

Working group on financing the green transition

Final report

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Working group on financing the green transition Final report

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Abstract

The green transition will require system-level change in all of society and a comprehensive reform of economic structures. Major investments will be needed from businesses, households and the public sector to mitigate climate change, halt biodiversity loss and transition to a circular economy. The changed geopolitical situation has increased the urgency of the green transition and breaking away from the fossil-fuel economy.

On 18 January 2022, Minister of Finance Annika Saarikko, Minister of the Environment and Climate Change Emma Kari and Minister of Economic Affairs Mika Lintilä appointed a working group to form a comprehensive view of the financing of the green transition. The purpose of the working group was to draw up proposals for financing measures to accelerate the transition in an economically, ecologically and socially sustainable manner.

This final report presents the key objectives defined by the working group to develop green transition investments and financing. In addition, the report describes solutions for key sectors to implement the green transition and the scale of the related investment needs. The report also discusses the role of various parties in financing the green transition and recent developments in how sustainability is taken into account in the financial markets.

The report closes with recommendations for responding to identified development needs and achieving key objectives.

Keywords green transition, financing, financial markets, investments

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Vihreän siirtymän rahoituksen työryhmä Loppuraportti

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Tiivistelmä

Vihreä siirtymä edellyttää järjestelmätason muutosta koko yhteiskunnassa ja kokonaisvaltaista talouden rakenteiden uudistamista. Yrityksiltä, kotitalouksilta ja julkiselta sektorilta tarvitaan mittavia investointeja, jotka edesauttavat ilmastonmuutoksen hillitsemistä, luontokadon pysäyttämistä ja kiertotalouteen siirtymisessä. Muuttunut geopoliittinen tilanne on nopeuttanut vihreän siirtymän ja fossiilitaloudesta irtautumisen tarvetta.

Valtiovarainministeri Annika Saarikko, ympäristö- ja ilmastoministeri Emma Kari ja elinkeinoministeri Mika Lintilä asettivat 18.1.2022 työryhmän muodostamaan kokonaisnäkömyksen vihreän siirtymän rahoituksesta. Työryhmän tarkoituksena oli laatia ehdotuksia rahoituksen keinoista siirtymän vauhdittamisessa taloudellisesti, ekologisesti ja sosiaalisesti kestäväällä tavalla.

Loppuraportissa esitetään työryhmän määrittelemät avaintavoitteet vihreän siirtymän investointien ja rahoituksen kehittämisessä. Lisäksi raportissa kuvataan ratkaisuja keskeisillä sektoreilla vihreän siirtymän toteuttamiseksi ja niihin liittyvien investointitarpeiden suuruusluokkaa. Raportti käsittelee myös eri toimijoiden roolia vihreän siirtymän rahoituksessa sekä viimeaikaista kehitystä rahoitusmarkkinoilla kestävyysnäkökohtien huomioimisessa.

Lopuksi esitetään suositukset tunnistettuihin kehittämistarpeisiin vastaamiseksi ja avaintavoitteiden saavuttamiseksi.

Asiasanat vihreä siirtymä, rahoitus, rahoitusmarkkinat, investoinnit

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Den gröna omställningen förutsätter förändringar på systemnivå i hela samhället och en övergripande reform av de ekonomiska strukturerna. Företag, hushåll och den offentliga sektorn behöver göra stora investeringar som bidrar till att begränsa klimatförändringen, hindra förlusten av biologisk mångfald och främja övergången till cirkulär ekonomi.

Det förändrade geopolitiska läget har påskyndat behovet av att genomföra den gröna omställningen och lösgöra sig från den fossila ekonomin.

Finansminister Annika Saarikko, miljö- och klimatminister Emma Kari och näringsminister Mika Lintilä tillsatte den 18 januari 2022 en arbetsgrupp som ska bilda en helhetsuppfattning om finansieringen av en grön omställning. Arbetsgruppen skulle lägga fram förslag till finansiella metoder för att påskynda omställningen på ett ekonomiskt, ekologiskt och socialt hållbart sätt.

I slutrapporten presenteras de viktigaste målen som arbetsgruppen slagit fast för utvecklingen av investeringarna och finansieringen i fråga om den gröna omställningen. Rapporten innehåller dessutom en beskrivning av olika lösningar inom viktiga sektorer för att genomföra den gröna omställningen och hur stort behovet av investeringar är i anslutning till lösningarna. Rapporten behandlar även vilken roll olika aktörer spelar i finansieringen av den gröna omställningen samt den senaste utvecklingen på finansmarknaden i beaktandet av hållbarhetssynpunkterna.

Till slut presenteras rekommendationerna för att möta identifierade utvecklingsbehov och uppnå de viktigaste målen.

Nyckelord grön omställning, finansiering, finansmarknaden, investeringar

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Summary and recommendations

A system-level change throughout society and an overhaul of economic structures are preconditions for the green transition. There are strong links between the measures aiming to combat climate change and halt biodiversity loss. Resolving simultaneously the challenges of climate change and biodiversity is a prerequisite for a successful transition.

To achieve Finland's climate objectives, investments of up to EUR 240 billion will be needed by 2050, corresponding to EUR 8 billion a year. Electricity and heat production would account for an estimated 59%, reducing emissions from buildings for 19%, cutting transport emissions for 10%, and reducing process emissions from industry for 10% of the additional investments. While investments associated with enhancing biodiversity must also be factored in when examining the green transition as a whole, no estimates of their magnitude have been produced as yet.

Finland has taken on the role of a pioneer in green transition solutions. To enable us to produce global climate and environmental solutions, we should focus more systematically on developing new sustainable solutions and seizing opportunities for exporting them. Before new solutions can be placed on the market and scaled, it must be proven that they work.

Circular economy is the key to ecologically sustainable growth not based on overexploitation of natural resources. A circular economy will help mitigate not only the climate crisis but also biodiversity loss and overexploitation of natural resources. In addition to changes in practices, a transition to a circular economy will require investments in different sectors, municipalities and regions. In a circular economy, conventional practices and production methods will be replaced by more resource-wise and efficient ones, making it possible to reduce the use of virgin natural resources and to adapt consumption and production to the limits of the Earth's carrying capacity.

The investments required to bring about the green transition must be mainly financed from private sources. Developing the financing system by integrating sustainability aspects more closely into financing decisions, financial services and risk management will be essential for a well-functioning market and funding investments in the green transition. Without a stable financial system, investments in the green transition may not go ahead, as uncertainty discourages investment decisions and makes anticipation challenging.

Regulation on the green transition in the financial market and sustainable financing is developing rapidly. Public authorities have a particular duty to ensure that a goal-oriented but predictable legislative framework is put in place. Many companies operating in financial markets are required to report on sustainability aspects at international or EU level. To ensure that the administrative burden and transaction costs of sustainable financing remain reasonable, attention should be paid to information exchanges. It is important for actors to have an up-to-date understanding of the information that finance providers need to make the sustainability assessments that underpin their funding decisions and to meet their reporting obligations. The preconditions for this include not only developing competence related to green transition financing but improving cooperation and information exchange practices.

The green transition should be a factor in all decision-making involving the use of public funds. All public finance providers have a role to play in financing green transition investments, and the existing instruments must be harnessed to promoting the achievement of cross-cutting green transition objectives in a comprehensive, coherent and mutually complementary manner and with verifiable impacts. A coherent approach to public special financing institutes and instruments is needed to channel funding to the green transition. The role of all public finance providers in financing green transition investments should be recognised.

In green transition financing, the primary duty of public authorities is to encourage and promote the channelling of private investments by cost-effective and consistent means. Public finance providers should participate in risk sharing and complement private funding where market financing is not available.

To make better use of different funding models and structures, including EU funding, competence development in administration, an ability to put together larger funding packages and closer cross-administrative cooperation will be required, among other things.

Sustainable public finances will improve the preconditions for solving such problems as climate change and biodiversity loss as well as help channel public funding to purposes important for ecological sustainability. Over the longer term, climate change, ecological sustainability and the carrying capacity of nature can also be expected to have significant impacts on the sustainability of public finances and Finland's country risk.

Recognising the social and income distribution impacts of the measures is essential for bringing about a just transition. Advancement in sustainability transformations will profoundly change job descriptions both in industry and services. Responding proactively to new competence needs will support not only employees' success in a changing labour market but also business competitiveness and the availability of skilled labour.

Stronger links need to be forged between the green transition and economic policy drafting and decision-making. To this end, an assessment, monitoring and analysis framework will be developed to appraise climate and biodiversity loss objectives and the overall economic and fiscal

impacts of the policy measures required to attain them. This is emphasised by a need to identify and monitor risks associated with the transition and the investment and financing requirements, as well as the links to climate and environmental policy objectives and a need for international cooperation.

The knowledge base and expertise needed for economic policy decision-making related to the green transition must be built up, and more economic research should be conducted. It is particularly important to invest in applied economic research on the links between climate change, biodiversity loss and the economy, and to create cooperation networks in which better use can be made of cross-administrative expertise and cooperation in the areas of economics and natural sciences. To this end, international scientific and research networks will be used. The availability of sufficient expertise related to the green transition and its financing in Finland will be ensured.

Green transition solutions have important international linkages. The importance of international cooperation is, in particular, emphasised in the development of analysis and assessment frameworks, international climate finance solutions, regulation, development of best practices and the areas of learning and research. The significance of regional cooperation is stressed, especially in the EU as well as the Nordic and Baltic countries, which have specific strategic interests and objectives relating to the green transition. International institutions and forums engage in cooperation and produce studies on the green transition and its financing.

Table 1. Summary of recommendations

Objective	Key measures
<p>1. Green transition investments will be made in Finland at a pace that will enable the attainment of carbon neutrality and environmental objectives</p>	<ol style="list-style-type: none"> 1. Investment certainty will be improved by means of a predictable regulatory environment and long-term commitments to promoting sustainable solutions. 2. Promoting the green transition will be set as an objective in public funding, subsidies, investments and procurement. 3. Inputs will be made into the circular economy as part of a sustainable economy.
<p>2. Finland will be a pioneer in scaling sustainable solutions to gain global benefits</p>	<ol style="list-style-type: none"> 1. Systematic inputs will be made into developing sustainable solutions and seizing their export opportunities. 2. Finland will engage in active international cooperation on developing good practices for green transition financing and influencing.
<p>3. A well-functioning financial market will make financing green transition investments possible</p>	<ol style="list-style-type: none"> 1. Consideration for sustainability perspectives in financial markets will be promoted by means that enhance trust and stability in Finland, internationally and especially at the EU level. 2. Continuous practices will be created for information exchanges and cooperation related to sustainable finance. 3. The steering and cooperation of publicly owned financial institutions will be developed to support the objectives of the green transition more coherently. 4. EU funding and models for leveraging private funding will be used more extensively to carry out green transition projects.
<p>4. Critical factors of the green transition will have been identified and the actors share a common situational picture</p>	<ol style="list-style-type: none"> 1. Stronger links will be forged between the green transition and economic policy drafting and decision-making. 2. The knowledge base for making economic policy decisions concerning the green transition will be built up, and economic research will be used and stepped up. 3. Competence associated with the green transition will be boosted across a broad front, and investments will be made in education, training and communication related to sustainable solutions and their benefits.

Objective	Key measures
5. Indicators for monitoring the achievement of key objectives will be introduced	<ol style="list-style-type: none"> 1. Indicators will be developed for monitoring the advancement of the green transition. 2. The availability of statistical data in Finland and internationally as well as the statistical systems' ability to collect and produce such data will be assessed.
6. Ensuring the implementation of the recommendations	<ol style="list-style-type: none"> 1. Effective means for horizontal cooperation will be created with the aim of ensuring and monitoring the implementation of the recommendations. 2. Responsibilities for implementing the recommendations in practice will be determined, taking into account ongoing studies.

FOREWORD

To mitigate climate change and halt biodiversity loss, significant investments made by companies, households and the public sector will be needed. A significant share of the investments and innovations associated with the green transition will come from the private sector. A number of financial sector actors have set carbon neutrality targets for their operations, in addition to which sustainable finance regulation has contributed to mainstreaming climate and environmental objectives in the financial markets. While the green transition will primarily be underpinned by private sector funding, public funding can have a significant leverage effect on investments. The public sector's task is to support and accelerate the green transition through various policy instruments, including predictable legislation, infrastructure and public funding. Households' choices and climate smart actions will also play an important role in promoting business opportunities and speeding up the transition.

Despite positive market development, it is necessary to ensure that funding will be systematically channelled to activities supporting the green transition and that in investments, strategic use will be made of different funding and risk-sharing instruments that can effectively increase or leverage private funding through public finance. Growing EU funding – EU aid programmes and market financing – has increasingly strong links to climate objectives, and a comprehensive analysis is needed to use it strategically. To seize these opportunities, new public-private models for boosting investment in line with the green transition objectives are needed.

On 18 January 2022 Annika Saarikko, Minister of Finance, Emma Kari, Minister of the Environment and Climate Change, and Mika Lintilä, Minister of Economic Affairs Mika Lintilä appointed a working group to form an overarching view of green transition financing.¹ The purpose of this working group was to draft proposals for means of accelerating the transition in an economically, ecologically and socially sustainable manner through financing.

1 Appointment decision of the Working group on financing the green transition, 18 January 2022: [Working group on financing the green transition](#)

The working group was chaired by Juha Majanen, Permanent State Secretary of the Ministry of Finance. Its Vice Chairs were Juhani Damski, Permanent Secretary of the Ministry of the Environment, and Ilona Lundström, Head of Department at the Ministry of Economic Affairs and Employment.

The members of the working group were:

Marja Nykänen, Board Member, Bank of Finland
 Janne Peljo, Chief Policy Adviser, Climate and Biodiversity, EK – Confederation of Finnish Industries
 Mari Pantsar, Director, Sitra
 Jouni Keronen, CEO, Climate Leadership Coalition CLC
 Venla Voutilainen, Special Adviser in Sustainable Finance (towards the end of the working group's term, Jussi Kettunen, Advisor), Finance Finland
 Antti Kontio, Head of Funding and Sustainability, Municipality Finance
 Belkis Kaader, Senior Adviser, European Investment Bank
 Paula Laine, Chief Executive Officer, Finnish Climate Fund
 Pia Santavirta, Managing Director, Finnish Venture Capital Association
 Timo Löyttyniemi, Chief Executive Officer, State Pension Fund
 Miira Riipinen, Director, Urban Development and Environment Unit, Association of Finnish Municipalities
 Kaisa-Reeta Koskinen, Head of Climate Unit, City of Helsinki
 Petri Malinen, Economist, Federation of Finnish Enterprises
 Reijo Karhinen, Vuorineuvos, Professor of Practice
 Hanna Silvola, Associate Professor, Hanken School of Economics
 Lassi Ahlvik, Associate Professor, University of Helsinki
 Ilkka Kaukoranta, Chief Economist (towards the end of the working group's term, Pia Björkbacka, Advisor, International Relations), Central Organisation for Finnish Trade Unions SAK
 Juho Korpi, Development Director, Ministry of the Environment
 Juhapekka Ristola, Director General (towards the end of the working group's term, Olli-Pekka Rantala, Director General), Ministry of Transport and Communications
 Jyrki Alkio, Chief Specialist, Ministry of Economic Affairs and Employment
 Armi Liinamaa, Ministerial Adviser, Ministry of Finance
 Milla Kouri, Ministerial Adviser; Ministry of Finance

The Secretaries of the working group were Pekka Moren, Senior Ministerial Advisor, Ministry of Finance; Eeva Alho, Chief Specialist, Ministry of the Environment; and Antti Valle, Senior Ministerial Advisor, Ministry of Economic Affairs and Employment. Significant contributions to preparing the report were also made by Mikko Jääskeläinen and Saara Jääskeläinen from the Ministry of Transport and Communications, Henri Tuominen,

Katja Tuokko, Juho Kortenieniemi and Bettina Lemström from the Ministry of Economic Affairs and Employment, Mikko Friipyöli, Riikka Malila, Heikki Sorasahi and Emma Terämä from the Ministry of the Environment, as well as Jenni Markkanen, Mira Paasonen, Lotta Mattsson, Bella Laiho, Jussi Kiviluoto, Ilari Valjus, Sara Tolonen, Jouni Sinivuori and Sara Hellemaa from the Ministry of Finance.

The working group on financing the green transition drafted proposals on how public and private funding can promote carbon neutrality, biodiversity and the attainment of other environmental objectives across a broad front while promoting sustainable growth. The working group organised its recommendations around the four key objectives and hopes that this structure will support the discussion that must be had on this complex issue. The working group met eight times and organised two workshops to consult stakeholders. The working group's mid-term report was published on 31 March 2022².

We would like to extend our thanks to the working group members and its secretariat for their commitment and actively sharing their expertise for the completion of this extensive task.

