ARTICLE – How is the Riksbank's work affected by climate change?

Climate change affects economic developments in different ways. The Riksbank needs to take this into account to maintain price stability and a safe and efficient payment system. With regard to monetary policy, the effects of climate change on the economy entail new challenges. The Riksbank also needs to take part in the discussion on how central banks can contribute to reducing climate change. The Riksbank can contribute the means available within its mandate, and as a complement to other policy. However, the most effective measures to limit climate change fall within the remit of other policy areas.

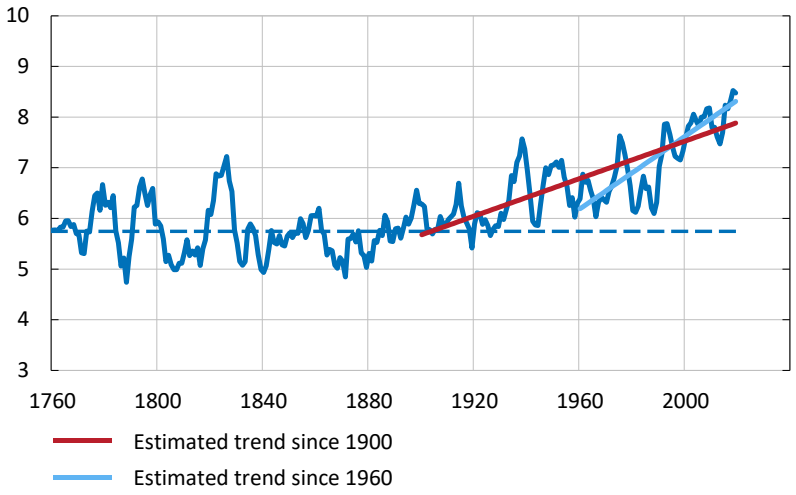
The earth's climate is becoming increasingly warm as a result of increases in greenhouse gas emissions. Since the pre-industrial age, the average global temperature has risen by around one degree. The warming process is expected to be even faster in the northern hemisphere.[26] In Sweden, for instance, the temperature has increased by around 2 degrees (see Figure 47). The temperature has also increased at an increasingly rapid pace as shown in the two trends in the figure. The trend since 1960 (turquoise line) has a steeper trend than the trend from the turn of the last century (red line).

The objective of the Paris Agreement is to limit global warming to 1.5–2 degrees. This requires a major reduction in global carbon dioxide emissions. In Sweden, emissions per person have steadily declined since the 1970s and are now below the global average (see Figure 48). One contributory factor to the decline in emissions in the 1980s was the extension of nuclear power, which meant that oil could be replaced with fossil-free electricity. At the beginning of the 1990s, a carbon tax was introduced, which formed the base for Swedish climate policy and has been a contributory factor to the decline in emissions since then.

[26] See the Swedish Society for Nature Conservation "Den globala uppvärmningens konsekvenser ["The consequences of global warming]", in Swedish only, https://www.naturskyddsforeningen.se/vad-vi-gor/klimat/konsekvenser-global-uppvarmning.

Figure 47. Temperature in Stockholm since 1760

Degrees Celsius, 5 year moving average

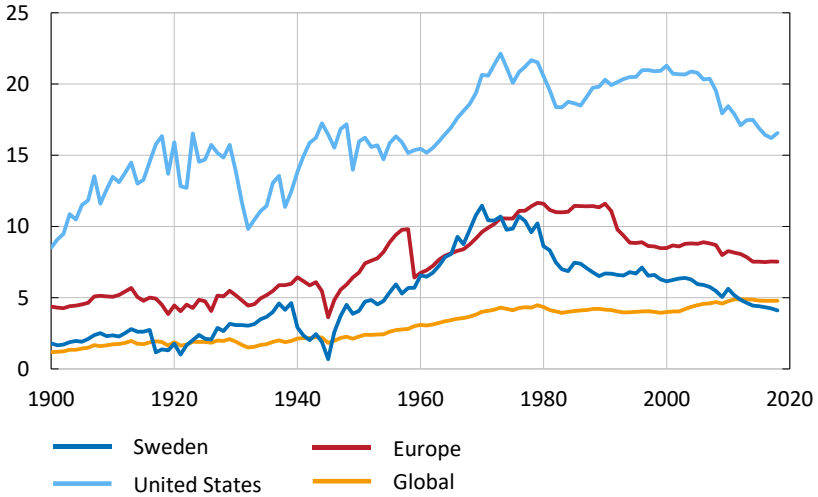


Note: The broken line shows the mean from 1760 to 1900.

