



Building for a Changing Climate

Adaptation through planning and construction



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Introduction

A basis for action

Adaptation through planning and construction can help to reduce the negative and inevitable consequences of climate change, such as flooding, landslides, landslips and erosion. Boverket (The National Board of Housing, Building and Planning) has published a report on how the planning and construction legislative framework, primarily the Planning and Building Act 1987 (as amended), PBL, can be used in the work on adapting the built environment to a changing climate. The report, published in June 2009, evaluates how effective the legislation is in dealing with adaptation and provides support and guidance to e.g. decision-makers, land use planners, developers and property owners. This brochure summarises the findings of the report.

Building sustainable communities

Buildings and infrastructure constructed today will last for many years. Buildings have a design life of 50-100 years – the infrastructure has an even greater longevity. This makes climate change a current, rather than a future issue. It is therefore important to take into account predicted climates at the different planning and design stages for development.

Both mitigation and adaptation measures are required to build sustainable communities

Climate change adaptation is an important prerequisite for building sustainable communities. It is however not an environmental issue in the traditional sense i.e. protecting the environment from man. It is rather a question of protecting man from nature. This is illustrated by the approximately 420 000 buildings located within 100 metres of the coast- or shoreline which might be affected negatively if no protective measures are taken. In recent years, we have also seen an increase in the number of developments in coastal areas, primarily for residential and business uses. Great assets are at risk if no action is taken.

Mitigation and Adaptation

There is now widespread scientific consensus that accelerated climate change is happening. Reducing greenhouse gas emissions (mitigation) is an urgent and pressing issue recognised worldwide. However, even with significant reductions in greenhouse gas emissions tomorrow, global warming will still continue for decades to come. We must therefore adapt society to the inevitable consequences of climate change. In other words, both mitigation and adaptation actions are essential for building sustainable communities for the future.





Photograph: Jan Bengtsson/Johnér.

1. Action is needed now

The climate is changing

Rising temperatures, increased precipitation, melting ice caps and rising sea levels will have significant impacts on society. Individual buildings and whole settlements may be affected, for example by increased risks of flooding, landslides, landslips and erosion. Climatic changes will also affect the built environment in other aspects including building facades, internal structures and service infrastructure.

Climate adaptation of planning and construction must begin now. Everyone involved in the process has a responsibility.

New measures are needed

By including adaptation measures in planning policies and by using technical solutions available, there are opportunities to build sustainable and climate resilient communities. Measures for new development may include adapting land use planning policies and ensuring building standards (including building regulations) take account of more extreme weather conditions and a more humid climate. For existing buildings and settlements, climate adaptation measures may include building barriers to protect them from rising water levels and reviewing disaster management strategies.

Risk and vulnerability analysis

All municipalities are required by law to carry out hazard, risk and vulnerability analyses (HRVA).

Through these, the municipalities may consider and assess the impact climate change will have on their activities. Several municipalities have already included climate change issues in some form in their analyses. The County Administrative Boards have an important role to play in this work as they provide the municipalities with information and advice and are responsible for supervising the municipalities work and for coordinating various interests at the regional level.

Plans and strategies for adaptation

Climate adaptation is a complex area involving many different sectors of society. Plans and strategies for adapting to climate change should therefore be produced through a broad cross-sectoral process. The municipalities should assess how their various activities may be affected by, and adapted to, climate change. This information may then inform land use planning and development of society at large.

What can be done at different levels?

Central authorities and

county administrative boards

- Promote and support climate adaptation initiatives at UN and EU levels
- Suggest climate adaptation of acts and regulations
- Incorporating climate adaptation considerations in regulations, guidelines and advice
- Conduct climate reviews of comprehensive plans and detailed development plans
- Disseminate information and good practice

Municipalities

- Carry out risk and vulnerability analyses
- Plan for climate adaptation

- Assess plan and building permits with regard to PBL requirements
- Inform and provide advice on climate adaptation

Developers

- Follow the technical property requirements

Property owners

- Maintain the buildings
- Keep informed about climate-related risks

Citizens

- Influence decision-makers, participate in the planning process by, for example, providing local knowledge and pointing out the risks and the opportunities to the local administration, and to land and property owners



Photograph: Hans Berggren/Johner.

