determine the areas subject to natural hazards, where building of structures and installations should be avoided as much as possible».

An important supplement would be to include a binding provision ensuring that climate effects and measures are taken into account within the context of a strategic environmental assessment of concepts and plans. Regional spatial and development concepts dealing with protection concepts and trade-off mechanisms at a supra-municipal level could serve as additional instruments for integrating adaptations to climate change (also see Chapter 5.5).

3.3 CONFLICTS OF OBJECTIVES AND SOLUTIONS

3.3.1 CONFLICTS OF OBJECTIVES

The implementation of spatial planning strategies to prevent climate change and adapt to unavoidable effects of climate change gives rise to a number of serious conflicts of objectives:

- Promoting traffic-reducing large-scale structures may well run counter to the objective of reducing disparities between urban and rural areas, prospering and disadvantaged regions. More than elsewhere, this could entail increased out-migration and the erosion of services of general interest in peripheral regions and small communities. The topics of «retreat» and «shrinkage» must be increasingly discussed especially against the background of climate change in the alpine region. Spatial planning could play a new role here: as active companion and designer of retreating processes as well as a mediator on negotiations on this topic that require particular sensitivity (Weber 2009b).

- Reducing the spatial planning competences of communities may be in conflict with democratic policy objectives and the municipalities' right to self-determination. Any such measure is likely to encounter fierce opposition especially in the Alpine region with its tradition of self-determination and autonomy of smaller spatial entities.

- A conversion of hazard zone plans into risk zone plans based on assumptions regarding future developments is likely to come up against acceptance problems.
- Expanding the use of renewable energy may be in contradiction with other objectives: nature conservation objectives, bio-diversity objectives and other uses (e.g. food production).

3.3.2 POSSIBLE SOLUTIONS

To some extent, Alpine settlement structures provide a good basis for a low-traffic development approach. The linear Alpine valleys offer ideal conditions for a public-transport-based structure. The Alpine cities and towns are in line with the concept of decentral concentration and are characterised by traditionally compact design of building structures. The objective must be to strengthen these structures and to prevent any further sprawl of single family houses to areas that cannot be reached by means of public transport. In remote village structures, any settlement expansion should be subject to the mandatory requirement of compact design of building structures.

Figure 16:
Independent development is contingent upon regions strengthening their capacity for governance.

In peripheral areas, a priority goal must be to further regional economic development to minimize commuting to distant job locations. At the same time, social capital in these areas needs to be strengthened to ensure that functioning community institutions create the basis for sustainable autonomous development. The municipalities' right to self-determination in matters related to spatial planning should be linked to a strong incentive/disincentive system. Financial assistance, budget allocations, permissions granted by higher administrative echelons must be linked to provisions to ensure space-minimizing settlement development.

A huge challenge is posed by the conflicts arising from a clash of interests between the utilisation of renewable energy sources (water, wind, biomass), nature protection and other uses (forestry, tourism, hunting, energy industry, etc.). Here, spatial planning must assume the role of a mediator/conflict manager and ensure a fair participation of all interests involved. This also applies with respect to expanding hazard zones to risk zones by taking into account not only probabilities derived from past experience but also the future likelihood of natural disaster (risk premiums for climate change).

A basic prerequisite for the successful implementation of avoidance as well as adaptation strategies in spatial planning is definitely to be seen in pro-active public relations work that effectively communicates the need, the purpose and the effects of strategies and measures.

4

CONCLUSIONS

Spatial planning is an instrument that may contribute to preventing and reducing climate-relevant emissions in other sectors (transport, energy). Spatial planning is also important to ensure that CO_2-binding capacity is preserved (unsealed soil, green areas, plants). Finally, spatial planning will have to assume an important role in supporting adaptation to irreversible climate changes by making provisions for hazard zone planning and micro-climatic requirements (heat islands, fresh-air corridors). The required instruments are largely available and the measures are already known, since most of these measures, apart from serving climate protection goals, have various other macroeconomic, social and ecological advantages. In most Alpine countries and regions, the spatial policy objectives relevant for preventing climate change are already laid down in superordinate concepts. However, conflicts of objectives with individual economic and personal interests are usually decided to the disadvantage of spatial policy objectives. The reason for this lies in the logic on which the system as a whole is based, as in this system the main decision makers in matters related to spatial policy – the municipalities – act rationally from their point of view if they do not observe the superordinate objectives of spatial planning.