Juha Majanen
Permanent State Secretary
Ministry of Finance

Juhani Damski
Permanent Secretary
Ministry of the Environment

Ilona Lundström
Director General
Ministry of Economic Affairs and Employment

² Mid-term report of the Working group on financing the green transition (in Finnish): <https://julkaisut.valtioneuvosto.fi/handle/10024/163964>

1 Basic premises and key objectives

Mitigating the climate crisis and halting biodiversity loss are some of the greatest challenges facing humankind. These crises need to be looked at side by side, as they increasingly require common solutions. Climate change is altering living conditions across the globe. An increase of 1.5 degrees in global temperature is sufficient to pose a significant risk to humans. Global warming has accelerated, and human actions are some of its key background factors in form of fossil fuels, land use and industrial processes.³ Biodiversity loss continues despite the measures taken, also in Finland. Key drivers of biodiversity loss include land use, climate change, pollution, unsustainable use of natural resources and alien species.⁴ The time span for ensuring that global warming remains below two degrees and halting biodiversity loss is limited. In the Arctic region, this may mean warming of up to four times as fast as the global average.⁵

Finland is committed to mitigating climate change and adapting to its impacts as set out in the Paris Agreement of 2015. The new national Climate Act lays down more stringent emission targets with the aim of Finland being carbon neutral in 2035, whereas the goal of the EU Biodiversity Strategy is to halt biodiversity loss and to put biodiversity on a path to recovery by 2030. Together with the other Member States, Finland is committed to the key objectives of the Strategy for achieving the goals. Measures aiming to mitigate and adapt to climate change and to halt biodiversity loss will have a crucial impact on future generations' well-being, the status of the environment, and the long-term sustainability of Finland's public finances as well as the economy at large.

A system-level change throughout society and an overhaul of economic structures are preconditions for the green transition. The pace of renewal must be accelerated, and a course must be set towards attaining the climate and environmental objectives. The preconditions for simultaneously overcoming the challenges of climate change and biodiversity loss include structural change in the use of natural resources, policy instruments, use of market economy mechanisms and significant investments. The ways in which commodities are produced and consumed must also change. Circular economy

3 IPCC Sixth Assessment Report, <https://www.ipcc.ch/report/ar6/wg1/>

4 IPBES, Models of drivers of biodiversity and ecosystem change

5 <https://www.ilmatieteenlaitos.fi/tiedote/6RyezLB6HGN8bFqFOeBC5x>

will play a key role in achieving climate objectives and preventing biodiversity loss. To break away from overexploitation of natural resources, we need to transition away from a linear economy in which more natural resources are constantly being taken into use. To bring about the green transition, circular economy must be mainstreamed. In practice, however, we are still far from an environmentally sustainable economy, in Finland as well as elsewhere. As more stringent climate and other obligations are brought in, the needs to invest in circular economy models that support the green transition will be constantly growing.

It has been estimated that more than a half of the world's economic output is directly dependent on well-functioning natural ecosystems.⁶ Nature and biodiversity are public goods that maintain ecosystems. Protecting and recovering biodiversity and nature-based solutions will help mitigate climate change and adapt to its impacts. Natural resources that can be exploited in production are limited. One of Finland's obvious weaknesses compared to our reference countries is our high use of natural resources.⁷ This underlines the importance of circular economy solutions, increased added value and services. Tackling the global crises of climate change and biodiversity loss will require more efforts to change the underlying factors of unsustainable models, better resource efficiency and altered consumption patterns to ensure that the green transition will not be based on unsustainable use of natural resources.

Economic, climate and environmental policies play a key role in creating the necessary drivers of change and managing the transition's economic impacts. The costs to the economy incurred from urgent investments required by the transition and changes in modes of production and consumption may be significant, unless economic challenges are met systematically during the transition^{8,9,10}. A precondition for systematically controlling costs is carefully analysing the economic mechanisms and choices associated with the transition and selecting policy measures that guide companies and households to reduce emissions cost-effectively.

6 World Economic Forum, Nature risk rising: Why the crisis engulfing nature matters for business and the economy, 2020.

7 Transitions performance index 2021, Towards fair and prosperous sustainability, European Commission, 2021.

8 <https://www.piie.com/system/files/documents/pb21-20.pdf>

9 <https://www.ipcc.ch/report/ar6/wg2/>

10 UNEP Emissions Gap Report 2022.

In its report published in April 2022, the IPCC notes that emissions reduction measures should be accelerated significantly, as the measures reported by different countries to date will not be sufficient to limit global warming to the critical level of between 1.5 and 2 degrees by the end of the century.^{9,10} The UNEP's Emissions Gap Report 2022 predicts that the global temperature will rise by 2.8° C by the end of the century with a 66% probability, unless rapid and effective emissions reduction measures are taken in the next two decades.

Increased geopolitical uncertainty and security policy threats create added pressure to reduce energy and raw material dependences. This may result in situations where the priorities and timing of different objectives and commitments must be reassessed at national level when facing an acute crisis or threat. In such cases, it will also be necessary to balance the short-term and long-term interests of society, which may be partly contradictory, especially over the short term. To resolve and reconcile these acute needs, multidisciplinary solutions should be sought which, in the area of green transition financing, could include integrating different funding arrangements and risk sharing instruments into a broader solution package.

The new operating environment has increased the need for a green transition and phasing out of the fossil economy. Russia's military attack on Ukraine has necessitated significant changes in energy policy to secure energy supply and reduce dependence on Russia for energy and materials. The solutions for the acute need to break away from fossil energy imports and for climate change are partly the same and partly different. The climate objectives for 2030, 2035 and 2050 and the need to resolve the ecological crisis also remain relevant in the new geopolitical situation. The long-term objectives must be clear, and it is important to persist with them.

Rising energy prices affect households while they speed up green transition investments, at least momentarily. When making decisions in an altered operating environment, people's everyday lives and the social aspects should be taken into consideration in order to ensure that decisions are fair and acceptable. To address the employment impacts of the green transition, for example, the changing competence needs must be anticipated.

Finland's operating environment has been hit by several crises in the last 15 years. They have had different root causes, and their impacts on public finances, companies and households have been difficult to anticipate and manage. The repercussions of the COVID-19 pandemic can still be seen, among other things as high levels of public and private debt, continuing supply chain difficulties, and a prolonged period of accelerating inflation. This has impacts on the cost of financing through pressures on monetary policy, resulting in increasing interest expenses in the refinancing of public and private debt, while the higher price of financing is also affecting the profitability of new investments.

Threats to economic and financial stability increase uncertainty, undermine predictability and may reduce willingness to invest in risky and non-liquid assets. Long-term investments, in particular, may dwindle as uncertainty is prolonged. Long periods of high inflation combined with weak productivity growth and sluggish economic growth put new pressures on the sustainability of public finances. In the meantime, national preparedness should be ensured, and the funding needs arising from the changed situation should be addressed in different sectors.

The investment needs associated with the green transition are substantial in all areas of the national economy. Estimates of investment needs in Finland in 2022–2050 range from over EUR 100 billion (EUR 3.3 billion/year) to as much as EUR 242 billion (EUR 8 billion/year) of additional investments. At global level, the need for additional investments is estimated to be as high as USD 3,500 billion annually¹¹. The growing need for sustainable solutions will create significant opportunities for actors who can offer them. According to international estimates, global demand for low-carbon solutions needed to meet the climate commitments already made will increase by at least 20% compared to today's figures. This means potential growth of over EUR 3 billion in Finland's annual exports of investment goods¹². Recovery measures taken to promote the green transition are expected to as much as double the demand for sustainable solutions.

The green transition will necessitate a comprehensive transformation of the economy and society that will have extensive impacts. The present report seeks to describe this transformation and build an overall picture of its nature and the measures needed to accelerate it. Consequently, the key objectives and recommendations formulated by the working group are not limited to issues of investments and finance.

11 McKinsey & Co. How the European Union could achieve net-zero emissions at net-zero cost (2021)

12 Technology Industries of Finland's low-carbon roadmap (2020): <https://teknologiateollisuus.fi/en/node/26811>

Key objectives identified by the working group

1. Green transition investments will be made in Finland at a pace that will enable the attainment of carbon neutrality and environmental objectives

Finland will have long-term and proactive policies promoting the sustainability of industries and the economy, which will encourage companies to invest and be reflected in interest shown by foreign investors. The investment needs will be examined as part of attaining the objective of carbon neutrality in 2035 and other climate and environmental policy objectives. Policy instruments and incentives will support households' green transition investments and public sector procurement and investments.

2. Finland will be a pioneer in scaling sustainable solutions to gain global benefits

Finland will effectively support the development of new sustainable solutions, increasing its international carbon and environmental handprint. Inputs into the expertise, knowledge base and research this requires as well as into placing on the market and exporting new solutions will be increased. Circular economy solutions will play a key role as the foundation of the economy and in reducing unsustainable use of natural resources and material dependences. Finland will engage in active international cooperation on putting good practices for green transition financing on a permanent footing.

3. A well-functioning financial market will make financing green transition investments possible

The financial market will provide a broad funding base for the green transition. The transition will be brought about in a way that improves the stability of and confidence in the financial system and promotes the principles of sustainable EU financing. Different funding models and structures will be used and developed actively. This will include EU funding, as expanding and stepping up its use in financing the green transition in Finland will be important. The public sector will identify market failures or disruptions and create effective incentives and support structures to address them. In addition, the public sector should strive to promote solutions implemented on commercial terms.

Private investments in the green transition will be primarily financed from private sources. Public financial instruments will complement and leverage market financing, in particular to share the risks associated with developing and marketing new solutions. The importance of public investments will be emphasised in central and local government infrastructure investments as well as in RDI investments and risk sharing, especially in the development of new technologies.

4. Critical factors of the green transition will have been identified and the actors share a common situational picture

The preconditions for the green transition as well as the challenges and opportunities associated with it in a changing international operating environment will have been identified, and the situational picture of green transition financing will be up to date.

An adequate knowledge base will be maintained regarding the required investments, expertise and other factors as well as their impact on the economy and climate and environmental policy objectives. Exchanges of information and dialogue between the actors on a common strategic vision will be continuous.

Key concepts used by the working group

The concept of *green transition* refers to bolstering the economy and sustainable growth through green technologies and sustainable industry and transport as well as by reducing emissions. A precondition for a successful transition is that besides the climate, other environmental dimensions as well as economic and social sustainability are also addressed. The goal must be set at achieving a green transition that is sustainable for the climate, nature and humans, in other words a transition towards an ecologically sustainable economy and growth that, rather than being based on overexploitation of natural resources, is underpinned by low-carbon solutions that promote the circular economy and biodiversity and aim to be just. Emissions will be cut by reducing the carbon footprint and increasing the carbon handprint.

The *carbon handprint* refers to positive climate impacts created by using a product, process or service, in other words its emissions reduction potential for the user.

The *environmental handprint* means positive environmental impacts that the use of a product, process or service has on biodiversity, promotion of the circular economy or improving the status of water bodies and similar.¹³

A *just transition* refers to safeguarding social justice and workers' rights as well as ensuring that the impacts of the transition are distributed fairly between population groups and regions and that no one suffers from the transition disproportionately. The transition will also be important from the perspective of security of supply and self-sufficiency.

13 <https://www.vttresearch.com/fi/uutiset-ja-tarinat/>
[https://www.vttresearch.com/en/news-and-ideas/
carbon-handprint-evolved-environmental-handprint- vtt-and-lut-developed-positive](https://www.vttresearch.com/en/news-and-ideas/carbon-handprint-evolved-environmental-handprint-vtt-and-lut-developed-positive)

2 Green transition financing needs

2.1 Climate and environmental objectives and pressures in a changed operating environment

Climate actions will be implemented more comprehensively across societies and, according to the IPCC, some countries have been able to combine reducing their greenhouse gas emissions with economic growth. Despite improved energy efficiency and increased use of renewable energy, global emissions have grown in all sectors of economy. According to the IPCC, approx. 34% of global greenhouse gas emissions were generated in the energy industry, 24% in industry, 22% in agriculture, forestry and other land use, 15% in transport and 6% by buildings in 2019. A slightly smaller proportion of Finland's emissions, or 43%, was generated in the emissions trading sector (energy and industry), whereas approx. 57% came from the effort sharing sector, which includes transport, buildings and agriculture.¹⁴

Effective means of reducing emissions are available globally for all sectors. As examples, the IPCC mentions improving the energy efficiency of buildings, low-carbon building materials and the use of renewable energy in heating and cooling. In industry, key solutions include materials technologies, production processes relying on low-emission energy, and carbon capture and storage. In transport, the most important means are electrification of cars and, in HGVs, use of biofuels and electricity and hydrogen based fuels.

The IPCC stresses the importance of boosting carbon sequestration methods that remove greenhouse gas emissions from the atmosphere (sinks), such as soil and forest carbon stocks. Technical means of carbon sequestration may also be needed to achieve the long-term objectives of the Paris Climate Agreement. However, technical methods are currently associated with significant restrictions related to feasibility and sustainability. The use of many low-emission technologies has become cheaper since 2010, and their deployment has gathered momentum. In some cases, renewable energy sources are already cheaper than fossil fuels. However, it has been estimated that the cumulative emissions generated by investments in fossil infrastructure that have already been decided and those that are being planned will alone be enough to exceed the 1.5° target.

14 Annual Climate Report 2022. Ministry of the Environment publications 2022: 24.

In the European Union, the Commission outlined its climate neutrality objective for 2050 and the means for attaining it in its Green Deal published in 2019. The European Climate Law entered into force in summer 2021, making the climate neutrality target and the goal of reducing EU greenhouse gas emissions by at least 55% from their 1990 levels by 2030 legally binding. The Fit for 55 package adopted by the Commission in July 2021 contains proposals for climate legislation with a view to meeting the obligations laid down in the EU Climate Law.

The goal set in Prime Minister Marin's Government Programme is that Finland will be carbon neutral by 2035 and carbon negative soon after that. The new Climate Act, which lays the foundation for climate action in Finland, entered into force on 1 July 2022. It lays down emissions reduction targets for 2030, 2040 and 2050. In addition, this is the first time that the goal of carbon neutrality by 2035 has been set down in law, creating continuity in climate policy. The most important monitoring tool for the Climate Act are the national Climate Change Policy Plans.¹⁵ These plans contain measures for reducing emissions, adapting to climate change and enhancing carbon sinks.¹⁶ In October 2022, the Government adopted a proposal for complementing the Climate Act by imposing on municipalities an obligation to prepare climate plans. Clearer provisions on requests for a review are also to be added to the Act.¹⁷

The Medium-term Climate Change Policy Plan contains the measures that must be taken in the non-ETS effort sharing sector to achieve Finland's carbon neutrality target. The effort sharing sector includes emissions from transport, agriculture, separate heating of buildings, machinery, waste management and F gases as well as emissions from non-ETS industry and other energy use. In addition, the plan determines the means to be used for reducing emissions from the effort sharing sector in keeping with the proposed new EU obligation of 50% by 2030. The plan does not examine the financing of the necessary emissions reduction measures or their impact on the economy and public finances.

15 https://valtioneuvosto.fi/-/1410903/uusi-ilmastolaki-voimaan-heinakuussa?languageld=en_US; <https://ym.fi/en/the-reform-of-the-climate-change-act>

16 https://valtioneuvosto.fi/-/1410903/uusi-ilmastolaki-voimaan-heinakuussa?languageld=en_US; <https://ym.fi/en/the-reform-of-the-climate-change-act>; <https://www.finlex.fi/fi/laki/alkup/2022/20220423>

17 https://ym.fi/-/hallituksen-esitys-kuntien-laadittava-jatkossa-ilmastosuunnitelmat?languageld=en_US

The achievement of the carbon neutrality target is linked to carbon sink development in the land use sector. The Government approved and submitted to Parliament a report on the Climate Plan for Land Use Sector on 8 July 2022.¹⁸The land use sector refers to land use, land use change and forestry (LULUCF), as referred to in the United Nations Framework Convention on Climate Change and the Paris Agreement. Statistics Finland's instant preliminary data indicate that rather than being a net sink, the land use sector became a net emission source in 2021.¹⁹

By maintaining and protecting biodiversity, the impacts of climate change can be mitigated, and adaptation to them can be promoted. Biodiversity loss, on the other hand, creates unpredictable risks to human health and the functioning of ecosystems, both regionally and globally. The Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES) and the Intergovernmental Panel on Climate Change (IPCC) strongly link the measures to combat climate change and halt biodiversity loss.²⁰They warn against taking climate actions that would be harmful to nature and addressing climate change and biodiversity as separate phenomena.

The goal set in the Government Programme is to halt biodiversity loss by 2030. Biodiversity underpins a large part of economic activity, which makes our economic system vulnerable to the impacts of biodiversity loss. The Government adopted a proposal for a new Nature Conservation Act to be submitted to Parliament on 12 May 2022. Among other things, the new Act provides a legal basis for a National Biodiversity Strategy and voluntary nature conservation action plans, which include restoration and active ecological management measures.