2. A holistic approach

An integral part of the development process

Climate change knows no borders. Action is needed at all levels and adaptation should be an integral part of policy formulation at global, national and local levels. Climate adaptation should be carried out in through the cooperation between municipalities, regions and organisations. All stages of the planning- and construction processes – from the comprehensive plan through to the management stage - must take into account the effects of climatic change.

Boverket considers that major climate change issues in land use planning are best dealt with at the comprehensive level, through regional and comprehensive plans. These stages provide the authorities with an opportunity to take a holistic approach and address comprehensively the consequences of climatic changes.

The adaptation work must be carried out in cooperation between organisations, municipalities and regions. All stages, from comprehensive plans to stages of management, are important

Important cooperation

Environmental classifications of buildings can be used as a tool to help save energy and to safeguard human health and the environment. They provide an overall picture of how the building works. The declarations can also be used in the planning phase to design healthier and more environmentally friendly buildings. Some environmental declarations already include criteria for making buildings more climate resilient and there is potential to include further adaptation criteria in the future. Criteria that can be used include choice of building materials, drainage systems and anti-moisture solutions

Examples of joint working

In 2007 the County Administrative Boards of Skåne and Blekinge jointly produced a report on how rising sea levels may affect land use planning. The aim of the project was to increase the awareness of the effects of climate change and examine how land use planning can contribute to building a more robust and climate resilient society. The work encompassed several sectors and involved people from e.g. the environment and planning and development departments. Read more about this project in the report "Rising Sea Levels – consequences for land use planning".

Since the autumn of 2007, the municipalities in the Lake Vänern region are working together on issues related to Lake Vänern's water regulation. The work is primarily concerned with establishing greater understanding of how climate change will affect Lake Vänern and the surrounding area. The work is also aimed at assessing how the municipalities in the area can work with businesses and other stakeholders in the area in order to reduce negative consequences of climate change. Read more at www.karlstad.se



Photograph: imageDJ - Megapix

3. Delivering adaptation action

Support for local action

Climate change constitutes a great challenge for the municipalities. Balancing conflicting interests, such as the economic development of an area versus protecting the natural and built environment from the negative effects of climate change, is a delicate task. Decisions made at the local level need to be well-informed and based on sound evidence. It is therefore imperative that government agencies and authorities provide the municipalities with up-to-date information and advice on climate change issues. It is the County Administrative Boards' responsibility to coordinate such information and advice and to ensure that it informs the work at the local level. When developing comprehensive- and detailed development plans, for example, the municipality must consult the Board which, in turn, must express its opinion on the plan proposal. Normally, the municipalities follow the advice and recommendations given by the Board. If, however, the municipality decides to adopt a plan, grant planning permission or an advanced notification contrary to the Board's recommendation, the Board can rescind the municipality's decision do so and cancel the plan or the permission. Valid grounds for such actions include that the development would be inappropriate with regards to the risk of flooding and erosion.

Pass on the knowledge

In order to secure delivery of adaptation measures on the ground, it is important that climate change issues are considered at all stages of the planning, design, construction and maintenance processes. It is critical to understand that the various require-

It is important that state authorities, county administrative boards and municipalities provide and utilise knowledge based on climate changes

ments and obligations set out in the Planning and Building Act and the Act on Technical Requirements for Construction Works (BVL) all form part of a single system and that these requirements and obligations are interlinked. For the purposes of a functioning system, it is therefore imperative that the knowledge and information is passed on from earlier to later stages in the process. Consequently, the information on climate change issues produced for the comprehensive plan should inform the production of the detailed development plan. Similarly, the information produced during the planning stages should be made available to the developer through the construction consultation stage, and finally to the property manager when the building is complete. Adopting such an approach will contribute to the development of sustainable and climate resilient communities.

