

What is climate risk?

How is Norway affected by climate risk, and how can climate change, climate policies and technological development constitute financial risks locally?

Introduction

We need to prepare for the unexpected. We cannot rely on our experience of the weather today or of the weather we know from the last few decades if we are to be prepared for the weather we will face in the future. In response to climate change, we should expect stricter climate policies, rapid technological progress and changing consumer preferences. On top of this, both authorities and companies may be held responsible for their greenhouse gas emissions and for any harm or damage others suffer as a result of their failure to adapt to climate change. All this is climate risk.

Climate risk is complex

Climate risk expands a municipality's existing risk profile and may, for example, affect its demographic development, the outlook for employment and businesses, its tax revenues and the value of its real estate and infrastructure. In short, climate risk can be of major significance to municipalities' economies and their attractiveness to businesses and residents.

Climate risk is a wide-ranging challenge for municipalities and consists of the following main components:

- **Physical climate risk**, which is the risk associated with the effects and consequences of climate change. Risk factors such as more extreme weather, flooding, rising sea levels and various types of landslide may inflict significant direct and indirect costs for the municipality itself and businesses located within the municipality.
- **Transition risk**, which is the risk that municipalities' existing assets experience a loss in value or require additional investment as a result of the transition to a low-emission society not having been taken into consideration at the planning stage. Transition risk also affects the private sector in that changes to regulations, technologies and consumer behaviour may cause businesses to cease to be competitive if they are unable to adapt to the low-emission society.
- **Liability risk**, which is the risk that parties adversely affected (directly or indirectly) by events caused by climate change seek financial compensation from municipalities.
- **Execution risk**, which is the risk that the municipality does not manage to achieve its adopted objectives and strategies in respect of the transition to a low-emission society and climate change adaptation. A municipality may, for example, not achieve its objectives because the changes it implements are not sufficiently supported by residents and businesses.
- **Cross-border risk**, which is a question of whether the effects of climate change in other countries, such as decreased food production, water shortages, conflict and migration, have consequences for Norway and its individual municipalities.

Why do climate change, climate policies and technological developments represent a financial risk for Norway's municipalities?

Various forms of climate risk represent a financial risk for municipalities, in the same way as they do for companies. Local government investments, whether stand-alone projects or larger-scale land use development projects, may be affected by climate risk if the effects of future climate change and the consequences of the transition to a low-emission society are not taken into account in the planning phase. Existing assets (e.g

property or means of transportation) may also suffer, for instance from extreme weather events, new energy efficiency requirements or an increase in fuel price. At the same time, the businesses located in a municipality are in danger of ceasing to be competitive if they do not keep up with developments. All Norway's municipalities will be affected by climate risk, but this is dynamic and each municipality's risk profile will be distinct.

The seriousness of each of the various forms of climate risk will vary significantly between municipalities and organisations. Climate risk assessments are built on a consideration of the following matters:

- The probability that something will happen (e.g. flooding, higher carbon prices).
- The level of exposure / susceptibility to being affected (e.g. how many people and how much infrastructure are susceptible if an adverse event occurs).
- A system's vulnerability if an adverse event occurs. This is a question of the extent to which various systems, such as real estate, infrastructure or a company, can withstand an impact. Vulnerability can be reduced through adaptation. Even if an area is, for example, exposed to flood risk, it is not necessarily vulnerable if comprehensive flood prevention measures are implemented

Climate risk and global financial stability

In recent years climate change and sustainability have shifted from being viewed as a question of corporate social responsibility to being viewed as a financial risk and, ultimately, as a threat to financial stability. The wake-up call for many was a speech given by Mark Carney, who was at the time the Governor of the Bank of England, entitled "Breaking the Tragedy of the Horizon". In the speech, Carney emphasised that once climate change becomes such a major threat to financial stability that humanity becomes willing to implement the requisite measures, it will already be too late.

In 2015 the Financial Stability Board, a G20 body, set up an expert group, the Task Force on Climate-related Financial Disclosures (TCFD), which was tasked with considering how businesses and financial institutions could report on how climate risk affects them. The thought is that shareholders and regulatory authorities might use this information to drive companies in the right direction before it is too late. The TCFD's voluntary guidelines on climate-risk reporting were published in 2017 and are used increasingly by organisations across the world. KBN reports in accordance with these guidelines with effect from 2019.

Physical climate risk

Physical climate risk describes the risk associated with the consequences of climate change, such as flooding, landslides, droughts, extreme precipitation and rising sea levels. The local nature of the impacts of climate change means that municipalities are on the "front line" with regard to managing physical climate risk.

