

# Climate Change and Alpine Spatial Development



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Climate change is posing specific challenges, but also opportunities for spatial development in the Alps. Some of which are Alpine-specific such as the question of water reservoirs for energy storage and the particularly high sensitiveness of the Alpine landscape in regard to wind turbine installations. Other spatial requirements are not limited to the Alpine context, but nonetheless relevant such as integrated settlement and transport infrastructure development.

Representatives of German spatial planning authorities have identified the following risks of climate change for their territory (font size according to the number of references).



There is an increasing need of balancing climate-change-related policy objectives and resolving target conflicts. Given the current momentum of climate change in the public debate, there is a danger of compromising equally relevant aspects of sustainable spatial development such as landscape values and conservation objectives. But there are also synergies with other socio-economic challenges e.g. regarding the adaption to demographic changes.

In spatial development, particularly regarding its formal instruments in the field of adaptation, a reliable data basis is indispensable. E.g. the effects of climate change on snow-reliability and snow-cover at lower Alpine altitudes is still being disputed. Warmer winter temperatures result in a higher moisture saturation of the atmosphere, which in return could bring about heavier snow-fall related to relief precipitation.

Climate change requires the adaption of spatial planning. The German Ministerkonferenz für Raumordnung (Ministry Conference of Spatial Planning) identified several main topics to deal with the challenges of climate change for spatial planning. The topics are differentiated in Climate Protection and Climate Adaption.

## Climate Protection

Climate protection means to take measures to reduce greenhouse gas emissions. Spatial planning provides many proven tools to support this goal.

### Integrated settlement and transport infrastructure development

- Minimising or avoiding traffic volumes through decentralised concentration of housing, supply, job opportunities and recreation
- Development of settlements within a certain perimeter of public transport stations
- Promotion of multimodal mobility along development axes and knots

### Climate-sensitive energy generation

- Coordinated regional concepts setting the framework for wind turbine and solar field locations in the Alps
- Biomass: Use of excess biomass / cultivation of energy crops



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## Preservation and development of carbon sinks

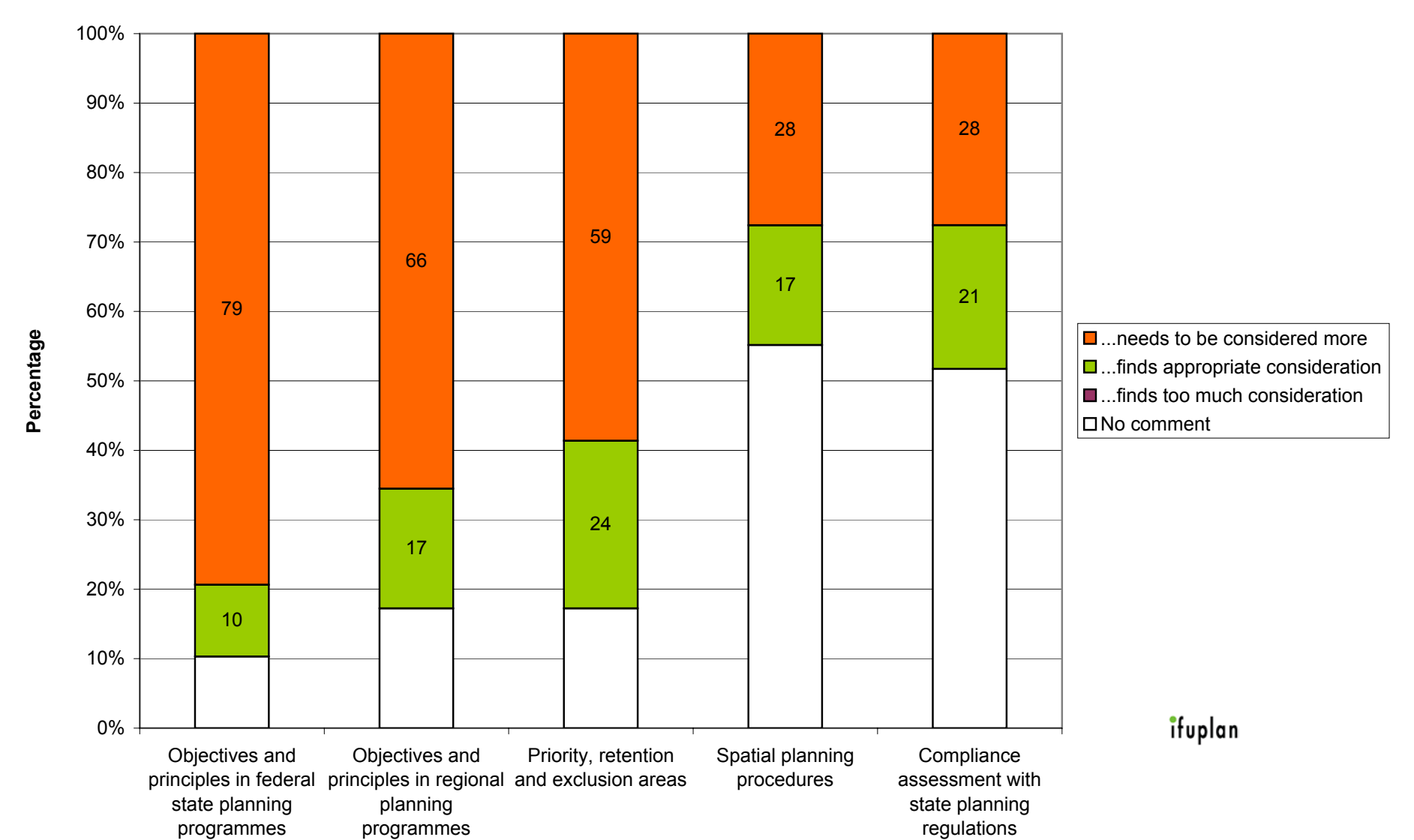
- Protection and renaturation of organic surfaces, particularly swamps, wetlands, humus soils
- Protection of old growth forests for carbon sequestration