Statutory requirements

The Planning and Building Act 1987 (as amended) contains certain requirements with regards to climate change. The municipalities must comply with these requirements when preparing regional, comprehensive and detailed development plans, area regulations and advanced notifications. The act is currently under extensive revision and further amendments with regards to climate change may be suggested at a later stage.

The technical property requirements set out in BVL are examined through a control- and inspection process starting with a building notification. It is the municipalities' responsibility to support and assist the developer in meeting these requirements.

4. Climate–smart action

Amendments to the Act

On 1 January 2008, certain amendments to PBL came into force, some of which relate to climate change. The amendments clarify the municipality's and County Administrative Board's obligations to take into consideration climate-related risks in the planning and development process.

A framework for new development

The planning and building legislative framework can be used as an effective tool for climate adaptation of new development on previously undeveloped land. This is provided that the municipalities do not plan for new development or grant building permits on land that is unsuitable for the intended use with respect to effects of a changed climate. It is also important that the county administrative boards use their powers to intervene in accordance with PBL when it is justified to do so. Equally important is to ensure that any subsequent permit decisions are complied with and that the developers take their responsibilities

The Planning and Building Act and the Act on Technical Requirements on Construction Works can be used for providing adaptation measures for new development, - other incentives must complement the legislation to effectively deal with adaptation of the existing built environment.

in meeting the technical property requirements. The technical property requirements are designed as functional requirements and may, in certain instances, make appropriate development that otherwise would have been unsuitable in specific locations. For additional buildings on developed land in risk areas, the planning and building legislation can be used to a varying extent to prevent the negative consequences of climate change. As an example, the municipality can cancel old detailed development plans and adopt new ones which are more updated from a climate point of view.

PBL and existing buildings

The possibilities of using planning and building legislations to provide adaptation measures in existing built environments are more limited. In order to, for instance, embank an area, broad civil agreements between the state, municipalities and property owners are required in practice. The measures must also comply with other legislation, such as the Environmental Code.

Comprehensive plan in Umeå

The comprehensive plan for the new city district Ön in the city of Umeå is an example of how measures to reduce the risks of flooding, landslip and landslide can be addressed at the planning stages. Ön will become a new major city district, built for long-term sustainability. In order to limit the risk of landslide and erosion, the plan states that buildings should not be located closer than 20 to 25 metres from the river banks if no safety-increasing measures are provided. Prior to the detailed development plan phase, detailed stability assessment should be conducted in order to ensure the stability of the river banks. The plan recognises that the area will be subject to more frequent floods in the future and any new development proposals close to the water should be accompanied by a floodrisk assesment. Guidelines for high flows are produced in the ongoing intensifications of the comprehensive plan for the river landscape. While waiting for better supporting documentation, it is recommended that buildings in the southern part of Ön are placed at a certain level (+3.0 metres above RH2000)

Read more at www.umea.se

Detailed development plan in Karlstad

In 2004, Räddningsverket (the Swedish Rescue Services Agency) and Boverket jointly produced a report on how, and to what extent, safety-increasing measures can be specified in detailed development plans. One measure discussed in the report is embankments where deposits of soil are placed to form a physical barrier between the risk source and the building that is to be protected. Embankments can be used to protect buildings from flooding and may be a suitable safety-increasing measure. The elevation and extension of the embankment should be specified in the plan in order to ensure a sufficient level of protection for the specific development site. A plan from the Municipality of Karlstad is an example of a detailed development plan that includes the provision on an embankment.

Read more in the report *Safety increasing measures in detailed development plans* available for order or download on the website of the National Board of Housing, Building and Planning, www.boverket.se.



Photograph: Britt-Louise Morell, Boverket

5. Opportunities

Examples of measures

What can be done at different levels in order to adapt buildings to the effects of climate changes? Below are some examples of measures that can be included as prerequisites and requirements in comprehensive and detailed development plans. The various measures can be used to promote climate resilient new development or to protect existing buildings.