It may sound paradoxical, but from the viewpoint of spatial planning the need for climate protection presents an opportunity to implement measures that have long been on the agenda.

However, there are a number of very fundamental conflicts of objectives. Spatial planning that is focused on climate protection and hence on reducing traffic and land consumption comes into conflict with goals aimed at reducing spatial disparities, above all, between urban and rural areas, centres and peripheral locations. The relocation of decision-making competencies from municipalities to superordinate institutions, though functionally significant, involves a democratic dimension.

What is needed in this situation are new instruments, above all, new forms of cooperation and task-sharing between all the actors involved: higher-level authorities, municipalities, real estate developers, builders and the population. Besides the classical spatial planning instruments (plans), new approaches can be followed to reach old goals: private law contracts, requirements linked to subsidies, the granting of approvals given subject

to compliance with quality standards. Best practice examples show that successful models are already in use.

A central factor in this context is that the required knowledge and information be made available. We must succeed in getting the message across to the players involved – municipalities, investors, real estate developers, households – that sustainable spatial development is not only important for climate protection, but may even generate substantial additional benefits, lead to material cost-cutting and contribute to social justice.

Since the Alpine region more heavily affected by climate change than others, it is challenged to assume a pioneering role in this respect.

GOOD PRACTICE EXAMPLES

The following presents a number of select examples that illustrate how climate protection can be integrated explicitly or implicitly into spatial planning instruments or instruments with high spatial relevance. Whether these are transferable to other regions will have to be examined in the individual cases as the legal systems differ from one Alpine country to another. Since an evaluation of the concepts or measures is available only in a very few cases, effects achieved and costs incurred can only be presented in qualitative terms.

5.1 LARGE-SCALE DESIGN OF A TRAFFIC-REDUCING SETTLEMENT STRUCTURE

The new Swiss spatial development concept contains several elements that support the development of a traffic-reducing settlement structure:

- A polycentric network of urban and rural centres with strong metropolitan regions;
- A dynamic directed towards conurbations.

This concept, however, is only for orientation. Its operationalization is largely left to the individual cantons, municipalities and different fields of sectoral policy.

Figure 17:
Many players are working together to achieve an urban development structure with low-impact traffic.

5.2 INTEGRATED OVERALL CONCEPTS

5.2.1 BOLZANO: STRATEGIC DEVELOPMENT PLAN FOR A SUSTAINABLE FUTURE AND «CLIMATE PACKAGE»

The City of Bolzano has agreed on a «climate package» which defines attaining «climate neutrality» within the next ten years as a priority goal. This means that the city will then be allowed to generate just the amount of CO_2 which it is able to bind by natural processes within the city boundaries. To this end, the Strategic Development Plan for the City of Bolzano defines a number of important requirements concerning spatial development:

Creating a multipolar and multifunctional city through measures such as

- developing the area of the railway station to a model climate district,
- recovering abandoned structures for residential purposes (internal development).

Realising a «sun city» through measures such as

- developing a distant heating /distant cooling network,
- revising the building code.

Creating the «Climate City/Città Clima» through measures such as

- constructing new buildings under strict adherence to the «Climate House» standards,
- promoting the adaptation of existing buildings to «Climate House» standards.

Measures aimed at promoting sustainable mobility such as

- promoting car-sharing and car-pooling models,
- implementing collective on-demand mobility services,
- establishing a professional mobility management.

In recognition of this ambitious project and the measures already implemented Bolzano was awarded the title of «Alpine town of the year 2009».

www.alpenstaedte.org (de/fr/it/sl/en)
City of Bolzano: Strategic Development Plan for the City of Bolzano

5.2.2 LES GETS PROJECT VILLAGE

A best practice example for an integrated approach to climate change is the «Les Gets Project Village 2003 – 2013»:

Les Gets in the French Alps has developed an action plan for climate protection and started to implement it. The action plan includes a three-year moratorium for building permits. Strict ecological standards were defined with regard to social housing and a wood-fired power station was built together with a distant heating network.

www.cipra.org/ccalpsresearch/LesGetsprojet-village-2003-2013
(de/fr/it/sl/en)

5.3 DESIGN OF ARCHITECTURAL PROPORTIONS AND STRUCTURES

The architectural proportions and structures of buildings are usually decided at the municipal level within the context of land use and building regulation planning. The section below presents a number of examples that have an influence on the behaviour of municipalities, but also of real estate and property developers.