The main objective set in the draft National Biodiversity Strategy currently under preparation is halting biodiversity loss by 2030 and recovery of biodiversity. Its aims also include a nature-positive Finland in 2035. This means that in 2035, the net impact of anthropogenic changes on the development of biodiversity in Finland will be clearly positive (enhance biodiversity). The Government will submit a report on the National Biodiversity Strategy for the period 2022–2035 to Parliament. This report will set key national targets for the status of biodiversity and the green transition of society for 2035.

18 <https://valtioneuvosto.fi/-/1410837/>

<https://valtioneuvosto.fi/-/1410837/>

valtioneuvosto-hyvaksyi-maankayttosektorin-ilmastosuunnitelman?languageId=en_US

19 Annual Climate Report 2022, Ministry of the Environment publications 2022:24.

20 IPBES-IPCC workshop report Biodiversity and climate change, 2021.

The changes in the operating environment caused by Russia's attack on Ukraine have led to a need to prioritise and front-load energy investments. These changes have also exacerbated the risk of policy choices guided by short-term priorities that are not in line with climate and environmental objectives. If such measures are necessary they should, as a rule, be introduced for a fixed term and cause as little harm as possible to the green transition objectives. If the policy coherent implementation of the green transition fails, this would increase investment uncertainty and, consequently, erode the prerequisites for the transition's cost-effective implementation. The preconditions for using controlled short-term solutions are a careful analysis of the options, anticipation of the future and making decisions for the long term. In addition to ending energy dependence, material dependences should also be examined.

As timber, oil and natural gas are no longer imported from Russia due to Russia's attack on Ukraine and the sanctions imposed as a result, there will be mounting pressure to find substitute timber elsewhere or to increase felling in Finland. In the meantime, the IPBES and the IPCC warn against developing climate change and biodiversity loss mitigation measures without interaction: a technology-based green transition may put ecosystems under strong additional pressure as efforts are made to replace non-renewable raw materials with renewable ones, and fossil energy with biofuels. Consequently, there is a risk of competitive natural resources use as different sectors rely on the same raw materials for their decarbonisation.

2.2 Green transition investment and financing needs in Finland

2.2.1 Large green transition investments will also generate economic benefits

A transition towards a low-carbon society will require substantial investments of the economy and society and bring about significant changes in all sectors of society. Straightforward estimates of the green transition investment needs are not available, however, as these figures depend on the assumptions and methodologies used. It should also be noted that while more detailed calculations have been produced, above all in relation to cutting greenhouse gas emissions, investments related to enhancing biodiversity must also be accounted for to examine the green transition as a whole.

It has been estimated that to achieve carbon neutrality by 2050, investments totalling approx. USD 125,000²¹ to 275,000²² billion would be required globally. The UN estimates that investments totalling USD 125,000 billion in the green transition could be achieved by 2050. On the other hand, McKinsey puts the global investment needs at USD 275,000 billion by 2050, which would require additional investments of approx. USD 3,500 billion a year. By comparison, the global GDP was around USD 85,000 billion in 2020.

To meet the proposed needs, existing investments would need to be multiplied to achieve the Paris Agreement goal globally.²³ However, current measures in different countries do not systematically promote the targeting of investments in keeping with the sustainability objectives. According to the OECD, for example, no more than just over 20% of public investments in COVID-19 recovery in 2020 were directed towards so-called green recovery.²⁴ At the same time, it should be noted that Finland and the other Nordic countries rank among the leaders in sustainability comparisons of recovery plans²⁵, which also paves the way for longer-term preconditions for targeting funding more systematically and comprehensively in line with sustainability objectives.

The European Commission (2020)²⁶ assessed the EU's investment needs in the context of preparing its Recovery and Resilience Facility. The annual investment need associated with the green and digital transitions is approx. EUR 600 billion, of which almost EUR 500 billion will be targeted at the green transition. This equals investment needs of around EUR 5,000 billion at the EU level in the current decade, with a particular focus on transport, construction, energy networks and energy production. The goal of the European Commission's Green Deal is to launch investments totalling EUR 1.000 billion in the EU's green transition by 2030.

21 UNFCCC, Race To Zero (2021): <https://racetozero.unfccc.int/whats-the-cost-of-net-zero-2/>

22 McKinsey, What it will cost to get to net-zero (2022): <https://www.mckinsey.com/mgi/overview/in-the-news/what-it-will-cost-to-get-to-net-zero>

23 IEA (2021), World Energy Outlook 2021, IEA, Paris: <https://www.iea.org/reports/world-energy-outlook-2021>

24 <https://www.oecd.org/coronavirus/policy-responses/key-findings-from-the-update-of-the-oecd-green-recovery-database-55b8abba/#section-d1e253>

25 The Global Recovery Observatory, tietoa haettu joulukuussa 2021. Tanska on kärjessä Vivid Economics' Greenness of stimulus index (GSI):n mukaan tehdyssä vertailussa. Katso. Vivid Eco-nomics. (2021) https://www.vivideconomics.com/wp-content/uploads/2021/07/Green-Stimulus-Index-6th-Edition_final-report.pdf

26 EU Komissio, SWD (2020) 176 final: [https://ec.europa.eu/transparency/documents-register/detail?ref=SWD\(2020\)176&lang=en](https://ec.europa.eu/transparency/documents-register/detail?ref=SWD(2020)176&lang=en)

While the estimates of green transition investment needs in Finland vary, even the minimum total of additional investments will be in the range of more than EUR 100 billion between 2020 and 2050 (EUR 3.3 billion a year). The most comprehensive and also the highest estimate was put forward by the Boston Consulting Group (BCG)²⁷: to attain Finland's climate objectives, cumulative additional investments of EUR 242 billion (in 2019 values) would be needed between 2020 and 2050: in other words, we are talking about annual additional investments of EUR 8 billion. Most of them would target the energy sector (including energy use in industry), cutting emissions from buildings and transport, and reducing industrial process emissions.

The price of the necessary investments is only one side of the equation when we calculate the costs of the green transition, however, as these investments will also generate economic benefits, for example through efficiency impacts. What is more, not all investments made in the name of the green transition will be additional to those currently included in the long-term calculations, as today's capital stock must in any case be largely replaced, and the future investment will be made in something different. Over time the price of new solutions will, in many respects, also be reduced as a result of economies of scale and technological development.

As noted above, in BGG's examination of the Nordic countries the accumulated additional investments required for Finland's green transition between 2020 and 2050 should total around EUR 242 billion. As the economic benefits of investments are factored in, the marginal cost of achieving carbon neutrality for society is significantly lower, or EUR 36 billion as an estimate, which equals around 15% of the value of the investments. This corresponds to approx. 0.4% of Finland's GDP²⁸. BCG also estimates that when made, the investments in the green transition would increase Finland's GDP by more than 5% and could create approximately 82,000 new jobs. Investments in the green transition will also prevent the realisation of risks associated with environmental change and, consequently, postponing or not making these investments also bears a price.

27 Finland's path to Net Zero. Boston Consulting Group, 2022 <https://web-assets.bcg.com/03/67/86916dc741e4b29e5e36f4777b3c/finlands-path-to-net-zero-bcg.pdf>

28 Finland's path to Net Zero. Boston Consulting Group, 2022 <https://web-assets.bcg.com/03/67/86916dc741e4b29e5e36f4777b3c/finlands-path-to-net-zero-bcg.pdf>

The estimates described above concern investments required to achieve the climate objectives. Overall assessments of the measures required for the green transition, including not only climate actions but also other environmental investments, are difficult to find. The World Bank puts the global costs of biodiversity loss at USD 2,700 billion until 2030²⁹, unless it can be halted.

According to the European Commission's first ever analysis of the environmental investment needs and investment shortfalls in the Member States³⁰, the total shortfall at EU level is EUR 110 billion. The Member States are encouraged to tap EU funding in environmental sectors, especially for nature conservation. The Country Report on Finland notes that, all in all, it is important to maintain and increase the level of financing for environmental investments (around 0.42% of GDP in 2014–2020) to cover the investment needs in 2021–2027 (over 0.96% of GDP). The financing gap in environmental funding consequently is at least 0.54% of GDP and probably larger, as the estimate only accounted for the needs identified at EU level (including water protection, circular economy and biodiversity).

2.2.2 Most emissions reductions will initially be achieved through electrification

In Finland, as in most other countries, a precondition for achieving carbon neutrality will be replacing fossil fuels with emission-free alternatives and raw materials in electricity and heat production, transport and industry alike. Electrification will be a key way of achieving this: emissions reductions in other sectors can be achieved by switching from fossil energy sources to low-emission electricity. Today, 86% of Finland's electricity production is already carbon dioxide free, and this share is growing rapidly.

While emissions reductions will initially be achieved especially through energy efficiency, by using bio-based raw materials and directly through electrification, progress in the medium and long term will rely on hydrogen, in particular, for the sectors that are the most difficult to clean. This will lead to a significant increase in electricity demand in Finland. In a background report produced for the National Climate and Energy Strategy³¹,

29 The Economic Case for Nature: A Global Earth-Economy Model to Assess Development Policy Pathways, 2021 World Bank.

30 Environmental Implementation Review, https://environment.ec.europa.eu/law-and-governance/environmental-implementation-review_en

31 Koljonen, T. et al. Pääministeri Sanna Marinin hallituksen ilmasto- ja energiapolitiittisten toimien vaikutusarviot: Hiilineutraali Suomi 2035 (HIISI) -jatkoselvitys, VTT Technology 402 (2022), <https://publications.vtt.fi/pdf/technology/2022/T402.pdf>

VTT Technical Research Centre of Finland estimates that the demand for electricity will increase by 25 TWh from the current figure of 87 TWh by 2040. In VTT's scenario, the greatest relative growth in electricity use will take place in transport, whereas consumption will also increase in the chemical industry and especially the energy industry. Electricity use in the energy industry will mainly grow as new fuel processing and storage technologies and the use of heat pumps in district heating are introduced. Future electricity needs will depend heavily on the development of power-to-X and hydrogen technologies, and a wide range of estimates of this need have been aired in public: for example, the demand has been estimated to double to 160 TWh by 2050, and even tripling of the demand is considered possible. Most of the increase in the electricity production capacity will come from onshore wind power, which must be supported by flexible electricity production and consumption, storage of electricity and powerful transmission connections.³²

Sitra's³³ take on the stages of the transition is that electricity production should be made emission free first, after which different sectors ranging from transport to heating and industry will be electrified in order of feasibility, while also implementing feasible energy efficiency measures. Electrification will not be an option in all sectors for a long time, if ever. Especially in industrial processes, HGVs and shipping, emissions reductions can be achieved by replacing fossil-based raw materials with bio-based ones and using hydrogen produced using zero-emission electricity (including synthetic 'electric fuels', steel or cement production with hydrogen).

McKinsey³⁴ estimates that by 2030, 47% of emissions reductions in the EU would be achieved through electrification, 17% through energy efficiency, 15% through demand-side factors and the circular economy, and 13% by hydrogen use.

32 Janne Peljo, EK, Investments in the green transition (2022): <https://ek.fi/ajankohtaista/blogit/janne-peljo-vihrea-siirtyma-avaa-tuhansien-miljardien-investointikysynnän-suomalaisille-yrityksille/>

33 Sitra, Enabling cost-efficient electrification in Finland (2021): <https://www.sitra.fi/en/publications/enabling-cost-efficient-electrification-in-finland/>

34 McKinsey & Co. How the European Union could achieve net-zero emissions at net-zero cost (2021): <https://www.mckinsey.com/capabilities/sustainability/our-insights/how-the-european-union-could-achieve-net-zero-emissions-at-net-zero-cost>

2.2.3 Sustainability transformations and investment needs

The most cost-effective way of achieving the goals set for reducing climate emissions and halting biodiversity loss is producing an overarching analysis of the necessary measures and ensuring that they are mutually complementary when implemented. This purpose is served by linking the green transition investments to key sustainability transformations. A sustainability transformation refers to systemic solutions in society for adapting activities that cause environmental harms to the limits of the environment's carrying capacity.³⁵

The working group selected for scrutiny five key areas of sustainability transformations that have been identified in previous studies as prerequisites for the green transition because of their emissions reduction potential and in terms of biodiversity.³⁶ Additionally, these five business ecosystems were identified in a recent report by the Boston Consulting Group³⁷ as the Nordic countries' strengths in achieving the green transition nationally with significant global potential for producing carbon handprint solutions. Accelerating investments in renewable energy while phasing out fossil fuels is the key to the transformation of the **energy system**. Large-scale investments in sustainable production methods of energy-intensive **industry** will be the central issue in cutting industrial greenhouse gas emissions over the next few years. A great deal of natural resources and energy are consumed in **construction and buildings**, in addition to which there will be considerable investment needs in renovations over the next few decades.

Transport innovations will similarly play a key role in reducing emissions and environmental impacts. Green transition solutions in the **food system and the land use sector** will be important in terms of not only the climate objectives but also biodiversity, status of the environment and Finland's self-sufficiency in raw materials.

35 SYKE Policy Brief: On kestävyysmurroksen aika. 9 December 2021. See also the Ministry of the Environment's strategy for 2035.

36 SYKE Policy Brief: On kestävyysmurroksen aika. 9 December 2021.; Kestävä elvytys - kohti koro- nakriisistä toipuvaa, menestyvää ja ekologisesti kestävää Suomea. Ministry of the Environment, 2020.; Suomen kestävä kasvun ohjelma (Sustainable Growth Programme for Finland).

37 Nordic net zero – The green business opportunity. Hjorth, Hegnsholt, Jameson, Saarela, Wagener, Groen & Parker, Boston Consulting Group, 2022.

The relative proportions of these investment needs associated with sustainability transformations can be examined on the basis of such figures as those included in BCG's analysis: of the additional investments required to achieve Finland's climate objectives amounting to EUR 242 billion, 59% (EUR 142 billion) concern electricity and heat production, 19% (EUR 45 billion) reduction of industrial process emissions, 10% (EUR 25 billion) cutting transport emissions and 10% (EUR 23 billion) reducing industrial process emissions. Food production and land use account for approximately 3% (EUR 6 billion) of the total. A significant part of the investments proposed for the energy system in BCG's analysis will serve the climate transition of industry, especially through electrification.

In addition to sustainability transformations, the following sections examine separately the key role of circular economy in the green transition, urban planning and local government actions as well as the role of households' investments, which have links to each one of the transformations discussed above.

2.2.4 Energy system

Around 80% of the greenhouse gases causing global warming are generated in energy production and consumption, including transport. This is why the energy sector plays an important role in climate change mitigation.

For many decades, promoting energy efficiency and clean energy sources have doubled as the cornerstones of Finland's energy policy and key climate change mitigation measures in the energy sector. In addition to the environmental viewpoint, key premises of the energy policy are continuity and security of supply well as competitive energy prices. A well-functioning energy market is a good starting point for achieving these objectives. The dramatic rise in electricity and fossil fuel prices in the second half of 2021 and Russia's invasion of Ukraine in February 2022 have also pushed security of supply and energy imports from Russia to the top of the agenda.

Substantial investments will be needed to carry out the changes needed in society, and especially in industry and the energy system. Consequently, companies' possibilities and willingness to make long-term investments in advanced clean technology will be crucial. The large scale of these investments will necessitate private funding on market terms, which can be supported by public funding. The IEA estimates that up to USD 5,000 billion a year should be invested in clean energy globally. In Finland, BCG puts the investments needed for the green transition of the energy system at EUR 142 billion between 2020

and 2050, which accounts for 59% of all green transition investments. Sitra's³⁸ estimate for the same period is EUR 64 to 70 million, of which 70% would be invested in wind power. The difference between these estimates is, among other things, explained by the fact that BCG's calculation includes industrial energy use and processes.

As fossil energy sources are phased out, investments must particularly be made in zero emission heat production, and the functioning of the electricity system must be ensured as variable production from renewable sources increases. In order to reduce emissions, not only investments in district heating, industry and separate heating of properties but increasingly also in the connectivity of different energy systems will be needed. In this so-called system integration, large heat pump solutions, exploitation of different surplus heat sources, electric boilers and heat storage solutions will be increasingly feasible as these technologies become competitive compared to traditional ones based on fossil fuels.

Significant investments in network infrastructure are another precondition for the electrification of society and ensuring continuity and security of supply. Fingrid has estimated that, in order for Finland to attain its carbon neutrality target set for 2035, approx. EUR 3 billion of investments in the main grid over the next 15 years will be required, and in its investment plan, the company's expectation is that around EUR 2 billion will be invested in the main grid over the next ten years³⁹. Recent information shows that the rapid growth in wind energy production has taken even Fingrid by surprise, and investments in the transmission capacity of the main grid are struggling to keep up with the increased production. An ability to develop the infrastructure proactively and to respond rapidly enough to future needs plays a key part in creating investment certainty for the energy sector and businesses.

The security of energy supply has been highlighted in recent times. Investments in the green transition should simultaneously bolster security of supply through ecologically sustainable choices. Actions⁴⁰ have been taken to secure the availability of LNG for the Finnish industry, enabling Finland withdraw from the Russian gas pipeline. In view of the long-term objectives of the green transition, natural gas as a form of fossil energy can only be an interim solution.