See the possibilities for climate adaptation in terms of location, safety distance, design and technical measures.

What can a comprehensive plan include in accident, flooding and erosion aspects?

- A clear account of geological and geotechnical conditions in specific areas
- An account of protected areas, such as water protection areas
- The identification of areas at risk from flooding, erosion, landslides and landslips
- Accounts of how stability and ground conditions will influence strategic land use decisions.
- Recommendations for how stability and ground conditions should be considered in detailed development planning and permission granting.

Examples of climate adaptation measures in detailed development plans

- Lay-out of plan area
- Pool, cofferdam, embankment
- Embankment against flooding
- Land surface
- No basements
- Plus elevation
- Backup filling against landslide and landslip
- Erosion protection
- Facade materials

Examples of flood protection in new buildings

- The ground floor can be used for car parking purposes
- Basements can be built using waterproof concrete and without windows or other openings
- Open spot-footing fundamentals or exterior air-ventilated foundation during risk of temporary flooding
- Permeable materials on the ground around the building
- Local management of surface water during rainfall
- Green roofs (to reduce runoff)
- Spillway overflow on the roof and procedures for the cleaning of roof and courtyard wells.

Examples of flooding protection in existing buildings

- Toilets and wells in basements can be fitted with temporary blockages
- Basement windows can be secured or boarded over
- Temporary flooding protection in exterior doors
- Sewage drains in lower floors of the buildings should may be fitted with one way valves or pumps accessible for inspection.

Planning and building legislation and climate adaptation

An outline of the PBL system and its climate requirements.