5.3.1 HOUSING SUBSIDIES IN AUSTRIA

Figure 18:
Zoning and land-use plans are an effective development instrument.

In Austria housing subsidies are a powerful control instrument which heavily influences the behaviour of real estate and property developers. The award of subsidies, their volume and the ranking of projects by temporal eligibility can be linked to project standards. In many cases, eligibility criteria in Austrian federal states are already linked to the energy consumption of buildings. Some states have also introduced standards aimed at achieving a higher development density:

Salzburg

Housing subsidies are graded by type of building. The highest rates are granted for the acquisition of apartments and terraced houses in buildings with a minimum of three residential units and a maximum land consumption of 350 m^2 per unit. Independent single-family homes are subsidised at the lowest rate. Premiums are granted for energy-related ecological measures, e.g. for use of biomass or waste heat utilisation and connection to a distant heating network.

www.salzburg.gv.at/themen/sir_haupt/sir_wohnen/sbg_wohnbaufoerderung.htm (de)

5.3.2 CASSINETTA DI LUGAGNANO (PROVINCE OF MILANO): SOIL PROTECTION THROUGH ZERO GROWTH OF BUILDING LAND

The municipality Cassinetta di Lugagnano (1800 inhabitants) in the catchment area of the metropolis of Milano exhibits high in-migration pressure. In 2007, the municipality approved a plan which provides for no further zoning of building land. Instead the municipality promotes renovation and condensation within existing settlement limits. This «zero growth policy» was put up for discussion in public meetings with the inhabitants. The political decision-makers responsible for the plan were confirmed in their offices by a large majority of votes.

Source: CIPRA Italia

5.3.3 INTERCOMMUNITY COOPERATION

An important factor furthering rural sprawl is competition between municipalities for inhabitants and jobs and the corresponding revenues. Cooperation between municipalities aimed at an equitable distribution of revenues, costs and burdens can contribute to the goal of achieving more compact settlement structures accompanied by less traffic and lower

land consumption.

Financial equalization between communities

In 2005, the Austrian Financial Equalization Act for the first time created the basis for several municipalities to enter an agreement regarding a distribution of municipal tax revenues from joint investments made to attract new business establishments or retain existing ones.

Source: Austrian Financial Equalization Act 2005, § 17, para. 1

INKOBA – Inter-communal business location in Upper Austria

The government of Upper Austria issues land use permits for new business and industry locations contingent on inter-communal location development. Several municipalities set up an association of local authorities which is responsible for selecting, developing and marketing the locations. The association is also charged with handling cost and profit-sharing matters.

www.inkoba.at (de/en)

5.3.4 PRIVATE LAW MECHANISMS

Dornbirn (Vorarlberg), Austria

The municipal land use policy of the municipality of Dornbirn links the award of building permits or the sale of land to energy and settlement structure-related criteria: minimum standards in terms of energy consumption, sparing use of building land and traffic development requirements (e.g. cycle path systems). Concrete agreements are laid down in sales contracts and building rights agreements.

Source: ÖROK (2009): Energie und Raumentwicklung.
In: Schriftenreihe Nr. 178.

Figure 19+20:
In Upper Austria decisions governing the settlement of new businesses is taken jointly by several municipalities.

5.3.5 LINKING OF DISTANT HEAT UTILISATION AND LOCAL DEVELOPMENT PLANNING

Bulle/Kanton Freiburg, Switzerland

The municipality of Bulle in the Canton of Fribourg has drawn up a municipal energy plan that includes a distant heat system in connection with a wood-fired plant with a capacity of 50 MW. Connection to the system may be made mandatory for new buildings.

Source: Boschung S. (2005): Freiburg lanciert kommunale Energiepläne. In: ARE (Hrsg.) Forum Raumentwicklung 1/2005. Bern.