Climate change in Norway

We are already seeing the consequences of climate change in Norway and in the rest of the world. In future, Norway will experience longer periods of drought, more extreme precipitation and a higher average temperature.

The effects we should expect to see over the next 10-20 years are primarily determined by the greenhouse gases that have been emitted and are already in the atmosphere. Climate change and its effects over the longer term, up until the end of the century, will depend on global emissions over the coming decades. If the world succeeds in reducing its emissions, we can limit additional and more dramatic effects and consequences. Our actions today will accordingly impact the climate and the weather with which coming generations will have to live.

What can be said with certainty is that global warming will lead to hotter weather and more extreme precipitation in Norway. Norway may experience longer periods of drought in the summer, particularly in southern areas, but also short periods of extreme precipitation, which in turn increase the risk of flooding and landslides. The total amount of precipitation is set to increase with the exception of during the summer months in southern areas, and it will rain more intensely and more frequently.

If the world does not manage to reduce its emissions, Norway will in the worst case face about five degrees of warming. The four challenges most likely to increase in probability in such a scenario are heavy rainfall, flash flooding due to rain, storm surges, and debris slides, debris flows and slush avalanches. There could also be an increase in the likelihood of droughts, wet snow avalanches, winter ice floes and ice floes higher in the watercourse, and quick clay slides as a result of an increase in erosion in streams and rivers.

Whether, and if so the extent to which, a municipality is susceptible to experience such changes to its climate and the effects of such changes will vary significantly. Municipalities and organisations therefore need to assess the probability of each effect of climate change occurring and the extent to which their municipality is exposed and vulnerable.

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If the probable future effects of climate change are not taken into account by municipalities when drawing up land use plans and making investment decisions, their buildings and infrastructure may suffer damage and their land use developments may be unsuccessful. This may result in large direct and indirect costs for municipalities and may threaten their long-term financial stability. Indirect costs can arise if, for example, transportation, electricity supply or water purification infrastructure is put out of action due to extreme weather, and businesses consequently have their production activities interrupted.

The effects suffered by municipalities can be due to spontaneous weather events such as extreme weather. Extreme precipitation gives rise to a risk of flooding, while extreme droughts can increase the risk of fires. The effects can also be due to long-term changes to weather patterns. For example, changes to precipitation patterns

and the temperature as well as more variable weather can cause rock falls, avalanches and various types of landslide.

Physical risk also includes scenarios in which various weather events and their effects affect one another. A combination of a higher sea level and significant precipitation or strong winds can, for example, result in a greater risk of flash and spring flooding. Dynamic effects of this type can also have unexpected consequences for the community and public health.

Example: Physical climate risk

Floods and surface water can damage public buildings and infrastructure and thus result in direct costs for municipalities. Damage to transport infrastructure or the electricity supply can bring businesses' operations or production activities to a halt, which has indirect costs for the municipality concerned. According to the Norwegian Water Resources and Energy Directorate, practically all of Norway's municipalities are exposed to the risk of flooding and some form of landslide. When planning land use and infrastructure, it is recommended that municipalities use a flood zone map and investigate and map all types of landslide.

Even small increases in the water temperature in lakes can change the quality of the water and require water processing facilities to be upgraded. What increase in temperature and what resulting change in water quality should municipalities assume when renovating or planning new purification plants? What do such temperature changes mean for the frequency with which maintenance and upgrades have to be carried out, and for the budget of the agency responsible for them?

In the short term, we will experience extreme precipitation more frequently. In the future, Norway will experience longer periods of drought in the summer months, particularly in southern areas. This will generate new challenges in respect of water management. Measures need to be introduced to reduce the consequences of floods and the danger of surface water.

How should these likely challenges be included when water and wastewater infrastructure is being renovated or planned for new land use allocations? Will new and existing systems be dimensioned for the expected increase in precipitation such that the risk of unexpected upgrades is reduced?

Transition risk

Transition risk describes the consequences associated with the transition to a low-emission society. Such a transition is required in order to reduce greenhouse gas emissions and for the Paris Agreement targets to be achieved. This transition will involve extensive changes that will affect local government investments and the businesses located in municipalities.

Transition risk can be divided into the following four categories:

- Changes to the political and regulatory framework
- Technological innovation driven by climate considerations
- Changes to consumer behaviour
- Reputational risk

If the political and regulatory framework is tightened as part of Norway's efforts to achieve its climate targets, this may result in a need for existing infrastructure to be adapted. The extent to which Norway will become a low-emission society and the pace at which it will make this change are uncertain. If a municipality invests in new infrastructure without taking into account the fact that the transition to a low-emission society might result in different or stricter requirements over the medium and long terms, the risk of it having to take steps earlier than planned increases, potentially resulting in additional costs.