38 Sitra, Enabling cost-efficient electrification in Finland (2021): <https://www.sitra.fi/en/publications/enabling-cost-efficient-electrification-in-finland/>

39 Fingrid network vision (2021, in Finnish): https://www.fingrid.fi/globalassets/dokumentit/fi/sahkomarkkinat/fingrid_verkkovisio.pdf

40 refers to Finnish Government's decision in April 2022

Similarly, the use of peat for energy as a temporary solution for phasing out Russian energy is justified in order to ensure the continuity of district heat supply, whereas the use of energy peat will obviously continue its sharp decline in the 2020s for feasibility reasons. No new investments relying on energy peat are on the horizon, nor are they considered appropriate from the climate perspective.

In addition to a need to break away from dependence on fossil fuels, investments in energy system development that will facilitate the next steps in the green transition should be identified. Advancement in carbon capture technologies will even enable negative emissions and the use of carbon dioxide in the manufacture of new fuels and products as part of the circular economy. The hydrogen economy as a whole is an important part of future solutions. Investments are needed in new low-emission hydrogen production methods on an industrial scale, prioritising those that enable ecosystem impacts and multiplier effects. Hydrogen could be one of the future national solutions in Finland, and over the longer term, it could also open up opportunities in export markets.

Green electricity could be a trump card for Finland. Renewable and zero-emission electricity is now being produced in Finland at an accelerating pace. New electricity production investments are currently mainly made in wind power on commercial terms. For the decades to come, a vision for increasing electricity consumption is needed. In order for investments in renewable production to continue their growth, there must be demand for capacity in form of new industrial uses. A hydrogen economy as well as storage of electricity and flexible solutions will help make use of the entire renewable electricity production capacity, which is great in Finland. Renewable electricity production is already largely taking place on market terms. Sufficient flexibility of the electricity system, or more flexibility in consumption to adapt to momentary fluctuations in production, has emerged as the key issue instead. There could be more focus on developing new value chains and new high value products associated with zero-emissions electricity and the hydrogen economy, and they could be identified more clearly as new opportunities for finding international growth and increasing the carbon handprint of the Finnish economy.

While the green transition of the energy system is already progressing, actions are needed to speed it up. Many technologies and solutions are only emerging, and plenty of new investments will be required. Low-carbon industrial solutions need to be supported by a significant amount of new clean electricity production, and according to some estimates, electricity consumption will double by 2050. To be able to respond to the increased consumption, Finland's electricity production capacity should more than triple from the current 20 gigawatts to over 70 gigawatts by 2050. Due to the geopolitical situation, investments related to energy system renewal and phasing out of fossil fuels should be managed within an even shorter time span than this.

Most electricity and energy companies in Finland are owned by municipalities. These companies operate in the market, as do any other businesses in the sector, and they need a predictable operating and regulatory environment for their investments. Municipal decision-makers influence the operations of their companies through their ownership steering and can, for example, advocate a transition to renewable energy. In the Board of Helen Oy, which is owned by the City of Helsinki, municipal policy-makers made a decision to switch to carbon-neutral energy production five years earlier than initially planned.

The preconditions for the transition to a low-carbon, clean and sustainable future include not only putting a price on emissions but also significant investments in development, research and innovation related to clean energy technologies. By developing new solutions, emissions can be reduced and competitiveness improved. The global transition of the energy system is associated with enormous new business potential for Finnish companies. New low-carbon solutions will create new opportunities for growth and exports.

2.2.5 Industrial production

Green transition and digitalisation are the key drivers that promote renewal in different business sectors. In industry, this is manifested as new production and business models that rely on automation and digital solutions. Changes in environmental impact requirements and customer demand have also led companies to invest in sustainable production processes and energy and material efficiency. Developing new sustainable solutions plays a key role in generating global climate and environmental benefits and exploiting global demand in the Finnish export industry.

The greatest individual emissions reduction potential and the investment needs associated with it are found in the energy and resource-intensive process industries. These sectors are covered by the EU ETS, which is an effective policy instrument related to investments and emissions reductions in them. In 2021, 12.2 Mt CO₂ (25.6%) of Finland's emissions (excluding the LULUCF sector) were generated by energy-intensive industries⁴¹. The steel and chemical industries are clearly the most significant sources of CO₂ emissions among these sectors, followed by the forest and cement industries. In 2021, almost 35% of all ETS emissions from energy-intensive industry were generated by a single steel plant. Around 70 industrial plants in Finland are within the emissions trading system, and 58 of them operate in the above-mentioned four sectors and account for around 89% of the ETS emissions⁴².

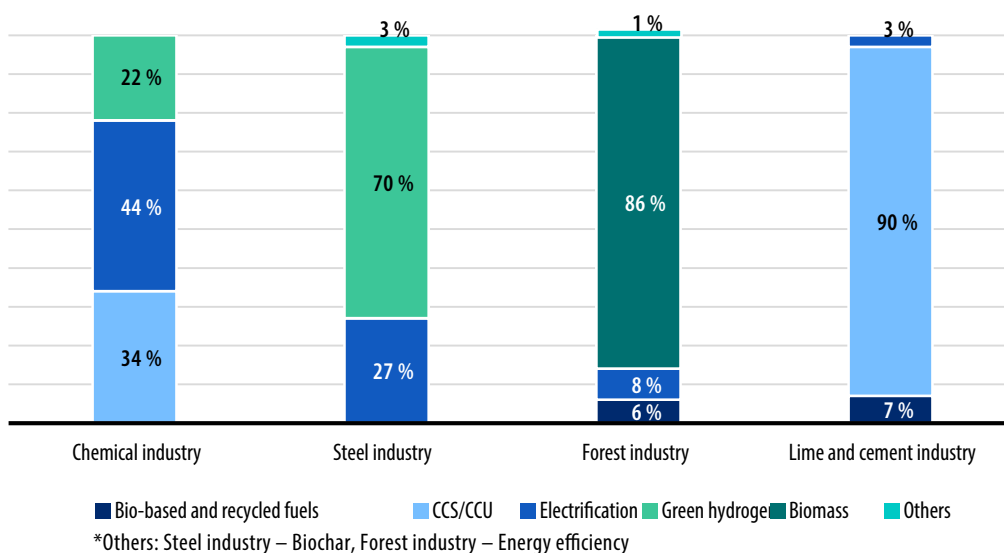
41 Energy Authority (2022): <https://energiavirasto.fi/paastokaupan-julkaisut>

42 Report commissioned by the Ministry of Economic Affairs and Employment on green transition investment needs in energy-intensive industry and their preconditions from Afry Management Consulting, to be completed in December 2022

In the background study for the National Climate and Energy Strategy (2022)⁴³, VTT Technical Research Centre of Finland notes that reducing greenhouse gas emissions will be considerably more difficult in the industrial sector than in energy production, despite the fact that the majority of industrial emissions are within the ETS. The trends of industrial emissions in Finland are critically influenced by technological changes in the process industry and the extent to and schedule on which the petrochemical industry will transition to using renewable raw materials. While the greatest emissions reductions through technological changes could be achieved by a transition to fossil-free steel production, the introduction of electric cracking in the chemical industry would also significantly reduce greenhouse gas emissions. No actual national emissions target has been set for industry, and the emissions reductions will ultimately depend on industrial companies' investment decisions. Due to the large scale and long cycles of these investments, they involve a high risk for both the implementer and the investor. Ways to accelerate green transition investments in existing industries must be found, without undermining companies' competitiveness.

Management consulting company BCG estimates that the investment needs relating to emissions reductions in Finland will be EUR 23 billion by 2050, which accounts for around 10% of the total need for carbon neutrality investments. Among other things, this examination includes industrial investments in energy efficiency, electrification, alternative fuels, hydrogen processes and introduction of CCS technology, which plays a key role in achieving emissions reductions. Estimates of the required investments in electricity networks and electricity production have been included in the energy sector, which accounts for EUR 142 billion of the total investment needs in BCG's analysis. In its report, AFRY also stresses especially electrification, green hydrogen, bio-based inputs and CCS/CCU for achieving emissions reductions. As the figure below shows, there are major differences between sectors regarding their needs and prioritised technologies for achieving emissions reductions.

43 National Climate and Energy Strategy (2022): <https://valtioneuvosto.fi/paatokset/paatokset?decisionId=0900908f807c35c1>

Figure 1. Prioritisation of emissions reduction measures by sector

Source: Afry 2022

According to an estimate contained in Finland's long-term emissions reduction strategy, the investments required to achieve the climate objectives in Finnish industry will exceed EUR 100 billion in total between 2020 and 2050⁴⁴. In order to get close to zero emissions in the energy system, it is expected that investments of at minimum EUR 20 billion in clean energy production will be required in 2020–2050. Significant investments will additionally be needed in energy networks and systems as well as new processes in energy-intensive industries. Climate solutions in industry will be closely linked to energy solutions. The production of hydrogen for the needs of industrial processes, for example, may also have a significant impact on investments in energy transmission and production.

Estimates of the green transition investment needs in industry consequently vary greatly according to the definitions used, especially depending on the extent to which clean energy investments are included in industry estimates. In terms of funding needs, it is also important to understand the investment cycles of different sectors and their differences in the prioritisation of emissions reduction measures while recognising the significant uncertainties in the scenarios for technological transformations. For example, several renewable energy technology solutions have achieved feasibility on market terms and scaling faster than expected.

⁴⁴ Finland's long-term strategy for reducing greenhouse gas emissions, Ministry of Economic Affairs and Employment 2020 <https://tem.fi/documents/>

An investment survey⁴⁵ conducted by the Confederation of Finnish Industries EK notes that the opportunities created by the green transition are a key reason for increased investments in industry. Significant investments in energy supply and the fact that the largest investments in different sectors are linked to the green transition almost without exception stand out in the data (including clean energy and energy efficiency, battery technology value chains, bioeconomy, expansion of production capacity in the value chains of clean solutions). Investments clearly falling in the category of fossil economy are few and far between, however.

To analyse the scale, costs and preconditions of measures needed to transition to a low-carbon society, 13 sectors have prepared low-carbon roadmaps⁴⁶ in cooperation with the key ministries. These roadmaps describe the emissions reduction trajectories in different sectors, most of which are based on electrification of machines and processes, improving energy and material efficiency, circular economy models and deployment of digital solutions. Electrification of processes is a key means of reducing fossil fuel use in heavy industry, which will radically increase the need for zero-emission electricity. In the future, industry will consequently use a significantly larger share of electricity, and the supply of affordable clean electricity will be a key factor in the location of industrial investments. Part of the investment need will emerge when decommissioned production capacity is replaced with low-carbon technology as well as when fossil fuels are phased out. Some of the investments will consequently also be about redirecting ones that would go ahead in any case to low-carbon objects.

While the sector-specific roadmaps do not provide commensurate estimates of the volumes of the required investments, estimates of the investments needed in their sector provided by the chemical industry in its low-carbon roadmap⁴⁷, for example, translate this issue into more concrete terms: in order to continue investments along the baseline trajectory (which also includes stepwise transition to carbon neutrality), EUR 34 billion will be required between 2015 and 2050. With an ambitious emission reduction scenario as the target level, the investment need is estimated to be EUR 58 billion over the same period. This 70% (EUR 24 billion) difference between the baseline and the ambitious target for the chemical industry alone reflects the scale of the challenge of green transition financing in Finland.

45 EK's investment survey, January 2022: <https://ek.fi/tavoitteemme/talouspolitiikka/suhdannetiedustelut/investointitiedustelu-tammikuu-2022/>

46 Summary of sector-specific low-carbon roadmaps (2020): <http://urn.fi/URN:ISBN:978-952-327-796-0>

47 Summary of sector-specific low-carbon roadmaps: Ministry of Economic Affairs and Employment Publications 2020:52. <http://urn.fi/URN:ISBN:978-952-327-796-0>

Alongside climate objectives, halting biodiversity loss has become a key objective of the green transition. Many pioneering companies have also been quick to make commitments to promoting biodiversity objectives. These objectives are seen as not only essential for preserving the environment but also an opportunity to offer clean solutions to meet a growing global demand.

Technology Industries has adopted a biodiversity programme for the entire sector⁴⁸ and is committed to supporting the objectives of the EU Biodiversity Strategy, according to which biodiversity will be on a path to recovery by 2030. Such stakeholders as the Confederation of Finnish Construction Industries RT are also preparing biodiversity roadmaps for their sectors.⁴⁹

While resource efficiency in different sectors has improved, Finland's domestic material consumption per capita remains the highest in Europe. In order to bring the green transition about, productivity and efficiency should be increased while reducing emissions and resource use. Any economic growth should be based on consumption of natural capital that is sustainable over the long term. At the heart of the ongoing industrial transformation is a shift from a linear economy based on using virgin raw materials to a circular economy, in which raw materials and products remain in use for a long time and preserve their value, and their adverse effects on the environment are minimised. According to the vision for Finland in 2035 contained in the national Strategic Programme for Circular Economy⁵⁰, a carbon-neutral circular economy society will be the foundation of Finland's successful economy, which will require sustainable and efficient use of natural resources. This programme sets the goals of reducing domestic use of non-renewable natural resources to the 2015 level and doubling resource productivity and the degree of circular economy by 2035.

In a circular economy, value is increasingly created by exploiting different service models in the use of products and resources, a precondition for which is reinventing business models. Enabling the efficient use, long life, repairs and reuse of products is a key factor in this. Circular economy business models create new growth opportunities⁵¹ and may

48 <https://teknologiateollisuus.fi/fi/vaikutamme/kestava-kehitys/teknologiateollisuuden-biodiversiteettiohjelma-tavoitteena-turvata-ja>

49 Rakennusteollisuus RT: Rakentajat haluavat ehkäistä luontokatoa, mutta onnistuminen edellyttää lisää yhteistyötä koko arvoketjulla.

50 [Government resolution on the Strategic Programme for Circular Economy.](#)

51 Sitra's playbook for developing circular economy business: Sustainable growth with circular economy business models: <https://www.sitra.fi/en/publications/sustainable-growth-with-circular-economy-business-models/>

help increase productivity, the sluggish growth of which is seen by the Sustainable growth working group⁵² as the main problem underlying the long period of slow economic growth in Finland.

The Sustainable growth working group regards bolstering innovation as the key to sustainable growth and underscores the Parliamentary RDI working group's objective of increasing research and development funding to 4% of GDP by 2030. New technologies and other innovations are needed to solve global sustainability challenges. Strong investment in RDI activities is also justified by the fact that according to estimates, one half of the emissions reductions needed by 2050 can be achieved by today's technologies, and new technological solutions and their commercialisation will consequently be crucial.⁵³ For Finland, investing in high-tech solutions represents an opportunity to multiply the benefits of climate efforts by exporting clean technology solutions and service models to countries and sectors where emissions are currently high.

Together with a large group of experts, VTT Technical Research Centre of Finland has prepared a vision for the fields of technological know-how with the highest potential for Finland⁵⁴. Many of these fields, including artificial intelligence, innovative materials, biotechnology, energy technology and manufacturing technology, may also help to create green transition solutions.

2.2.5.1 Buildings and the built environment

Renovations and improvement of the building stock will support the EU's transition to a carbon-free, clean energy system, as the building stock today accounts for one third of climate emissions and is currently largely inefficient in terms of energy use.⁵⁵ Emissions are generated in the construction processes of new buildings and as heating and electricity consumption when the buildings are used. Construction and buildings consume 50% of natural resources and 40% of all energy. The building stock offers great potential for significant emissions reductions through low-carbon and energy efficiency measures. Building materials account for a significant share of the greenhouse gas emissions

52 Sustainable economic growth and our future well-being: Final report. <http://urn.fi/URN:ISBN:978-952-327-815-8>

53 IEA International Energy Agency, Net Zero by 2050: A roadmap for the global energy sector. 2021.

54 VTT's vision paper: Most promising technologies. Perspective on sustainable growth and effective innovation policy in Finland: <https://www.vttresearch.com/en/vtts-vision-paper-most-promising-technologies>

55 Renovation Wave.

generated during a building's life cycle. Residential and public buildings as well as urban infrastructures and transport are additionally responsible for one quarter of anthropogenic pressure on biodiversity.⁵⁶

Green transition solutions for the construction and use of buildings have significant global demand potential. In the design phase, solutions for the reuse and recycling of materials are essential, in addition to developing low-carbon building materials. Green transition solutions for the use of buildings include smart energy management technologies for heating and local production and use of renewable energy.

In the context of the built environment, a precondition for the transition to a circular economy is seeing the existing building stock as a primary resource that can be converted, developed and improved in quality. Energy-efficient renovation creates value for areas and buildings. A determined effort should be made to optimise the utilisation rates of existing facilities by means of digital tools and new earnings models. In new buildings, modular construction and prefabrication of building products in factories are examples of ways in which the sector's productivity can be increased and the circular economy supported. In the future most buildings, infrastructure and building products in Finland should be made from recycled, renewable or other low-carbon materials. Sites should be examined as resource banks and carbon sinks, the contents of which are recorded in digital material passports and known so precisely that the reuse and recycling of building components and materials released from sites can be planned well in advance. Large-scale investments and funding are needed in these areas, including for demonstration projects using reusable building components.