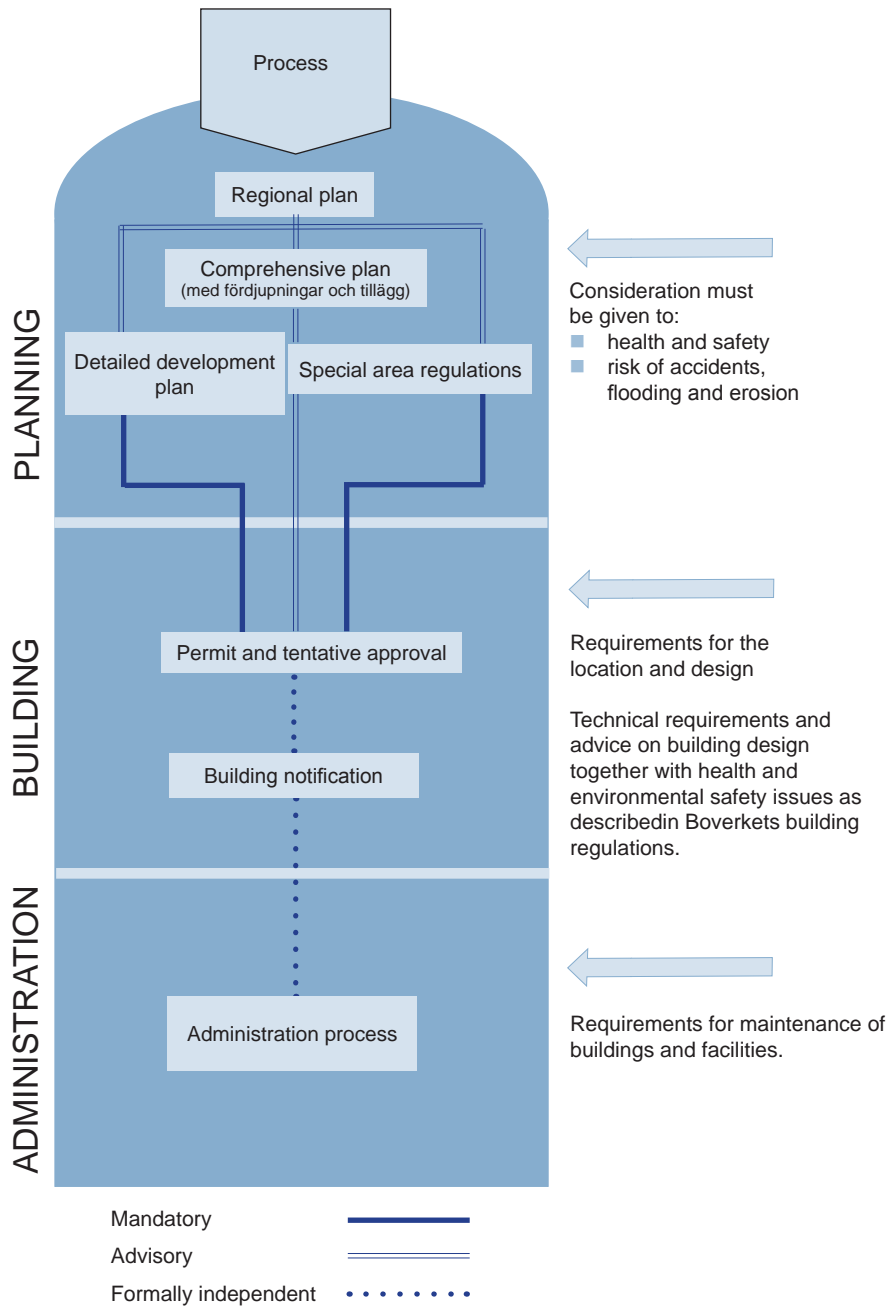


Illustration : Johan Säfström.

6. Towards adaptation

Supporting Actions

Is your municipality ready to address climate change? Central authorities and government agencies are responsible for providing the municipalities with different types of information and knowledge. The information is in many cases available through the County Administrative Boards. The Swedish Civil Contingencies Agency (MSB), The Swedish Meteorological and Hydrological Institute (SMHI) and The Swedish Geotechnical Institute (SGI) are but a few examples of authorities responsible for producing information on climate adaptation for people involved in the planning and construction process.

Examples of information available include:

- Climate analyses – SMHI
- Flood mapping – MSB
- Stability mapping – MSB, SGI
- Mapping and investigation of erosion – SGI
- Guidance for Hazard, Risk and Vulnerability Analysis – MSB



The Climate Adaptation Portal

The Swedish Environmental Protection Agency, MSB, SGI, the Swedish Energy Agency, the National Land Survey, SMHI and Boverket are participating in an agency network on climate adaptation issues.

The aim is to disseminate knowledge and information on climate adaptation. The information is available on a dedicated web-portal, www.smhi.se/klimatanpassning. In the near future the portal will be available on the following address: www.klimatanpassning.se.

State subsidies for preventive measures

For existing areas where the risk of natural hazards is significant, the state has allocated approximately SEK 40 million annually for preventive measures. Municipalities can apply for subsidies from this allocated amount through MSB. Additional information is available at www.msbmyndigheten.se/naturoluckyckor

Further reading

The report “Build for the climate of tomorrow”, provides an in-depth analysis of how the planning and building legislation can be used in order to adapt planning and construction to future climate changes. The report is available at www.boverket.se.

Websites

Swedish Civil Contingencies Agency (MSB), www.msbmyndigheten.se
Swedish Meteorological and Hydrological Institute (SMHI) www.smhi.se
Swedish Geotechnical Institute (SGI) www.swedgeo.se

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6. Towards adaptation

Adaptation through planning and construction can help to reduce the negative effects of climate change, such as flooding, landslides, landslips, and erosion. Boverket has conducted an analysis of how the Planning and Building Act can assist in the work towards climate change adaptation. This brochure provides guidance and support to for example property owners, developers, officials and decision makers in municipalities and the state.



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Under the heading "Planning and Construction, in practice", the National Board of Housing, Building and Planning (Boverket) publishes information on planning and building legislation, in form of regulations, manuals and other publications. Read more about the PBL work of the National Board of Housing, Building and Planning at www.boverket.se