Source: Stockholm University.

Figure 48. Carbon emissions per person in Sweden, Europe, the USA and globally

Tonnes per person



Note: Carbon dioxide emissions (CO2) refer to emissions from burning fossil fuels to produce energy and cement.

Source: Our World in Data (OWID).

The global warming caused by climate change affects economic developments. The Riksbank needs to take this into account to maintain price stability and a safe and efficient payment system.[27] The Riksbank also needs to take part in the discussion on how central banks can contribute to reducing climate change.[28]

The effects of climate change on the economy

Global warming entails new types of risk that also have consequences for economic developments. The risks can be divided into three categories: **physical risks**, **transition risks** and **risks of irreversible threshold effects**. The physical risks concern different types of extreme weather, such as drought, flooding or hurricanes, as well as effects from a gradual warming, such as reduced harvests or rising sea levels. The transition risks are linked to the changeover to a less fossil-based economy. This can be political decisions to raise taxes on carbon emissions or changed patterns of consumption. The risks of irreversible threshold effects arise when climate change has gone so far that it can no longer be reversed and instead accelerates further change in a self-generating process. These risks are examples of what are known as fundamental uncertainties – science cannot say if and when a certain event will occur, but neither can it rule out the possibility of the event occurring – with potentially disastrous consequences. This could be, for instance, melting icecaps in the Arctic or decimation of the Amazon rainforest.

From a monetary policy perspective, it is particularly important to understand how the risks affect:

- Inflation and inflation expectations
- Output and employment in the short and long run
- The long-term real interest rate

Physical risks in the form of extreme weather events may lead to greater fluctuations in food, housing and energy prices, which in turn may affect inflation and inflation expectations. Extreme weather may also lead to the destruction of facilities and infrastructure, broken production chains, etc. with ensuing negative consequences for output and employment. These physical risks are mostly short term, but can also have more long-term effects. The risks from a gradual warming often entail long-term and unpredictable consequences for both prices and output. Various threshold effects probably also entail more long-term consequences for the economy.

The transition to a less fossil-based economy entails structural changes in different parts of the economy. The phasing-out of carbon-intensive sectors in favour of greener sectors is one example of this, another is differences between companies in

[27] This article is primarily about the consequences of climate change for monetary policy, but climate change also has consequences for the possibility to maintain a safe and efficient payment system, see Financial Stability Report 2020:2, Sveriges Riksbank, where some of these consequences are discussed.

[28] See, for instance, A. Breman, "How the Riksbank can contribute to climate policy", speech at the Royal Swedish Academy of Engineering Sciences, Stockholm, 3 March 2020.

the same sectors, depending on how well they have adapted their operations to climate change. The transition can also involve rapid and unexpected changes in asset prices when, for instance, coal and oil deposits remain unused. In other words, the transition to a less fossil-based economy can have both short-term and long-term effects on inflation, output and employment.

The risks from climate change can mean that economic developments become more uncertain and that the likelihood of natural disasters increases. There is also a risk that long-term growth will decline. These factors can lead to the long-term real interest rate declining, but there are also other consequences of climate change that can have an impact in the opposite direction.[29]

Challenges for monetary policy

Climate change can entail new challenges for monetary policy (see the compilation in Figure 49).[30] The monetary policy analysis work includes identifying which changes in the economy are temporary and which are structural and thereby more permanent. Climate change can make this work more difficult, as global warming can give rise to both types of change.

Global warming could subject the economy to new types of shock that have not previously been observed. These may be both unpredictable and have major economic consequences.