The total repair backlog in different sectors in Finland is estimated at EUR 30 to 50 billion on sites ranging from water supply facilities to public buildings.

Investments in green transition financing and repair backlog overlap. Many directives on energy efficiency, including the Energy Performance of Buildings Directive (EPBD), the transposition of which was approved in Finland in 2020, will require highly significant investments in the building stock from households, companies and municipalities. For households, energy efficiency of residential buildings and heating systems, waste management and emissions from mobility are key themes of the green transition. Old buildings theoretically offer great potential for reducing emissions.

⁵⁶ The biodiversity crisis is a business crisis. Wubbels, Portafaix, Meyer zum Felde, Zieckle. Boston Consulting Group, 2.3.2021.

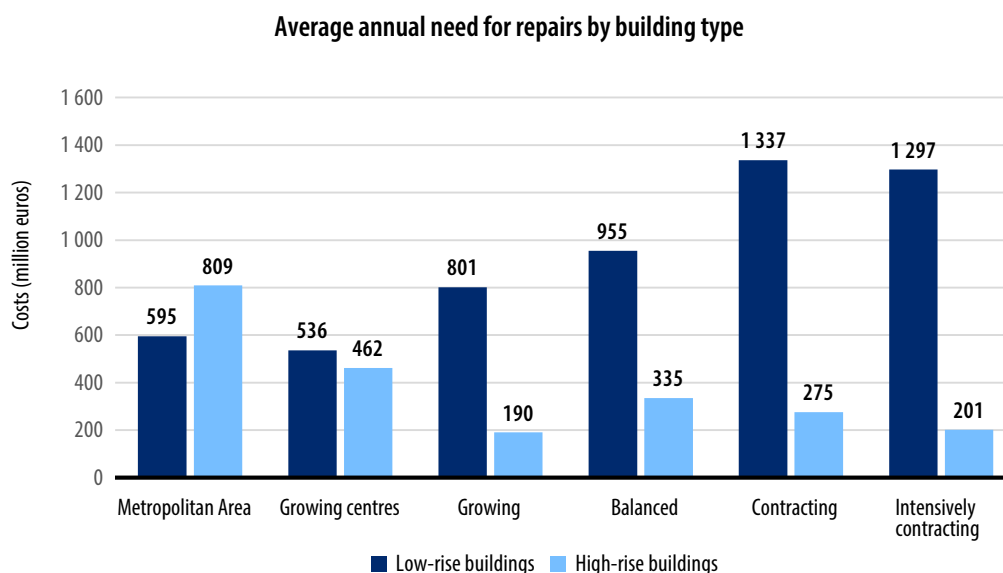
Financing repairs in buildings in need of energy renovations may be partly challenging. In Finland, the EPBD particularly applies to the obligations of building more capacity for charging electric cars and reducing emissions from properties by means of modern building technology. The estimated costs will be tens of millions of euros a year, depending on the scale of the measures.

Implementing Finland's renovation strategy will cost EUR 24 billion over 30 years and EUR 800 million a year based on cost-optimal levels of minimum energy efficiency requirements for renovation (2018).⁵⁷ This strategy implements the EPBD Directive in Finland. Finland's strategy sets the target at reducing carbon dioxide emissions from buildings by 90% from their levels at the beginning of 2020 by 2050. The targeted emissions reductions are divided between different sectors: emissions from buildings will be reduced by 40% by phasing out fossil fuels in heating and electricity production for buildings, while 20% of the reductions will be achieved by improving energy efficiency and 30% through decommissioning old buildings and improving efficiency of space use. These investments are well placed to receive market funding as they will pay themselves back as improved energy efficiency. One of the challenges in Finland is the low collateral values of properties in areas with weak housing markets. Carrying out energy renovations in these properties will be difficult if loans cannot be obtained for them.

A report by Pellervo Economic Research (PTT) estimates that **the average technical renovation needs in residential housing stock are approx. EUR 7.8 billion annually**, measured at 2021 cost levels.⁵⁸ The report puts the value of the repairs at EUR 6.4 billion in 2020. The PTT report assesses the technical and financial repair needs until 2050. The estimates are linked to energy efficiency requirements and, consequently, climate targets as investments in the building stock improve energy efficiency as a rule. At the end of 2020, there were fewer than 2.8 million permanently occupied dwellings and more than 1.3 million residential buildings in Finland, which accounted for 86% of all buildings. The value of the housing stock at average 2021 prices is around EUR 480 billion. Between 2022 and 2050, the average annual technical renovation need is estimated to be 4.07 million square metres, corresponding to 1.8% of the total housing stock.

57 Renovation Strategy (2020)

58 Huovari Janne, Kurvinen Antti, Lahtinen Markus, Saari Arto and Sen Tuuli. 2022. Asuinrakennusten korjaustarve 2020–2050 PTT reports 276

Figure 2. Repair needs in different areas.

Source: PTT 2022

The investment needs related to public building stock in Finland are significant, and the repair backlog is estimated at approx. EUR 5 to 9 billion⁵⁹. The excessive volume of building stock in relation to the service needs, its age structure and inappropriate facilities are, among other things, manifested as underuse of the building stock. It is likely that the number of underused or disused properties will increase in the next few years due to demographic changes and space solutions associated with the health and social services reform. Energy efficiency measures should only be taken in properties that will remain part of the municipal service network and are fit for repair. If there is no use for a property, investing in its energy efficiency is not appropriate.

2.2.5.2 Transport

Greenhouse gas emissions from domestic transport in Finland⁶⁰ totalled approx. 10 million tonnes of carbon dioxide equivalent in 2021. Transport emissions account for around one fifth of all greenhouse gas emissions in Finland and around 40% of emissions in the ETS sector. Approx. 94% of domestic transport emissions were generated by road transport.

⁵⁹ Healthy Premises 2028 Programme (2017); and Development and saving potential in the municipalities' building stock, Government's analysis, assessment and research activities 5/2018.

⁶⁰ Domestic transport emissions include emissions from road, rail and domestic waterborne transport powered by different fuels

The goal is to halve greenhouse gas emissions from transport by 2030 compared to 2005 levels and to eliminate them completely by 2045.⁶¹

A green transition in transport is, among other things, promoted by the Roadmap for fossil-free transport⁶² adopted in 2021 and the National Transport System Plan, or the so-called Transport 12 Plan⁶³. The societal objectives of developing the transport system include promoting Finland's competitiveness, mitigating climate change and securing the vitality and accessibility of regions. The green transition is also seen as an opportunity to promote investments in the transport sector and business and export-driven growth nationally⁶⁴. A sustainable, cost-effective and energy-efficient transport system will also facilitate the green transition and sustainable growth of other sectors.

The approaches to reducing greenhouse gas emissions from transport can be roughly divided into three groups⁶⁵:

1. Reducing the performance (kilometres driven) of transport that produces emissions and improving the transport system's energy efficiency in other ways.
2. Transitioning to low-emission or emission-free technologies in means of transport (including electric cars).
3. Introducing increasingly low-emission or renewable fuels.

The Roadmap for fossil-free transport prioritises measures for achieving the emissions reduction targets set for transport by 2030. The measures primarily focus on road transport, which creates the majority of the greenhouse gas emissions. Over the longer term, the green transition in transport will include reducing energy consumption in transport and replacing fossil fuels (petrol, diesel and natural gas) with sustainable renewable fuels and electricity in both passenger traffic and carriage of goods. In practice, this means measures to promote electric transport and increase the use of

61 Roadmap for fossil-free transport – Government resolution on reducing domestic transport-related greenhouse gas emissions; Ministry of Transport and Communications publications 2021:15

62 Roadmap for fossil-free transport – Government resolution on reducing domestic transport-related greenhouse gas emissions; Ministry of Transport and Communications publications 2021:15

63 National Transport System Plan for 2021–2032. Government publications 2021:75

64 National Programme for Sustainable Growth in the Transport Sector in 2021–2023, Government, publication 2021:60

65 Action programme for carbon-free transport 2045 – Final report by the Transport Climate Policy working group, Ministry of Transport and Communications publications 13/2018

renewable fuels. The driving power transformation will require significant private and public investments in both renewing the vehicle fleet and developing the distribution infrastructure for alternative forms of driving power. Investments in the production of sustainable fuels and renewable electricity will also be crucial.

In addition to driving power changes, the preconditions for the green transition will include an increase in the share of sustainable modes of travel (public transport and other transport services, cycling, walking) in passenger traffic. For this, public sector investments in transport infrastructure and public transport appropriations will be needed. A more determined effort should be made to aim for a transport system based on a high service level of public transport and its effective integration into other shared mobility services (including electric car sharing) as well as walking and cycling. To achieve the emissions reduction targets in transport, the opportunities offered by new transport services, automation and digitalisation of transport will also be used, and the realisation of social and regional justice will be promoted. To accelerate the servicification of mobility, a so-called mobility account has been proposed, which is in use as a fringe benefit in some countries. From the perspective of electrification of transport, a critical emerging investment theme is the development and scaling of battery material recycling.

The basic premise of developing the distribution infrastructure for alternative fuels in Finland is commercial operation and financing construction with user charges. As these operations are not yet economically viable, however, the transition has been accelerated with national subsidies. The investment costs of the distribution infrastructure for alternative fuels in Finland have been assessed as part of processing the Commission's proposal for a regulation on the deployment of alternative fuels infrastructure⁶⁶. Should the proposal be implemented as it stands, its minimum requirements would result in significant additional investment needs, especially for HGVs. The estimated costs of achieving the objectives set in the regulation would be approx. EUR 65 million for the part of electric charging pools for HGVs in 2030, whereas the costs for hydrogen refuelling stations would total around EUR 14 to 42 million. While the construction of charging infrastructure for light vehicles would also result in additional investment needs, it is likely that at least the targets for 2025 will be achieved as the pace of constructing public high-power charging stations is accelerating. This development is also promoted by the current subsidies.

⁶⁶ European Commission's proposal for a regulation on the deployment of alternative fuels infrastructure, and repealing Directive 2014/94/EU of the European Parliament and of the Council (COM(2021) 559 final)

No estimates have so far been produced on the private investments needed to renew the vehicle fleet. However, the minimum goal set in the Roadmap for fossil-free transport is a total of 700,000 electric cars in Finland in 2030, which would mainly join the Finnish fleet as new vehicles. The average prices of electric cars were around EUR 50,000 in April 2022, which would mean that the investment needs shouldered by private consumers, companies and other actors would, as a rough estimate, be as high as EUR 35 billion. The investment needs in new driving powers for the HGV fleet will also be in the range of billions of euros.

To reach the objective of halving transport emissions, substantial investments will also be necessary in sustainable mobility infrastructure. In 2018, the ILMO45 report estimated that the investment costs of sustainable mobility could cumulatively amount to around EUR 17 billion in total by 2045. Measures for developing a sustainable transport system for the years to come were identified in the National Transport System Plan, on the basis of which the Finnish Transport Infrastructure Agency prepared an investment programme for the transport network.⁶⁷ The measures will be promoted as permitted by the estimated annual central government appropriations.

In 2019, less than one per cent of domestic transport emissions were generated in rail traffic. Electric traffic accounts for more than 90% of train-kilometres in Finland today.⁶⁸ The development of rail traffic has also effectively enabled sustainable urban structure in the largest urban subregions and along the connections linking them⁶⁹. In keeping with the Government Programme, the amount of rail investments will be increased from their current levels.

International maritime logistics is undergoing a transition to increasingly sustainable fuels and other driving powers. This transition concerns not only maritime transport, shipping companies, ports and the entire maritime cluster but also sustainable production and distribution of fuels and electricity on the shoreside. No national overall estimate of the magnitude of these investments is available. It has been estimated that globally, 87% of the total investment will consist of sustainable fuel distribution infrastructure and investments in shoreside production facilities. This transition will also require substantial investments in Finland. For example, constructing a 10 MW shoreside electricity

67 Finnish Transport Infrastructure Agency's Investment programme for state-owned transport infrastructure network for 2022–2029, Finnish Transport Infrastructure Agency publications 73/2021

68 Roadmap for fossil-free transport – Government resolution on reducing domestic transport-related greenhouse gas emissions; Ministry of Transport and Communications publications 2021:15

69 National Transport System Plan for 2021–2032. Government publications 2021:75

connection to each of the four TEN-T core network ports would, according to one estimate, incur a total cost of approx. EUR 7.5 million. If similar investments were made in each one of the thirteen TEN-T ports, the estimated total cost would be around EUR 24 million.

A government resolution adopted in May 2021 outlines a number of measures to facilitate the transition to alternative driving powers and fuels in shipping and to support improved energy efficiency of existing vessels and the development of new low-emission vessels.⁷⁰ It also emphasises active exertion of influence for reducing emissions from international shipping, as global actions are the most effective in the international maritime sector.

Emissions reduction and the green transition in air traffic have been assessed in recent years by the Working group on fossil-free transport and in the government resolution adopted in May 2021⁷¹. Increasing the use of renewable aviation fuels and efficient deployment of new driving powers, including electricity and hydrogen, will be essential for achieving the targets. Halting and reversing the increase in aviation emissions will require efficient deployment of a diverse set of measures, both internationally and nationally. By implementing the measures of the resolution, the Government aims to reduce emissions from domestic and international aviation departing from Finland by 15% by 2030 and 50% by 2045 compared to 2018. Domestic air traffic should be emission free in 2045.

Transport is also an intrinsically important sector from the viewpoint of employment and value creation in the national economy. A National Programme for Sustainable Growth in the Transport Sector is currently being implemented with the aim of promoting investments in this sector as well as business and export-led growth in cooperation between the public and private sectors and research, underpinned by sustainable solutions. A precondition for attaining the goals of this programme is funding provided by companies, the public sector and the EU, for example for RDI.

2.2.5.3 Food system and land use

Despite national and international objectives, Finland has not managed to halt biodiversity loss. The root causes of biodiversity loss include increasing pressure created by land use change as well as agriculture and forestry.⁷²As a result of nutrient loading, emissions of hazardous substances and climate change, the state of the oceans, the Baltic

70 Government resolution to reduce emissions from maritime and inland waterway transport. Ministry of Transport and Communications publications 2021/12.

71 Government resolution to reduce greenhouse gas emissions from aviation LVM/2021/64

72 Final report of the Working group on sustainable recovery, 22 October 2020.

Sea and inland water bodies has not improved towards a good status in line with the targets set in river basin management plans and the marine strategy.⁷³ Depleting mineral phosphorus resources⁷⁴ and efforts to cut down on the use of energy-intensive nitrogen fertilisers will make it necessary to rely on recycled raw materials, among other things. The amount of phosphorus contained in manure from livestock alone meets the annual needs of Finnish agriculture. The challenge associated with phosphorus, however, is to process and transport phosphorus contained in manure out of the areas with a surplus. This could have a significant impact on nutrient emissions from agriculture.

Land use is the largest single driver of biodiversity loss, and the value chain of food production accounts for more than a half of the anthropogenic pressure on biodiversity.⁷⁵ At the same time, a good status of biodiversity is critical for food production. In the future, a transparent, responsible and sustainable food system must address the welfare of the environment, human health and economic success better.⁷⁶ The European Commission's communication on the Farm to Fork Strategy notes that promoting climate actions, circular economy, resource smartness and biodiversity should be incorporated in all parts of the food chain.⁷⁷

Regenerative cultivation methods that improve carbon sequestration in the soil, soil condition, biodiversity and also the profitability of cultivation will play a crucial role in *food production of the future*.^{78, 79} Sustainable bioenergy production and, for example, processing livestock manure into biogas offer both potential for emissions reduction and business opportunities for companies.⁸⁰ Biogas can also be obtained from organic waste and side streams from communities, agriculture and industry.

73 Sustainable Growth Programme for Finland

74 Varying estimates have been presented of the adequacy and depletion of phosphorus reserves. In any case, the quality of phosphorus deteriorates as the reserves run out, increasing costs.

75 IPBES, Global Assessment Report on Biodiversity and Ecosystem Services, 2019; The biodiversity crisis is a business crises. Wubbels, Portafaix, Meyer zum Felde, Zieckle. Boston Consulting Group, 2.3.2021.

76 Final report of the Working group on sustainable recovery, 22 October 2020.

77 https://ec.europa.eu/commission/presscorner/detail/fi/ip_20_884

78 European Commission's Farm to Fork strategy, 2020: <https://www.consilium.europa.eu/en/policies/from-farm-to-fork/>

79 Climate-friendly practices that promote carbon sequestration could include planting hedges or trees, cultivating legumes, using catch and cover crops, cultivation that maintains soil condition and the preservation of peatlands as well as afforestation and reforestation.

80 Nordic net zero – The green business opportunity. Hjorth, Hegnsholt, Jameson, Saarela, Wagener, Groen & Parker, Boston Consulting Group, 2022.