If businesses are affected by transition risk, the potential consequences for municipalities include lower employment, lower tax revenues, a decrease in real estate prices, negative population growth and a decrease in their general attractiveness to businesses and residents. A decrease in economic activity can also impact a municipality's land use development (residential sites, roads, schools etc.) and other infrastructure. Municipalities should be clear about the connection between transition risk for businesses and the consequences for the municipality. In addition to mapping this risk (see the page for your municipality), municipalities can be proactive partners in relation to businesses' transition to the low-emission society by facilitating physical and intellectual infrastructure.

Norway's climate obligations will change the political and regulatory framework

Norway has in various fora and documents committed itself to an overall target of cutting its greenhouse gas emissions. Norway's target is described and set in the Norwegian Climate Change Act, the Agreement on Climate Change Policy (Klimaforliket), the Norwegian White Paper on Climate Policy and the Paris Agreement, inter alia.

Norway's overall target is for the country to reduce its greenhouse gas emissions by 50% by 2030 and by 90% to 95% by 2050, compared with 1990 levels. This means that new and more radical climate change measures than contained in the Paris Agreement will probably need to be implemented in Norway.

The 2015 Paris Agreement saw the parties to the UN Framework Convention on Climate Change agree to keep the increase in the global temperature by the end of this century to well under 2°C compared with its preindustrial level, and to work to limit the increase in temperature further to 1.5°C.

In the context of Norway's support for the Paris Agreement, Norway's Parliament adopted five priority areas for Norway's climate policies:

- Reducing emissions from the transport sector
- Developing low-emission technologies in industry and clean production technologies

- CO2 management
- Strengthening Norway's role as a provider of renewable energy
- Environmentally friendly shipping

Example: Transition risk

In 2018 the Norwegian government declared its intention for Norway to be a pioneer in the circular economy. The waste and recycling industry have an important role to play in the transition to a circular economy. When municipalities are investing in existing or new waste management infrastructure, it is relevant for them to assess what this transition means in terms of the capacity of their facilities. The government's discussion of targets for reducing the greenhouse gas emissions from the waste sector should be taken into account during the planning stage. If such issues are not taken into account, the risk of a facility subsequently requiring costly changes increases.

In a scenario in which the Paris targets are to be achieved, it is probable that some industries will be forced to adapt in order to reduce their carbon footprint. If their efforts are not successful, there is a risk that jobs will be lost, which could in turn lead to depopulation, triggering and/or feeding a negative feedback loop. The risks faced by the businesses in a municipality can be assessed by mapping their exposure and vulnerability. When planning how land will be used and developing new areas, it is relevant for municipalities to consider the transition risk faced by businesses as well as the risk of jobs being lost and depopulation.

Businesses may be affected by transition risk in numerous different ways in a scenario in which the aim is to limit global warming to 2°C. Among the most discussed are the risk of higher taxes on carbon emissions and of competitors adopting innovative technologies that have a smaller carbon footprint.

Liability risk

Liability risk represents the risk that a municipality will be held financially liable for damage or losses suffered due to climate change. Parties that directly or indirectly suffer a loss as a consequence of climate change may try to hold municipalities or companies legally responsible. This can happen either as a result of the parties who suffer damage or loss seeking compensation from the municipality themselves or as a result of insurance companies seeking redress from the municipality, for example in the event of flood damage due to surface runoff.

Insurance companies that have paid out for flood-damage to houses may seek financial compensation from the municipality if it has granted permission for buildings to be built (or to be rebuilt) without having sufficiently assessed the level of flood risk in the area or invested in preventative measures. In such cases, it could be argued that the municipality must take into account the fact that climate change will result in a greater risk of more dramatic floods.

It can be assumed that liability risk will become more pronounced the worse climate change becomes. Liability risk will increase if the political framework changes such that municipalities have a greater responsibility for completing assessments and/or implementing measures to manage climate risk. With the expected increase in the scope of the damage caused, it will presumably become important for all parties to avoid being held liable.

Example: Liability risk

In Kvam in Gudbrandsdalen valley, a residential building was totally destroyed by flooding twice. After the first time it was destroyed in 2011, the municipality granted its owners permission to rebuild it as the area was due to be protected by flood defences. After the building was washed away again in 2013, the insurance company, which had now had to pay out twice, sought compensation from the municipality. It argued that the municipality should have obtained specialist advice and should not have granted permission for the building to be rebuilt. Demands for compensation of this type can cost municipalities significant sums.