5.4 SPATIAL DEVELOPMENT AND ENERGY PLANNING

5.4.1 INTEGRATING SPATIAL DEVELOPMENT PLANNING AND ENERGY SUPPLY

Swiss energy plan

The Swiss Energy Act (EnG of 26 June 1998; as amended 1 May 2008) provides for energy planning at cantonal level. The energy plan is to serve as a decision-making basis for measures regarding spatial planning, planning and design of plant and facilities and subsidisation measures. The cantonal energy master plans are binding for authorities, public bodies and state enterprises. Communal energy master plans are drafted on the basis of the cantonal energy plans.

Minergie promotion programme in the Canton of Valais

The Canton of Valais has introduced the Minergie energy efficiency standard for all public sector buildings. A planning bonus of 15% per site area is to create an incentive for private sector developers to apply this standard. Additional investments of 5% to 10% pay off thanks to this incentive.

Figure 21:
Regional planning is also an important planning instrument when it comes to energy.

Source: www.minergie.ch (de/fr/it/en)

Compilation and provision of spatial information for planning purposes
Solar cadastres enable the suitability of locations for utilising solar energy to be assessed. Their information content ranges from a rough breakdown in «sunny» and «shadowy» settlement areas (Tyrol 2008, Salzburg 2008) to an evaluation by global radiation criteria (Vorarlberg 2008) to precise roof-area evaluations of photovoltaic inclinations (Osnabrück 2008).

Source: ÖROK (2009): Energie und Raumentwicklung. In: ÖROK-Schriftenreihe Nr. 178
www.osnabrueck.de/sunarea
www.vorarlberg.at/solarkataster
Land Salzburg (2008): GIS-Online, Sonnenscheindauer

Swiss basic concept for wind park locations
A total of 110 potential locations were identified on the basis of a GIS analysis. They will be further filtered in the context of a broadly-based participation process. The selected locations will then be presented at the cantonal and the communal level.

Source: BFE, BUWAL, ARE (Hrsg.) (2004): Konzept Windenergie Schweiz. Bern.

Baden-Württemberg: Priority and exclusion areas for wind power plants
The State Planning Act for the Federal State of Baden-Württemberg commissions the competent regional associations in Baden-Württemberg to determine regionally significant wind power plant locations. These are then defined as priority areas, whereas the remaining areas are designated as exclusion areas for regionally significant wind power plants.

Source: State Planning Act 2003 for the Federal State of Baden-Württemberg (§11, para. 3 no. 11)

Land use category «wind power plants in green land» in Lower Austria
The Lower Austrian Spatial Planning Act provides for a separate zoning category for wind power plants, which is linked to the following criteria:

A defined minimum wind power density at the location and defined distances to individual building land/green land categories, municipal boundaries, residential farm buildings and buildings worthy of preservation located in green land.

Source: State of Lower Austria: ROG-NÖ 1976, State Law Gazette No. 13/77 as amended by State Law Gazette No. 72/07

Figure 22:
Wind farms need to be planned sensibly.

5.5 SPATIAL PLANNING AND ADAPTATION MEASURES

To date, there are hardly any concepts and plans that integrate definite measures for climate adaptation. A positive example is the Landscape

Structure Plan of Hochrhein-Bodensee. This plan contains a classification of micro-climatically relevant zones:

- Protection zones for areas that are relatively unaffected by bio-climatic impacts and air pollution as well as climate and immission protection forests
- Preserving and developing the air circulation systems of climatic compensation areas and slope wind systems.
- Restructuring and upgrading of areas affected by cold air congestion, malfunctioning air circulation systems and malfunctioning aeration corridors within settlement areas.
- Climate redevelopment areas.

Further measures are being defined for these zones.

There is also best practice that may be seen as indirect climate adaptation. This relates especially to protection concepts implemented in reaction to recent disaster events.

Integral flood protection in the Mangfall Valley (Rosenheim/Bavaria)
42 000 inhabitants live in the inundation area of the River Mangfall in the lower Mangfall Valley. The flood protection infrastructure is dimensioned for a 30-year flood (HQ 30). The potential damage given a HQ 100 event is one billion euros and hence the highest by far in Bavaria. In view of the increasing risk caused by climate change a comprehensive flood protection concept has been drawn up for the valley region. Envisaged measures include:

- Construction of a retention basin with a capacity that exceeds the HQ 100 volume and hence includes a climate change risk premium (plus 15% of HQ 100). beinhaltet (15 % zum HQ 100).
- Supplementary measures by means of flood control measures at lake Tegernsee (lake retention through optimised control), retention in all upstream areas, decentral retention in the entire catchment area.