In a circular economy, food production relies on interactions between biomass production, nutrients and energy, and perennial plants are cultivated to produce biomass and to promote biological nitrogen fixation. The food system will also be more self-sufficient as less energy and fossil fertilisers need to be imported. A precondition for achieving this is cooperation between food system actors with the aim of integrating production chains. Disruptive methods can also be used to produce food without soil (with cellular agriculture as an example). The food system should use less land for food production. This means transitioning to a diet dominated by plants and fungi. Fields can also produce other commodities besides food, including materials for textiles and construction.

By promoting *nutrient recycling*, loading in the Baltic Sea can be reduced and water protection improved by circular economy means while safeguarding domestic food production and increasing self-sufficiency in nutrients and energy.^{81,82} Both measures have a positive impact on reducing greenhouse gas emissions. Significant investments will be needed in the processing and transport of manure for biogas production and nutrient recycling. There is a demand for technologies that promote nutrient recycling in both domestic and international markets.

In the land use sector, greenhouse gas emissions can be reduced especially by restoring peatlands and ensuring that forests are not taken over by other types of land use (deforestation). For peatlands, creating value chains of wetland farming is essential. Introducing a forest cycle longer than that suggested in current recommendations is a quick solution for forest owners who wish to maintain and increase carbon sequestration in forests.^{83,84} The ability of forests to sequester carbon can be boosted by ensuring the growth capacity and health of forests, for example by increasing the number of deciduous trees in commercial forests and favouring mixed forests in silviculture. Afforestation of fallow lands is another one way of increasing the forested area and thus carbon sequestration.⁸⁵

81 <https://ym.fi/ravinteidenkierratys>

82 <https://ym.fi/web/ym/-/ravinteiden-huoltovarmuuden-turvaamiseksi-uutta-rahoitusta-investointeihin-seka-tutkimukseen-kehitykseen-ja-innovaatioihin>

83 <https://mmm.fi/-/pidennetyn-kiertoajan-mahdollisuudet-ja-menetelmat-metsien-hiilensidonnassa>

84 Extending the forest cycle helps maintain the carbon stores and sink of the forest, depending on their structure and the trees. However, this is only a temporary measure if the forest is clear-felled at the end of the cycle.

85 <https://mmm.fi/en/climate-plan-for-the-land-use-sector>

Nature-based solutions are multi-benefit natural structures or practices that can be used to simultaneously promote climate change adaptation, biodiversity protection and human well-being. They produce ecological, social and economic benefits simultaneously.^{86, 87} Nature-based solutions can rely on the preservation or restoration of existing ecological sites or building such ecosystems as wetlands or green roofs.⁸⁸ Nature-based solutions consequently play a key role in preparing for the impacts of climate change. A report found that extensive construction of green roofs appears to be a more economically feasible way to manage the risks of heavy rainfall than local measures focusing on channels, but in order to bridge the gap between the social benefits of green roofs and the costs incurred by private individuals, incentives would be needed for individuals who usually carry the costs of green roofs.⁸⁹

No comprehensive estimate of investment needs related to the sustainability of the food system and land use is available. The Climate Plan for the Land Use Sector contains proposals for the additional funding needs required by the measures. A transformation of the food system is essential for the green transition, and investments and funding targeted at supporting the green transition throughout the entire food chain are a precondition for bringing it about. In particular, primary production and the food industry must be reformed. As far as the food industry is concerned, the same financing instruments are mainly needed as for the green transition of other types of industry. Agricultural primary production is a separate issue due to the large role of subsidies. The incentive effect of agricultural subsidies should consequently be used by systematically directing subsidies towards primary production in keeping with the green transition and, similarly, other subsidies paid from public funds for any environmentally harmful activities should be reallocated and discontinued. When developing incentives within the subsidy system, it is important to ensure fairness and safeguard self-sufficiency in food production.

86 Sitra Lab.

87 An example of nature-based solutions is stormwater wetlands that retain water, offer habitats for plants and birds, and provide recreational opportunities and nature experiences for people. Protected marine areas that conserve biodiversity and promote the vitality of species important to the fishing industry are another example.

88 Sustainable urban planning: Nature-based solutions in provinces and municipalities, Publications of the Government's analysis, assessment and research activities 2019:48.

89 Implementing nature-based solutions in provinces and municipalities in practise, Publications of the Government's analysis, assessment and research activities 2019:49.

The circular economy investment needs of the food system are associated with boosting the plant protein and mycoprotein sector, building value chains for wetland farming products, new forms of processing grassland products, and other production and consumption that improve soil condition. To increase the output of plant proteins in Finnish primary production, it has been estimated that investments of approximately EUR 10 to 15 million will be required on farms and in agricultural enterprises.⁹⁰ In addition, a protein isolate plant and industrial-scale facilities using plant protein sources are a precondition for developing a plant protein ecosystem, and the total investments needed in these facilities have been estimated at approx. EUR 40 to 150 million.⁹¹ Land use planning plays a key role in the implementation of nature-based solutions.⁹² A report found that nature-based solutions are being planned and implemented in municipalities on municipal budget funding and project funding, which project actors apply for separately for innovative development of operations.

Economic impacts are, for example, generated from using the by-products of communities and industry as well as from improved business potential for companies when using new solutions.⁹³ Restoration and management measures focusing on endangered habitats, species and landscape values promoted under the new Nature Conservation Act and through the financial support system included in it may additionally be apt to trigger new business in ecological and landscape management tasks.

Voluntary ecological compensation makes it possible to offset any impairment caused by economic activities to nature. While voluntary compensation measures can contribute to the fight against biodiversity loss, they will not be adequate on their own, as they should be considered a last resort when harms cannot be prevented or mitigated. Voluntary ecological compensation is about responsible business and the operator's ability to prove their corporate responsibility, for example to finance providers, investors or customers, civil society and business partners.⁹⁴ A private landowner, company, municipality or state enterprise could create natural values to offset any values lost due to other economic activities.

90 Financing SDG transformations: Experience from four Finnish pilots, 2022.

91 Financing SDG transformations: Experience from four Finnish pilots, 2022.

92 Sustainable urban planning: Nature-based solutions in provinces and municipalities, Publications of the Government's analysis, assessment and research activities 2019:48.

93 Sustainable Growth Programme for Finland

94 <https://ym.fi/en/ecological-compensation>

The result of the green transition will be healthy ecosystems. Finland's Country Report in the Environmental Implementation Review published by the Commission compares the funding available for implementing environmental legislation in Member State in proportion to estimated investment needs. The Country Report on Finland notes that significant investments will still be needed in the following areas⁹⁵:

- pollution prevention and control, EUR 1.1 billion by 2030;
- water management, EUR 1.3 billion beyond the baseline investment by 2030, 90% of which relates to wastewater;
- waste management, EUR 289 million beyond the baseline investment in 2021–2027
- biodiversity and ecosystems.

The costs of nature conservation (including the Natura 2000 network) in Finland will total EUR 6.03 billion in 2021–2027, or approx. EUR 862.4 million a year.⁹⁶ Annual one-off costs account for EUR 99 million of this amount. It does not include the additional costs of implementing the Biodiversity Strategy for 2030, including the costs of more wide-spread conservation and restoration.

2.2.6 Cross-cutting solutions that promote sustainability transformations and the associated investment needs

2.2.6.1 Role of circular economy in the green transition

The green transition is a transition towards an ecologically sustainable economy and growth that, rather than being based on overexploitation of natural resources, is underpinned by low- carbon solutions that promote the circular economy and biodiversity. The circular economy transition means a transition to an economy that will help to mitigate not only the climate crisis but also biodiversity loss and overexploitation of natural resources. A precondition for the transition to a circular economy that aims for phasing out excessive consumption of natural resources will be changes in practices as well as investments in different sectors, municipalities and regions. Key sectors in the transition are those that use a great deal of natural resources, including the energy industry, mining, chemical industry, real estate and construction sector, forest industry, food system and technology industry.

⁹⁵ <https://eur-lex.europa.eu/legal-content/FI/TXT/PDF/?uri=SWD:2022:277:FIN&from=FI>

⁹⁶ PAF, or Priority Action Framework

The prerequisites for achieving the climate objectives include major changes in energy and emission-intensive industries and steering transport and energy consumption onto a path towards zero emissions. One of the key drivers of environmental degradation is consumption, which does not show any signs of decreasing. A growing demand for raw materials, rising prices and efforts to mitigate climate change emphasise the need to replace the use of non-renewable raw materials and energy with renewables and to improve their efficient use, recovery and reuse. The growing demand for metals driven by the digitalisation and electrification of society gives rise to global needs to develop more resource-efficient ways of using metals and creates demand for sustainable alternatives produced from renewable raw materials.

Investments in circular economy and promoting the circulation of materials could improve Finland's self-sufficiency in both energy and materials, reduce the risks associated with material dependence, and help avoid new dependencies. In the future, it will be essential to see greenhouse gases, various side streams and materials currently considered wastes as raw materials. This will require a change in our ways of thinking and acting as well as dismantling of legislative obstacles.

In a circular economy, conventional practices and production methods will be replaced by more resource-wise and efficient ones, making it possible to reduce the use of virgin natural resources and to adapt consumption and production to the limits of the Earth's carrying capacity. In circular economy solutions, products and materials are used for as long as possible, which reduces the requirement for natural resources and new land areas, and less waste is also created. A Sitra report found that global circular economy measures in four sectors (food chain, forest industry, built environment, textiles) will make it possible to restore biodiversity to the 2000 level by 2035.⁹⁷

A transition to a circular economy will help to:

- Reduce the need for raw materials and other materials (including by means of material and energy efficiency as well as sharing and service models).
- Extend the service life of materials and products (including by reuse and re-manufacturing, repairs and recycling).
- Replace raw material sources with alternatives that burden the environment significantly less and bolster natural capital, accounting for their entire life cycles.
- Promote different sets of resource-wise solutions and ecosystems that implement circular economy diversely within a certain sector, regionally or across sectoral and regional boundaries.

⁹⁷ Tackling root causes – Halting biodiversity loss through the circular economy, Sitra, 2022. <https://www.sitra.fi/en/publications/tackling-root-causes/>

The circular economy will generate economic growth and create jobs. Resource-wise, high- added value products and services will create welfare for the entire country, while the resource- wise use and recycling of materials and exploitation of side streams reduce dependence on non- renewable raw materials. Circular economy solutions have potential to create significant value added and new business in Finland, but no up-to-date estimates of this potential are available. Reports published by Sitra in 2014 and 2015 found that the circular economy could, as a conservative estimate, have annual value creation potential amounting to EUR 2 to 3 billion in Finland by 2030. However, this estimate does not take into account all sectors or the opportunities offered by new technologies. What is more, the circular economy has gathered momentum since the report was produced. As an overall estimate circular economy business models, including sharing platforms, product-as-a-service models and re-manufacturing, could generate USD 4,500 billion worth of added value in the global economy through innovations and new jobs by 2030. At the EU level, it has been estimated that circular economy principles could increase the gross domestic product in the EU by an additional 0.5% and create approximately 700,000 new jobs within a similar time frame.⁹⁸

In addition to business sectors and companies, the transition will also require investments and a systemic change in society's decision-making and planning as well as in the attitudes and behaviour of households and consumers. From the public administration perspective investments will, among other things, be needed to increase financial incentives that support the circular economy as well as for RDI and investment funding and public procurement.

Investment themes that promote the circular economy can be examined in terms of the sectors of society that consume the largest amounts of natural resources. These sectors include the built environment, the food system, mobility and other consumption, which together account for about 75% of the natural resources use. This is why investments and policy instruments that support the circular economy transition should also be targeted at these aspects, in particular. Solutions in line with the circular economy transition were described earlier in this report in the context of construction, transport and food production.

98 <https://newsroom.accenture.com/news/the-circular-economy-could-unlock-4-5-trillion-of-economic-growth-finds-new-book-by-accenture.htm> [or in more concise form: Lacy & Rutqvist, 2015. Waste to Wealth: The Circular Economy Advantage.]
<https://op.europa.eu/en/publication-detail/-/publication/fc373862-704d-11e8-9483-01aa75ed71a1/language-en>

In terms of other consumption, key value chains for the circular economy transition include textiles, household appliances, home electronics as well as furniture. In textiles, a shift away from fast fashion and cotton, which causes high environmental loading, to recycled fibres and other eco-efficient solutions including textiles made from pulp fibres should be accelerated. In this respect, significant investments in RDI have been made in Finland in recent years, and there are promising companies about to launch industrial scale production. However, in textiles and other consumer product groups, including appliances and electronics as well as furniture, it is important to develop and introduce not only incentives for business models and consumers but also policy instruments that promote the long service life, repairability and reuse of products as well as service and sharing models that support this.

According to a Rome Club report from 2017, a precondition for a large-scale circular economy transition in Finland is annual investments corresponding to 3% of GDP until 2030, which in the current situation would mean EUR 8 billion a year.^{99,100} Key investments include those made in renewable energy, rail traffic and public transport, circular economy solutions for agriculture, new high added value bio-based products, energy efficiency in industry, energy-efficient renovations, and service, repair and recycling business that promotes society's material efficiency. Significant investments will also be needed in skills and education, enabling future workforce to take on the tasks required by the new sustainable economy.

As part of the Strategic programme to promote a circular economy, a circular economy Green Deal and scenarios will be produced in 2022–2023.^{101,102} The participating sectors, companies, regions and municipalities are engaged in the scenario work led by research institutes. This will provide a knowledge base of effective measures and alternative paths to a low-carbon circular economy. The aims of the scenario work also include producing rough information on needs for investments to support the most effective measures. The

99 The Club of Rome, 2017. *The Circular Economy and Benefits for Society*.

100 The transition described in the report consists of three scenarios for 2030 and a combined scenario: i) 25% increase in energy efficiency; ii) halving the use of fossil fuels and replacing them with renewable energy; iii) 25% increase in material efficiency, replacing 50% of virgin raw materials with recycled raw materials, and doubling the life cycle of long-life consumer products.

101 Actors participating in the Green Deal process: <https://ym.fi/documents/1410903/42733297/Kiertotalouden+green+deal+-+prosessin+osallistujat+08092022.pdf/db49011c-70ae-0344-df8a-a3665be9ed74/Kiertotalouden+green+deal+-+prosessin+osallistujat+08092022.pdf?t=1663828868858>

102 The circular economy Green Deal is a voluntary commitment process that promotes the achievement of goals related to natural resources in the Strategic programme for a circular economy, attainment of carbon neutrality as well as a sustainable economy by 2035.

participating sectors play a key role in contributing information on investment needs to the scenarios. As part of modelling the scenarios, an effort will be made to get an idea of the general investment level needed in each sector.¹⁰³ The preliminary results of the Green Deal scenario work for a circular economy will be finished in early 2023, and the final scenarios will be completed in autumn 2023. The information generated in this process should, for instance, be used to gear financial incentives, funding and policy instruments to accelerating the circular economy transition.

2.2.6.2 Municipalities' role in the green transition

Municipalities play a key role in achieving the environmental objectives set by the EU and the central government. Municipalities control the setting for residents' sustainable daily lives: housing, mobility, service networks and other everyday infrastructure. As more green transition policy measures are introduced, increasing numbers of new recommendations and obligations with an impact on local government finances will focus on tasks that affect municipalities' climate emissions and safeguarding of natural values, including energy production and use, mobility, building stock and land use. Municipalities' measures relating to preparation for and adaptation to climate change will also have an impact on the costs of climate-resilient urban construction in the years to come.

The Climate Survey conducted by the Association of Finnish Local and Regional Authorities (2021) found that 80% of Finns already live in a municipality that has set a climate target. Municipalities' emissions decreased by an average of 21% between 2005 and 2019. Most municipalities with a climate target aim for an 80% reduction in emissions, or carbon neutrality, by 2030¹⁰⁴. Should the municipalities succeed in attaining their climate targets, their emissions would be halved from the 2018 levels by 2035, which corresponds to more than one half of the emissions reductions needed to achieve Finland's carbon neutrality objective. The resources allocated to climate issues are meagre, however, with the exception of large cities and pioneering municipalities: the work relies on projects, which has an adverse affect on its sustained nature.

103 The modelling results of the scenario work based on the Finnish economy's input and output model (ENVIMAT) contain the following economic variables:

- national economy: gross domestic product, net national income, income, income distribution and income use;
- sectors: output, value added, employment, labour productivity;
- products: production, import and export of product groups (EUR);
- consumption: households' consumption expenditure.

104 Association of Finnish Local and Regional Authorities (2022): Kuntien ja maakuntien ilmastotyön tilanne 2021.

Municipal policies that address biodiversity have so far not been carefully mapped. Many solutions for tackling biodiversity loss are local, and municipalities also have many possibilities for taking action to safeguard biodiversity. The central government has provided incentives for measures that promote biodiversity for municipalities through its Kunta-Metso and Kunta-Helmi programmes. Land use issues are some of the core questions in the discussion on biodiversity loss, and as municipalities have a monopoly on zoning, it is up to them to find a balance between building and preserving natural values.