Parts of these results are based on a study on the activities of spatial planning on federal state and regional level in Germany carried out for the German Federal Institute for Research on Building, Urban Affairs and Spatial Development (BBSR) and the German Federal Ministry for Transport, Building and Urban Development in 2010. The study comprised a survey of all federal state planning authorities as well as selected regional planning institutions, contributing to the national programmes on climate change and spatial planning KlimaMORO and Klimzug.

## Climate Change Adaptation

Adaption to Climate Change covers many different topics. Some are spatial planning topics since a long time (e.g. flood protection), some of them are new challenges. Regarding the consideration of climate adaptation, representatives of federal state and regional planning authorities see the greatest need for action in formulating coherent objectives and principles in spatial planning programmes on state and regional level.



Assessment of the role the aspect of adaptation plays in existing formal planning instruments in Germany by spatial planning representatives. (n=30)

## Flood protection

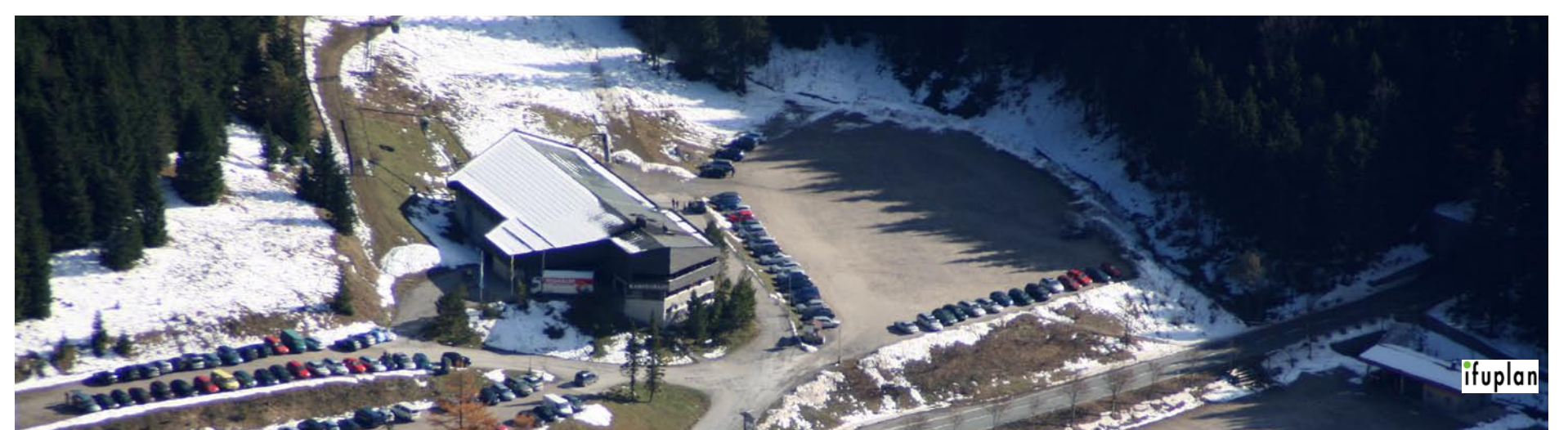
- Identification and designation of areas prone to flooding
- Avoiding, retrofitting and - if necessary - deconstructing settlement and infrastructure in risk-prone areas
- Risk assessments for 3rd/4th-category streams (creeks)
- Expanding upstream water retention capacities

## Geogenic hazards

- Avoiding, retrofitting and - if necessary - deconstructing settlement and infrastructure in risk-prone areas
- Spatial planning has to deal with uncertain dimensions of possible hazards
- Communication of hazard maps

## Tourism

- Adaption of winter tourism to a potential decline in snow-reliability
- Preparing the Alps for their potential renaissance as a summer retreat



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## Regional water scarcities

- Summertime water scarcities due to predicted glacier retreat, cumulation of extreme heat events and droughts