Figure 23:
Flood protection in flood plains - adapting indirectly to the effects of climate change.

- Relocation of dykes back to the alignment line.
- Supplementary ecological measures (reactivation of old arms, renaturation, etc.)

An important prerequisite for successful implementation of the measures was targeted awareness-raising and involvement of the population as well as of the downstream and upstream municipalities in the planning process. The concrete measures include the introduction of the Flood Forum Mangfall Valley, target-project-specific community meetings and the Blue Riband initiative. 120 high water marks were set up throughout the settlement area with a view to achieving lasting risk awareness.

Sources: http://www.cipra.org/competition-cc.alps/WWARO (de)

Flood risk management-based spatial development plan (Schutzwasserwirtschaftlicher RaumEntwicklungsPlan (SREP)

A top-down instrument for the integration of flood risk management and spatial planning was developed in Carinthia. It simultaneously serves as a tool for handling conflicts at inter-municipal and regional level, as for instance between upstream and downstream municipalities.

Source: BMVIT, Lebensministerium (2009): Flood Risk II, Vertiefung und Vernetzung zukunftsweisender Umsetzungsstrategien zum integrierten Hochwasserschutz. Wien.

Abbildung 24:
Raising the public's awareness of specific issues and involving it in the planning process are often key to the successful implementation of any planning measure.