No overall estimates exist of how investments related to climate change and green transition in municipalities will be funded. In the next few years, local government expenditure will mainly remain at a level that slightly exceeds the revenue. In the meantime, substantial investment needs will persist due to migration, building stock age and the green transition, among other things. While municipalities cover part of their investments with borrowing and income financing, long-term lease models are increasingly used instead of investments entered in their balance sheets.

Cities and municipalities play an important part in investments in sustainable transport infrastructure and public transport procurement. While municipal rail investments have been made with green loans from such lenders as Municipality Finance, the central government has also promoted projects through its MAL agreements on land use, housing and transport. MAL agreements with the urban subregions of Helsinki, Turku, Tampere and Oulu, in particular, set out major investments in transport system development. In these urban subregions, the central government will contribute at minimum EUR 755 million to transport-related measures during the current agreement period.

Cities and municipalities are responsible for their part of the investments in infrastructure for sustainable modes of transport and public transport procurement. The municipalities must pay attention to the environmental friendliness and energy efficiency of any vehicles they procure. The largest cities' target is that clean vehicles account for 50% of their vehicle procurements, and the target set for other municipalities is 35%. These requirements also apply to procurement of transport services, a certain proportion of which must be delivered with environmentally friendly and energy-efficient vehicles. The most significant investments in sustainable public transport include the Länsimetro line in Helsinki and Espoo as well as trams in Tampere, which have an estimated 225,000 daily users in total.

City of Lahti, an international forerunner in environmental issues

Lahti has undergone a transformation from a traditional industrial city to a pioneer of sustainable urban development. The first steps towards climate action and the circular economy were taken in Lahti as early as the 1990s by collecting energy waste and purchasing shares in a renewable energy company. The city's long-standing strategy has been to succeed as an environmental city, both in Finland and internationally. Year 2021 as the European Green Capital was an important step towards putting the strategy into practice. Lahti aims to be carbon neutral in 2025, ten years ahead of the national target.

Over the past decade or so Lahti Energia Oy, which is owned by the city, has spent EUR 400 million on investments making it possible to phase out coal in energy production.

Today's fuels are non-recyclable waste and logging residues from the forest industry. The city also recovers heat energy from treated waste water, which is reused as district heat. The quantity of heat produced corresponds to the annual energy demand of 1,000 single-family houses.

The environmental returns, expenditure and investments of the City of Lahti and the City Group are monitored annually in environmental balance sheets. They contain information collected from the city's organisation and the most significant group companies. In 2021, the environmental expenditure of the City Group totalled EUR 44.2 million, while the environmental revenue was EUR 40.3 million. Environmental expenditure is generally defined as costs whose primary purpose is promoting environmental protection, preventing, reducing and remedying environmental damage, or promoting sustainable natural resources use. The data collection follows the breakdown used in the national classification of environmental protection statistics.

2.2.6.3 Households' investment needs

Households' choices play an important role in emissions reductions and the green transition.¹⁰⁵ The environmental impacts of private consumption must be significantly reduced for the part of housing, mobility and food, which account for three quarters of our emissions, and other consumption.¹⁰⁶ The Annual Climate Report indicates that there has been little or no reduction in households' carbon footprint in recent years. According to the Finnish Environment Institute, household consumption accounted for about 66% of Finland's greenhouse gas emissions from consumption in 2015. However, Sitra finds that overall, Finns understand the significance of their lifestyles better, and an increasing number of people are making more sustainable choices in their everyday lives to mitigate climate change through their personal actions. Household choices create demand for sustainable solutions. On the other hand, consumption and production are not disconnected, and emissions from consumption will be reduced as the energy system and industry green up. In particular, households make green transition investments in energy solutions associated with housing and mobility, as discussed in previous chapters.

People have different motives for making sustainable choices in their daily lives, and understanding motivational factors helps in the planning of measures.¹⁰⁷ Studies have shown that households react to prices when making investment decisions.¹⁰⁸ On the other hand, consumption correlates with income levels, and according to estimates, the carbon footprint of the highest income decile is almost three times that of the lowest one.¹⁰⁹ Making sustainable choices should be easy, attractive and financially motivating. Guidance by information is also of great importance, as demonstrated by the Down a Degree energy saving campaign launched in autumn 2022.¹¹⁰

105 IPCC 2022.

106 Final report of the Working group on sustainable recovery.

107 Sitra. Motivation profiles of a sustainable lifestyle, 2021.

108 **Harjunen**, Oskari and **Liski**, M. (2014). Not so myopic consumers-evidence on capitalization of energy technologies in a housing market. Available at SSRN 2507740.

Sahari, Anna. (2019). Electricity prices and consumers' long-term technology choices: Evidence from heating investments. *European Economic Review*, 114, 19–53.

109 Finnish Environment Institute and the Finnish Climate Change Panel.

110 <https://www.astettalemmas.fi/en/>

To forge a proactive, effective and fair economic policy for the green transition, attention should be paid to understanding its impacts on consumer behaviour. If investment subsidies are used to encourage the green transition, the risk is that no additional investments will be created if subsidies are paid to middle-income people who would make the energy investment anyway. The challenge lies in targeting the subsidy correctly at those households for which it is crucial and which would otherwise not make investments.

2.3 Importance of the transition for the national economy

The green transition will have significant macroeconomic impacts, and efforts are being made to assess their long-term synergies more comprehensively.¹¹¹ While modelling them is difficult, some drivers of change can be identified. They include technological development, policy measures and behavioural changes. At the micro level, the change is manifested in consumer habits, markets for goods and production factors (prices and availability), investments and income distribution. At the macro level, they are reflected in structural changes in different sectors, employment, productivity and possibly financial market instability, which can arise in different ways. It is also important to recognise that from the national economy's perspective, costs will be incurred from the realisation of not only the risks of climate change and biodiversity loss but also the potential physical risks.¹¹² The impacts may be direct or indirect.¹¹³

The transition is associated with considerable potential, however, if investments can be targeted correctly from the national economy's viewpoint, maximising the multiplier effects on economic growth, employment, productivity and competitiveness. Identifying such investments will be highly important from the perspective of financing and creating incentives for the green transition. It is also vital to examine the need to develop assessments of the overall economic impacts of climate change and biodiversity loss, including financial stability impacts, and research related to them.

111 In Finland, for example an on-going project of the Government's analysis, assessment and research activities: [Overall economic impacts of climate change on public finances](#) (in Finnish)

112 Coalition of Finance Ministers for Climate Action, Report on Climate-related Risks for Finance Ministries, 2021 May and **An Overview of Nature-Related Risks and Potential Policy Options for Ministries of Finance: Bending the Curve of Nature Loss; June 2022**

113 Coalition of Finance Ministers for Climate Action, Report on How to Scope the Fiscal Impacts of Long-Term Climate Strategies? A Review of Current Methods and Processes, May 2022

In recent years, the central government has supported the green transition with historically high amounts as policy measures launched in the context of the COVID-19 crisis and the war in Ukraine have increasingly been targeted at supporting the green transition. In the meantime, environmentally harmful central government subsidies are still in place, and their reallocation will be an important part of the green transition. Finland's public debt has increased significantly since the financial crisis. General government debt-to-GDP ratio, which was 40% in 2010, had already reached 52% in 2021. The Finnish economy is also experiencing a sustainability crisis caused by structural problems. The population is ageing, the dependency ratio is deteriorating, economic growth is sluggish, productivity is low and, consequently, the funding of the welfare state is not on a sustainable basis.

Sustainable public finances will improve the preconditions for solving such problems as climate change and biodiversity loss as well as the possibility of channelling public funding to purposes important for ecological sustainability. Over the longer term, climate change, ecological sustainability and the carrying capacity of nature can also be expected to have significant impacts on the sustainability of public finances, especially in a national economy that depends on natural resources, such as Finland's. According to the World Economic Forum (2021), climate change and biodiversity loss are increasingly significant global risks to the economy. From the viewpoint of general government finances, it is possible to prepare for risks by developing sustainability calculation tools and impact assessments as well as by channelling funds and investments to a controlled transition. Similarly, it should be noted that the intensifying impacts of climate change will increase risks and public spending over the longer term. The Coalition of Finance Ministers for Climate Action has charted the risks arising from failure to combat climate change. These impacts may be manifested in the creditworthiness, or financing costs, of the state, shocks affecting the economy, and higher public expenditure, taking into account such factors as social problems caused by climate change and possible support needs following disasters.¹¹⁴A large part of the consequences of natural disasters are already excluded from insurance coverage, which causes uncertainty relating to costs for both the central government and households.

¹¹⁴ Coalition of Finance Ministers for Climate Action, Report on Driving Climate Action through Economic and Fiscal Policy and Practice, April 2022

There are considerable differences in the impacts between countries. By international comparison, the direct impacts of climate change have so far been minor in Finland, but indirect impacts may be channelled to Finland through contagion caused by international connections. Over the short term, the measures required to achieve the carbon neutrality objective and the green transition can undermine both the balance of public finances and economic growth, as new and less efficient technologies are introduced and investments are made. Over the medium and long term, however, this change will be essential from the competitiveness perspective, ensuring that Finland will not lag behind global technological development. If the transition does not take place, significant negative impacts may be the result.

Stable public finances also bolster corporate financing and investments. The state of public finances has a bearing on the price of public money and may even affect the price of corporate financing, as the central government's credit rating impacts the ratings of companies based in the country. Assessing and understanding these impacts is crucial from the perspective of both fiscal stability and the state's access to funding.¹¹⁵

Investments in RDI and policy instruments for the green transition are needed to enable Finland to create the innovations required by the energy transformation and to achieve a competitive advantage over the long term. Innovation policy can play a significant role in promoting the sustainability transformation if new operating models that promote sustainability are adopted. In this context, the ORSI project funded by the Academy of Finland has published recommendations for innovation policy¹¹⁶:

- Make solving sustainability challenges the goal of innovation policy y Identify sustainable competence areas of the future
- Ensure responsible research and innovation
- Reform ecologically and socially harmful industries
- Develop governance and ensure that sustainability goals are attained in policy implementation.

To mitigate and remedy environmental problems, a technological transformation is needed, a significant part of which will take place through creative destruction. Creative destruction means reallocating inputs, in terms of both production capital and workers. While new jobs are created, some old ones will disappear. In this process, the well-being of people must be safeguarded.

115 This aim is promoted by both the Coalition of Finance Ministers for Climate Action and national research projects: among others, [Overall economic impacts of climate change on public finances](#) (in Finnish)

116 ORSI project: https://www.ecowelfare.fi/en/themes/orsi_project/

3 Possibilities for financing the green transition and different actors' roles

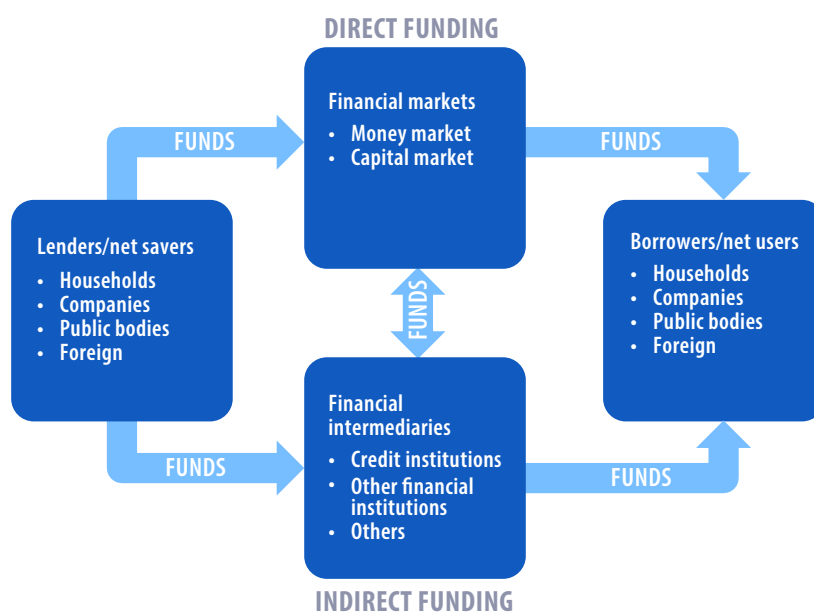
3.1 Financial markets and the green transition

3.1.1 Big picture of the Finnish financial market

Financial markets are part of a financing system in which economies with a surplus can give loans to or otherwise finance those in need of financing. Economies with a surplus include different providers of financing or investors as well as companies and households that invest money.

In the financing system, funding may be provided directly or indirectly through financial intermediaries. Funding obtained by selling securities in the stock market, or from the bond market, comprises market financing. Financial intermediaries channel funding to those who need it, for example as loans granted by credit institutions.

Figure 3. Financial intermediation.



Source: Bank of Finland

The financing of both companies and households in Finland largely consists of loans granted by credit institutions. The Finnish financial institutions' corporate loan portfolio amounted to EUR 103.6 billion¹¹⁷ in July 2022, while lending to households totalled EUR 145.5 billion¹¹⁸.

At the end of 2021, Nasdaq Helsinki had 129 companies with a total market value of EUR 340 billion on its main market list, and 50 companies with a market value of EUR 7.8 billion on its First North list. In 2021, for example, a total of over EUR 2 billion of new venture capital was obtained through these two lists, most of which through the First North list. It should be noted that the market has gone down in value this year, and at the end of September 2022, for example, the market value of the main list was EUR 261 billion and that of the First North list EUR 5.0 billion.¹¹⁹ The value of outstanding bonds issued in Finland was EUR 129.1 billion at the end of April 2022. However, most of this, or EUR 115.9 billion, represented government debt. The debt of financial and insurance institutions amounted to EUR 5.8 billion, while this figure for enterprises and housing companies was EUR 7.4 billion.¹²⁰ For example in 2021, Finnish non-financial companies issued fewer than 30 bonds worth approximately EUR 7 billion¹²¹.

A total of EUR 1.2 billion of equity investments were made in unlisted Finnish start-ups in 2021. Equity investments amounting to around EUR 1 billion are additionally made in unlisted growth companies every year. Consequently, the volumes of funds obtained by non-listed companies from outside the stock exchange are similar to those raised through the stock exchange.¹²²

117 https://www.suomenpankki.fi/fi/Tilastot/rahalaitosten-tase-lainat-ja-talletukset-ja-korot/kuviot/rati-kuviot-fi/vaade_kanta_ja_korko_chrt_fi/

118 https://www.suomenpankki.fi/fi/Tilastot/rahalaitosten-tase-lainat-ja-talletukset-ja-korot/kuviot/rati-kuviot-fi/kotitalouslainat_chrt_fi/

119 Figures provided by Nasdaq Helsinki.

120 https://www.suomenpankki.fi/fi/Tilastot/arvopaperitilastot/kuviot/arvopaperit-kuviot-fi/jvk_lainat_chrt_fi/

121 Figures obtained from Refinitiv Eikon system.

122 Source: Finnish Venture Capital Association

3.1.2 Green transition of the financial markets

Financial markets play a key role in channelling private finance to investments that meet the needs of the green transition. The markets are undergoing a transformation in which sustainability perspectives, including the climate targets of the Paris Agreement, will increasingly and more broadly inform the operations of financial institutions, while the climate policies of states and development of low-emission solutions are putting pressure on emission-intensive business. This development will have impacts on financing decisions, risk management and pricing of financing actors in some areas, and some of these impacts will be extensive. Similarly to ESG requirements¹²³, sustainability perspectives have started to play a larger part in the criteria for investment and financing decisions in recent years.

Many international and also Finnish finance providers and investors have set emissions reduction targets and dates by which they aim for carbon neutrality in their operations.¹²⁴ Such strategic policies will increasingly divert financial flows away from the fossil economy and towards climate-resilient investments over the next few decades. In addition to diverting capitals, however, efforts should be made to include sustainability risks more systematically in risk management. This goal has indeed been set in new legislative projects. In recent years, not only climate perspectives but also other viewpoints of environmental sustainability, including biodiversity, have gained prominence in financial markets.

Identification of risks related to biodiversity loss and environmental pollution is still only taking its first steps, however.¹²⁵ In order for green transition investments to access market funding, stable and well-functioning financial markets are needed. In efforts to develop financial markets, the main objective is ensuring a well-functioning financial system and maintaining financial stability, for which transparency and trust are required. Financial market regulation and the objectives set for it are constantly evolving, however. The key objective of statutes is to create preconditions for sustainable economic growth, in addition to improving the financial system's resilience.

123 ESG (Environment, Social and Governance) is an abbreviation used in responsible investing. It refers to taking environmental issues, social responsibility factors and governance questions into account in investment operations, improving the portfolio's returns and risk profile. (Finsif)

124 For example, the UN Principles on Responsible Investment (PRI) had been signed by 3,800 financial sector actors in 2021. There additionally are different consortia of investors with specific objectives, including the Net-Zero Banking Alliance, which aims at having a carbon-neutral loan and investment portfolio by 2050.