Fewer than half Norway's municipalities that responded to the 2018 survey of municipalities carried out by the Norwegian Directorate of Civil Protection stated that they are attaching great importance to the additional risk and vulnerability associated with incorporating the risk of climate-change-related flooding and landslides into their municipal planning.

Execution risk

Execution risk is the risk associated with objectives in respect of the transition to a low-emission society not being achieved. Such objectives may not be achieved because the measures associated with them are not implemented or do not have the desired effect.

Some of these measures could have unintended consequences or could cause public dissatisfaction. The authorities could lose the support of the local community because the measures are not understood, because the community has not been sufficiently involved in the process, or because the complexity of a measure has been underestimated.

Factors such as these may delay the achievement of the objectives or may cause changes to be needed that render the measures ineffective. Dissatisfaction may cause the political objective of the transition to a low-emission society to be reversed, measures to be stopped and projects that have received investment to lose their value.

Other reasons for which the objective of creating a low-emission society might not be achieved could, for example, be because municipalities lack the requisite expertise, the work is not sufficiently well organised, or there is only weak support for the local climate policy among residents, businesses, elected representatives etc. Changes to the regulatory and political framework can also impact execution risk.

Example: Execution risk

A number of municipalities have adopted the objective of reducing car traffic as part of the transition to a low-emission society. Some of the tools employed for this purpose are toll booths and the removal of parking spaces in urban areas. Tools of this type have caused dissatisfaction and protests in some locations, such as in Jæren. The dissatisfaction and opposition to the various new toll booths here and in other places have been sufficient for those who oppose the measures to gain representation, e.g. on Stavanger Municipal Council.

The location of transport hubs can affect the value of private and corporate real estate. Noise, pollution, quick access to motorways or public transport either have a positive or negative effect. Decreases in the value of real estate as a result of changes to transport hubs can cause dissatisfaction.

Decreases in support for individual measures associated with the transition to a low-emission society can lead to the political objectives of achieving such a transition being reversed, to the measures being stopped and/or to projects that have received investment losing their value. The reputation and attractiveness of a municipality to its residents and businesses may also be affected if it does not manage to implement measures and to achieve its objectives in relation to the transition to a low-emission society.

In this context, communication about climate change and dialogue with the local community at an early stage can play a preventative role.

Cross-border risk

Cross-border risk refers to risk factors that are due to the effects of climate change in other countries but that may have consequences within Norway and individual municipalities.

These risk factors are, for example, related to changes in biological diversity, decreases in food production, water shortages, foreign investment, conflict and migration. Agriculture is one of the sectors most exposed in relation to climate change in other countries. As Norway imports a significant proportion of its food, this represents an area where there is significant cross-border risk. Crop failures in other countries could impact Norway in that availability could decrease and prices could rise.

Due to the globalised and complex nature of supply chains Norway is exposed to this risk. Its severity will depend on the extent to which Norway's most important trading partners adapt to climate change.

Cross-border risk is a central consideration in NOU 2018:17.

Example: Cross-border risk

A number of industries related to food production, including producers of fish feed and concentrates for producing pork and chicken, use imported soya. 75-80% of the Norwegian soybean meal market is supplied by soya imported from Brazil. Since genetically modified soya is not permitted by Norway's authorities, the country's demand is met from the approximately 10-20% of the world market that is not genetically modified. In addition, Norwegian buyers seek soya that is certified in order not to contribute to rainforest deforestation in Brazil.

This concentration risk means that if the production of certified, non-GM soya in Brazil experiences a crop failure due to climate risk, e.g. due to extreme weather, this would cause significant problems for Norway's production of meat and fish. This, in turn, would very likely have consequences for food production companies, producers of various types of feed and the food industry as a whole, as well as for the municipalities where they are located.

Norway's climate risk commission

In 2017 the Norwegian government appointed a separate expert commission to study climate risk and the Norwegian economy. The Commission published its report, *Climate Risk and the Norwegian Economy* (NOU 2018: 17 Official English Summary), at the end of 2018.

The commission was instructed to:

- Assess how climate risk can be analysed and presented most appropriately at the national level.
- Identify the expected important global, climate-related risk factors and to assess their significance to the Norwegian economy and financial stability.
- Assess any methodologies for providing private and public sector entities, including financial institutions, with a specialist framework for analysing and managing climate risk in the best possible way.