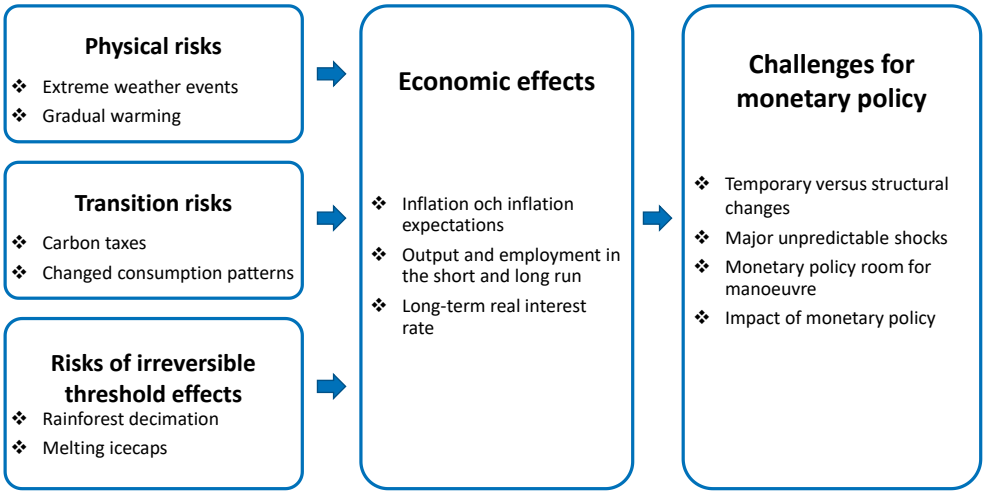
Several of the risks from climate change can mean that the long-term real interest rate becomes lower. If this were to occur, the policy rate could hit the lower bound more often and this would limit the monetary policy space.

The financial markets play an important role in managing climate risks, which can create risks in the financial system. With regard to the banks, the value of their collateral can be reduced and credit losses may rise. This can reduce their capital, diminish their liquidity and thereby weaken the banking system's potential to supply credit. If the financial system is weakened, it may also become more difficult for monetary policy to make an impact.

[29] See E. Bylund and M. Jonsson, "How does climate change affect the long-term real interest rate?", Economic Commentaries 11, 2020.

[30] For a more detailed discussion of the challenges, see "Climate change and monetary policy: Initial takeaways", Network for Greening the Financial System (NGFS), Technical document, June 2020.

Figure 49. Effects of climate change on the economy that can entail new challenges for monetary policy



Sources: Network for Greening the Financial System and the Riksbank.

Can central banks help to limit climate change?

The climate crisis is based on a market failure, what is known as a negative externality caused by emitting carbon dioxide. When, for example, an aircraft burns its fuel, carbon dioxide is created, which contributes - albeit marginally - to global warming, leading in turn to increased economic costs. When an individual air traveller chooses how much to fly, he or she does not take these costs into account, which is a market failure. To rectify this, one can make it more expensive to emit carbon dioxide. This can be achieved in a number of ways. Many economic studies based on economic theory find that a global carbon tax is the most effective measure to reduce emissions.[31] Such a tax could be a cheap insurance against future large-scale and uncertain costs, but it can also have substantial distribution effects between countries, companies and individuals.

The question of different ways of taxing carbon dioxide is high on the international agenda, but it would appear so far to be difficult to reach any concrete proposals at global levels. This, combined with the negative effects of climate change becoming increasingly clear, has raised the question of whether central banks and other institutions can also contribute to limit climate change. It is important to remember that the most effective measures for limiting carbon emissions fall within the remit of other policy areas. But this does not prevent central banks contributing the means available within their mandate. The Riksbank has a mandate that entails promoting price stability and an efficient and safe payment system. Within the scope of this mandate, the Riksbank can contribute to limiting climate change by, for instance:

[31] See C. Olovsson, "Global warming from an economic perspective", Sveriges Riksbank Economic Review 1, 2020, pp. 6–23.

- Promoting regulation of the financial markets to reduce the risks climate change may entail for the financial system. This could be stress tests, reporting climate-related risks or banks' capital adequacy requirements.
- Having a sustainability perspective in the asset purchases, the collateral required in monetary policy transactions and in the management of foreign currency reserves. With regard to the latter, the Riksbank has, as of 1 January 2019, a new financial risk and investment policy, which adopts a sustainability perspective in the management of the foreign currency reserves. The Riksbank has also decided to take sustainability into account when purchasing corporate bonds, and to measure and report carbon emissions in its corporate bond portfolio. Moreover, green municipal and government bonds will be included in the asset purchases.
- Participate in various networks that work on climate-related issues, for instance, the International Monetary Fund, the Financial Stability Board, the Basel Committee and the Network for Greening the Financial System (NGFS).
- Ensure that its own activities are in line with international agreements, such as the Paris Agreement, and avoid unnecessarily contributing to global warming.
- Helping to increase knowledge of the effects of climate change on the economy by supporting and contributing its own research. Together with other institutions, the Riksbank has contributed to research on climate change since 2013.