6

BACKGROUND INFORMATION

- **A current listing of links, further examples, and compacts on other topics available on www.cipra.org/cc.alps (de/en/fr/it/sl)**
- Akademien der Wissenschaften Schweiz (Hrsg.) (2007): Denk-Schrift Energie. Energie effizient nutzen und wandeln. Beitrag zur nachhaltigen Entwicklung in der Schweiz, Bern. www.akademien-schweiz.ch/Publikationen/Denkschrift_deutsch_komplett.pdf
- ARE – Bundesamt für Raumentwicklung (Hrsg.) (2007): Bauzonenstatistik 2007. Bern.
- BFE, BUWAL, ARE (Hrsg.) (2004): Konzept Windenergie Schweiz. Bern.
- BFS – Bundesamt für Statistik (Hrsg.) 2001): Bodennutzung im Wandel; Arealstatistik Schweiz, Neuchâtel.
- BMVIT – Lebensministerium (Hrsg.) (2009a): Flood Risk II TP9.3.2 Praktische Umsetzung künftiger Strategien gefährdungsarmer Raumnutzung – Interkommunale Kooperation. Wien.
- BMVIT – Lebensministerium (Hrsg.) (2009b): Flood Risk II, Vertiefung und Vernetzung zukunftsweisender Umsetzungsstrategien zum integrierten Hochwasserschutz. Wien.
- Boschung, S. (2005): Freiburg lanciert kommunale Energiepläne. In: ARE – Bundesamt für Raumentwicklung (Hrsg.): Forum Raumentwicklung 1/2005. Bern.
- Bucar, G. u. a. (2005): Dezentrale erneuerbare Energie für bestehende Fernwärmenetze, Energiesysteme der Zukunft. Wien.
- Dittrich-Wesbauer, A., Krause-Jung K., Osterhage, F. (2008): Kosten und Nutzen der Siedlungsentwicklung. Hrsg: Institut für Landes- und Stadtentwicklungsforschung und Planersocietät. Dortmund.
- Doubek, C., Zanetti, G. (1999): Siedlungsstruktur und öffentliche Haushalte. In: ÖROK (Hrsg.): Schriftenreihe Nr. 143. Wien.
- Doubek, C., Hiebl, U. (2000): Soziale Infrastruktur und öffentliche Haushalte. In: ÖROK (Hrsg.): Schriftenreihe Nr. 158. Wien.
- Doubek, C. (2002): Kräfteverschiebungen am Boden. In: RAUM: Österreichische Zeitschrift für Raumplanung und Regionalpolitik, Nr. 46, S. 20 - 23.
- Ecoplan (2000): Siedlungsentwicklung und Infrastrukturkosten. Bericht zu Händen des Bundesamtes für Raumentwicklung (ARE), des Staatssekretariats für Wirtschaft (SECO) und des Amtes für Gemeinden und Raumordnung des Kantons Bern (AGR).
- Friedwanger, A. u. a. (2005): KORS – Verkehrsreduktion durch kompakte Raumstrukturen. Wien.
- Hautzinger, N., Heidemann, D., Krämer, B. (1999): Räumliche Struktur der Pkw-Fahrleistung in der Bundesrepublik Deutschland – Fahrleistungsatlas – Institut für angewandte Verkehrs- und Tourismusforschung e. V. (IVT), i. A. d. Bundesamtes für Bauwesen und Raumordnung (BBR), Bonn.
- Land Salzburg (2008): GIS-Online, Sonnenscheindauer.
- Land Vorarlberg (2009): Wohnbauförderung: Wohnbauförderungsrichtlinien 2009/2010, Beschluss der Vorarlberger Landesregierung.
- Mezl u. a. (1999): Was kann Deutschland hinsichtlich eines forcierten Ausbaus der Kraft-Wärme-Kopplung von anderen Ländern lernen? Berlin.
- Motzkus, A. (2002a): Dezentrale Konzentration – Leitbild für eine Region der kurzen Wege? Auf der Suche nach einer verkehrssparsamen Siedlungsstruktur als Beitrag für eine nachhaltige Gestaltung des Mobilitätsgeschehens in der Metropolregion Rhein-Main. Bonner Geographische Abhandlungen 107.
- Motzkus, A. (2002b): Verkehrsvermeidung durch Raumplanung – Reduktionspotenziale von Siedlungsstrukturkonzepten in Metropolregionen. In: Internationales Verkehrswesen 54/3, S. 82 - 87.
- Mühlinghaus, S. (2006): Massnahmen der Raumplanung zur Lenkung des Zweitwohnungsbaus. In: ARE – Bundesamt für Raumentwicklung (Hrsg.): Forum Raumentwicklung 2/2006 – Tourismus im Alpenraum. Bern.
- Oeltze, S., Brachart, T. u. a. (2007): Mobilität 2050 – Szenarien der Mobilitätsentwicklung unter Berücksichtigung von Siedlungsstrukturen 2050. Edition Difu Stadt Forschung Praxis Band 1. Berlin.
- ÖROK (2009): Energie und Raumentwicklung. Schriftenreihe Nr. 178. Wien.
- Seidenberger, Ch. (2006): «Tourismusturbo» oder Wildwuchs – raumplanerische Chancen und Herausforderungen des Tourismus in Kärnten. In: ARE – Bundesamt für Raumentwicklung (Hrsg.): Forum Raumentwicklung 2/2006 – Tourismus im Alpenraum. Bern.
- Seidl, I., Schultz, B., Gellrich, M. (2009): Flächenzertifikate. Ein Instrument zur Senkung der Flächeninanspruchnahme? In: Forum für Wissenschaft und Umwelt (Hrsg.): Wissenschaft und Umwelt 12/2009.
- Statistik Austria (2006): Konsumerhebung 2004/2005. Wien.
- VCÖ (2005): Fokus Energieeffizienz im Verkehr, In: VCÖ (Hrsg.): VCÖ – Schriftenreihe Mobilität mit Zukunft 4/2006. Wien.
- Weber, G. (2009a): Raumplanerische Interventionen – neue Orientierungen im Labyrinth der Möglichkeiten. In: Forum Wissenschaft und Umwelt (Hrsg.): Wissenschaft & Umwelt 12/2009.
- Weber, G. (2009b): Schrumpfung als Planungsauftrag? Der gestaltete Rückzug als neue Planungsaufgabe. Vortrag an der CIPRA Jahresfachtagung am 18.9.2009, Gamprin (FL).
- Wegelin F. (2009): Raumkonzept Schweiz. Präsentation bei der 13. ÖROK-Enquete zum Auftakt des Österreichischen Raumentwicklungskonzeptes ÖREK 2011. 17.6.2009. Wien.
- **www.salzburg.gv.at/themen/sir-haupt/sir/wohnen/sbg-wohnbaufoerderung.htm**
- **www.inkoba.at**
- **www.osnabrueck.de/sunarea**
- **www.vorarlberg.at/solarkataster**
- **www.cipra.org/competition-cc.alps**
- **www.minenergie.ch**
- **www.alpenstaedte.org**