125 ECB, The state of climate and environmental risk management in the banking sector, November 2021.

Various crises and instability are detrimental to economic growth, employment, investment and, consequently, to promoting and financing the green transition. Promoting a stable financial system is consequently also a key priority in terms of economic and social stability. Maintaining financial stability and a stable investment environment is additionally vital for investments in the green transition. For example, financial stability has a significant impact on credit institutions' ability to finance companies. Among other things, financial stability can be maintained by promoting credit institutions' stability through prudential regulation. Ensuring sufficient resilience in the banking sector safeguards financing, in particular, as the most financially sound banks have the best ability to maintain their lending, especially in the event of economic and financial disruptions. To safeguard a well-functioning financial system, it is also necessary to survey risks, including those related to the environment and social factors, that may threaten financial stability.

Climate change, biodiversity loss and other environmental risks may increase the risks associated with the financing of different providers through physical and transition risks. The above-mentioned and other sustainability risks, any reputational risks associated with the valuation of green financial instruments and also with greenwashing may, similarly to other risks, destabilise the financial system. This is why sustainability risks are becoming an essential part of overall risk management. In the context of credit institutions, for instance, sustainability risk management should primarily be linked to well-established areas of credit institutions' risk management, such as credit risk, concentration risks and operational risk¹²⁶. For credit institutions, the greatest impacts of climate and environmental risks are associated with their credit risks.

It should be acknowledged, however, that surveying and measuring environmental risks is challenging, as identifying many environmental risks and translating them into figures used in the framework of the financial system is difficult. In addition, such phenomena as climate change are gaining momentum, which is why historical data is often not fit for this purpose. Consequently, scenario models are frequently used to map the risks of climate change. Developing comprehensive and well-functioning models takes time, and yet they fail to fully account for all impacts.

126 https://www.eba.europa.eu/sites/default/documents/files/document_library/Publications/Reports/2021/1015656/EBA%20Report%20on%20ESG%20risks%20management%20and%20supervision.pdf

In international forums but especially in the EU, the finance system is being developed by requiring of investees better understanding of and preparedness for climate change and the risks associated with it as well as other sustainability perspectives and risks. The financial sector has put forward a number of initiatives for developing methods, standards and frames of reference that address sustainability, and similar development can be seen in the area of regulation. Initiatives relating to financial market regulation, for instance, aim to integrate sustainability aspects into reporting practices and, in the future, also risk management more strongly¹²⁷. The fiduciary duties of asset managers towards their customers have also been discussed internationally with regard to sustainability aspects. At present, the EU has concluded that better communication on ESG perspectives and risks addressed to customers has been the best way to promote ESG issues in regulation. A debate on whether the fiduciary duties should be even more extensive than this is gradually starting. The question of extending these duties is complex and challenging. International organisations have developed different standards and carried out crucial work on making the sustainability perspective more prominent in the financial system. The first well-known voluntary and market-based reporting framework is called TCFD (Task Force on Climate-Related Financial Disclosures), which are recommendations for climate reporting. The first TCFD reporting recommendations were published as early as summer 2017. Currently, more than 4,000 international and less than 30 Finnish actors follow the TCFD recommendations in their reporting.

Similar work has been launched to develop reporting recommendations for nature (TNFD, Task Force of Nature-Related Financial Disclosures). In addition, international standards have been developed for green bonds: the ICMA principles and the Climate Bonds Initiative. International sustainability standards (ISSB), which would be similar to the IFRS reporting standards but examine operations from the perspective of sustainability reporting, are currently under development.

3.1.3 Sustainable finance instruments and actors

The best-known green finance instruments are *green bonds* issued by companies, financial institutions and public sector actors around the world. Green bonds are usually issued to raise money for an environmentally beneficial object. For example, the Länsimetro line in Helsinki was partly funded with Municipality Finance's green bonds.

127 For example, the Sustainable Finance Disclosure Regulation (SFDR) ((EU) 2019/2088), Taxonomy Regulation (EU 2020/852), a proposal for a Corporate Sustainability Reporting Directive, an update of the EU legal framework for the prudential regulation of credit institutions, and an update of the EU legislation on the solvency framework for insurance companies.

By August 2022, companies and financial institutions¹²⁸ in Finland had issued green bonds worth USD 19 billion. Of these 52 bonds, 15 were issued by the NIB and six by Municipality Finance. While the first one was issued in 2012, most issues had taken place in the last couple of years. For example last year, there were 15 issues.¹²⁹

The international green bond market is larger than this. The ICMA principles and the Climate Bonds Initiative are internationally recognised standards for green bonds. In addition to these, the EU is preparing its EU green bond standard to create a transparent legislative framework for green bonds. According to the Commission's legislative proposal, compliance with it would be voluntary. In addition to green bonds, different types of bonds with sustainability aspects have increasingly been issued, including ones that stress social sustainability. In some cases, green bonds have had the impact of reducing the cost of financing ('greenium'). A green bond may also have brought the issuer reputational benefits.

In addition to green bonds, green and sustainability-linked loans, which involve some angle of sustainability, have also been granted in the financial markets. Green housing and car loans offered to consumers have been seen abroad and to some extent also in Finland. However, green and sustainability-linked loans have mainly been granted to companies. As such loans come with various guidelines and are granted to individual operators, no estimates of their total amount are available.

There has been some discussion about the greenwashing risks associated with sustainability-linked loans. Such loans are often tailored to the borrower's needs, which has given rise to doubts as to whether some of them have been created to improve the company's reputation rather than to promote the green transition or other sustainability objectives. Doubts have also been voiced concerning the real impacts of green bonds on supporting the green transition.

Whereas green bonds and loans largely represent investments by professional investors, retail investors and consumers have also been able to invest in sustainable and green investment funds. Legislation laying down disclosure obligations for investment funds marketed as sustainable investments has been in place in the EU for a short time. While funds marketed as purely sustainable investments are still few and far between, the investment funds of several management companies in the Nordic countries and also in Finland have attributes of sustainability.

128 This figure includes such actors as Municipality Finance and the Nordic Investment Bank but not municipalities.

129 Figures obtained from Refinitiv Eikon system.

From the viewpoint of investing in shares, the green transition may be relevant to financing new investments or good governance. When an actor buys shares already on the market, this is about a transaction with another investor rather than company finance. This is why the issuance or listing of new shares can in some cases be considered as acquiring market funding for such purposes as investments supporting the green transition. By owning shares, however, investors exert control in the company through decisions made at general meetings. A fairly large shareholding is usually needed to be an active owner. However, retail investors may also be able to make a difference indirectly, for example by acquiring shares in investment funds whose management companies are institutional investors active at general meetings. For instance, institutional investors, and especially so-called activist investors, have managed to get climate experts onto the boards of oil companies.

A number of professional investors are already subject to some obligation to report on their corporate social responsibility and, in addition, many of them are increasingly interested in the responsibility and sustainability aspects of investments, as the risks of climate change and market development have an impact on the risks and returns of an investment. Sustainability perspectives are also here to stay when it comes to retail investors. In the future, retail investors will also be obliged by regulation to consider their sustainability preferences when receiving financial advice concerning their investments. In addition to education and teaching actors, financial institutions could play a role in improving households' economic competence. Sustainability perspectives are also increasingly part of economic competence. The Ålandindex developed by Ålandsbanken is an example of an innovative way of illustrating the carbon footprint of customers' consumption habits¹³⁰.

Impact investors, who also operate in the markets, mainly comprise such institutional investors as venture capitalists. In addition to financial returns, the purpose of impact investing is to produce measurable and significant positive impacts on the state of the environment or society. Investing in start-up companies that support the green transition, especially if the investor's intention is to promote the green transition, is an example of this. Start-up investments also play a role in financing the green transition through funding innovations. New technological solutions and service models will be needed in the future, and producing them requires research and venture capital. In Europe, impact investment funds mainly rely on the assets of foundations and family office investors. The operating model of venture capital funds differs from other forms of funding, particularly in that they contribute not only capital but also expertise to start-up and growth companies to accelerate their growth, internationalisation and sustainable development.

130 <https://www.alandsbanken.fi/blog/aland-index>

Venture capital funds are also significant providers of financing for innovations and start-ups in Finland. They are shareholders in around 600 start-ups and growth companies which actively follow responsible business and sustainable development models. At the end of 2021, the total turnover of venture capitalists' portfolio companies exceeded EUR 20 billion, which accounts for about five per cent of the turnover of all Finnish companies. At the same time, the portfolio companies had some 76,000 employees in Finland, which corresponds to approximately five per cent of the people working in all companies in Finland, and 18,000 employees abroad. The sector has recognised that a lack of diversity among those who invest in venture capital funds is a significant bottleneck in the operating environment of these funds that slows down the growth of domestic funds and consequently affects the availability of financing for start-ups and growth companies. This matter has been on the agenda for some time already, as the proposals for measures published by Ala-Pietilä and Sipilä¹³¹ in spring 2021 recommend, among other things, examining the possibilities of finding a legislative solution for the tax treatment of venture capital investments that would promote the (tax neutral) investment of Finnish foundations in Finnish venture capital and impact investing funds.

3.1.4 Sustainable business finance

A wide range of different financial actors, some of which were already mentioned above, provide financing for Finnish businesses. Credit institutions are the most significant providers of financing for Finnish businesses, mainly in form of business loans. In 2021, business loans totalling EUR 20.2 billion were withdrawn from Finnish credit institutions¹³². New funding sought in the stock exchange by issuing new shares totalled about EUR 2 billion. In 2021, Finnish non-financial companies issued bonds worth EUR 7.4 billion.¹³³ Finnish start-ups additionally obtained EUR 190 million in domestic venture capital funding. Many different investors also finance companies directly or through different channels. They include finance from international investors, pension companies and insurance companies as well as crowdfunding. The total amount of financing from such sources reached EUR 1.2 billion in 2021. Equity investments accounted for 62% of this amount. Buyout and growth investments of around EUR 1 billion in unlisted growth companies are additionally made every year in well-established industries.¹³⁴

131 https://julkaisut.valtioneuvosto.fi/bitstream/handle/10024/162961/TEM_2021_15.pdf?sequence=1&isAllowed=y

132 This figure does not include loans to housing companies. Source: Bank of Finland

133 Figures provided by Nasdaq Helsinki.

134 <https://paaomasijoittajat.fi/wp-content/uploads/Venture-Capital-Suomessa-2021.pdf>

No clear overall picture is available of Finnish companies' green transition financing. However, the difference to average business financing, in which bank lending is prominent, is that investments in the green transition are often financed from other sources. Large companies seek direct funding for their energy investments and other green transition investments by such means as green bonds, whereas venture capital funding plays an important role in financing innovations and start-ups that support the green transition. In addition, growth and buyout investors in established growth companies promote sustainable development in the companies they invest in as part of value creation. Accounting for sustainable development has become part of the basic practices of the equity investment sector, which has an impact on promoting sustainable development perspectives in the unlisted companies in which they invest. Venture capitalists own around 600 growth-oriented companies.

Equity investment consequently has significant potential to influence sustainable development in Finnish companies. The green transition and sustainable business will concern more and more companies in the years to come. In the future, companies' transition plans will play an increasingly important role as they seek funding. The transition to more sustainable operations and the technological development and innovations associated with it may also create new business opportunities for companies. However, the Finnish SME sector is not yet fully aware of the impacts that sustainable financing has on the availability and terms of business financing, and there is still room for improvement in SMEs' reporting capabilities.¹³⁵ To enable companies to make an optimal contribution to the green transition and obtain funding for investments that support it, clear regulation with appropriate impacts is needed. Producing comprehensive impact assessments and organising extensive stakeholder consultations will promote the achievement of this goal.

The SME Barometer survey conducted by the Federation of Finnish Enterprises, Finnvera and the Ministry of Economic Affairs and Employment in spring 2022 illustrates this situation. The Barometer results also show that so far, only one out of five SMEs has charted the climate impacts of their business, and one out of three of this group has examined the carbon footprint of their business in detail. The Barometer findings also indicate that the company's values and strategy are the key drivers for introducing emissions reduction measures. Efforts to build their corporate image as well as to save costs and improve their efficiency also guide companies towards emissions reductions, whereas neither regulation nor customers' or finance providers' requirements are primary drivers of introducing emissions reduction measures in SMEs. It should be noted that growth-oriented SMEs recognise the impacts of climate change mitigation measures on the company's operations more often than others.

¹³⁵ Financing of the Green Transition as Part of Growth Policy (Ministry of Economic Affairs and Employment publications 2022:41)

These enterprises see climate change mitigation measures as creating business opportunities, above all.¹³⁶

As a state-owned investment company, Finnish Industry Investment Ltd Tesi annually surveys the situation of companies with Finnish investments in different areas of corporate responsibility: the environment (E), social aspects (S), governance (G) and prosperity. It has found that most companies that monitor environmental indicators are energy-intensive actors, including industrial manufacturers, but also businesses focusing on consumer products. Monitoring is carried out in companies of all sizes. While most of the companies that already engage in monitoring were striving to improve their measures, more than one half of the companies Tesi invests in (55%) have no energy and/or waste monitoring, and even a larger share neglects to monitor their greenhouse gas emissions (65%). Tesi follows this trend annually and actively influences the development of its investees.¹³⁷

3.1.5 Insurance companies

Insurance companies play an important role, not only as investors but also through their ownership steering. In their capacity of insurers, insurance sector operators are additionally vital for climate change adaptation. As losses become more common, the increasing risks of climate change may push insurance prices up and lead to insurers limiting their coverage. To get insurance to cover the risks, it is important to understand the prerequisites for maintaining eligibility for business insurance. The insurance sector has been forced to prepare for climate change because of its two roles.

Especially earnings-related pension companies and other pension operators play an important part as institutional investors in Finland. At the end of June 2022, Finnish pension providers' invested pension assets totalled EUR 239 billion, of which EUR 55 billion was invested in Finland¹³⁸. Some Finnish pension companies have been pioneers of responsible investing. Overall, the insurance sector's importance for the green transition and its financing is significant.

136 <https://www.yrittajat.fi/tutkimukset/pk-yritysbarometri-1-2022/>

137 https://www.tesi.fi/userassets/uploads/2022/08/Vaikuttavuuskatsaus_2021_korj..pdf

138 <https://www.tela.fi/elakevarojen-sijoittaminen/elakevarojen-maara/>

3.2 Public financing for the green transition

3.2.1 Central government

Budget financing for the green transition

Prime Minister Marin's Government Programme set carbon neutrality by 2035 as Finland's goal. As a result, appropriations related to the green transition in central government budgets have increased considerably in the current parliamentary term of 2020–2023. Among other things, the increased inputs are due to more stringent climate objectives and efforts to phase out the fossil economy following various crises. The most important increases in the appropriations were made in four phases. As the Government Programme was drafted, a decision was made on investments that promote the green transition. Some of them will be permanent, while others are fixed-term investments in the future.

During the first wave of the COVID-19 pandemic in spring 2020, a decision was made on a supplementary budget for recovery (fourth supplementary budget). Some of its targets relating to economic recovery were relevant to the green transition. One half of the EU Recovery and Resilience Facility funding, or more than EUR 900 million, was allocated to expenditure consistent with the green transition by decision of the Government. These inputs with their leverage effects will trigger investments of around EUR 3.5 to 4 billion and achieve an annual emissions reduction of approx. 3 Mt from 2026 on. As international tensions spiked in spring 2022, the Government decided to increase the green transition appropriations for 2022–2023. Without additional decisions, investments in the green transition will decrease significantly from 2024 on.

The following sections seek to describe these increases of appropriations as a whole. In 2018, appropriations for promoting carbon neutrality totalled around EUR 1.7 billion. These appropriations reached their lowest point of EUR 1.5 billion in 2019 due to the expiry of fixed-term increases put in place by the previous Government. During Prime Minister Marin's term of office, the annual appropriations have varied between EUR 2.2 billion and EUR 2.5 billion. It is estimated that the appropriations will amount to around EUR 2.4 billion in 2023, which means that they would be approx. EUR 0.9 billion higher than when the previous Government's term of office ended. Additional appropriations have been allocated to such areas as energy subsidies, the circular economy, electrification and decarbonisation of industry, nature conservation, climate policy in the land use sector, promoting nutrient recycling in water supply, and subsidies for phasing out oil heating.

The appropriations shown in the following table do not include operating expenditure or grants to NGOs. The table describes the total budget figures related to promoting carbon neutrality. The breakdown is based on the strategic entities of the Government Programme. While most of the appropriations were granted by Government decision as discretionary policies, some involve changes in the timing of projects and automated mechanisms, or estimates of increases in appropriations from EU funds allocated to carbon neutrality.

Table 2. Carbon neutral Finland and key appropriations in budget proposals 2019–2023

Carbon neutral Finland – key appropriations	EUR million Budget	Budgeted in 2020	Budget 2021	Budget 2022	Budget proposal
Carbon-neutral Finland that protects biodiversity	395	762	722	749	917
Globally influential Finland	245	314	371	388	392
Dynamic and thriving Finland	205	229	242	272	297
Transport network development and maintenance	132	543	314	455	269
Agriculture	531	571	586	680	569
Total	1,507	2,420	2,235	2,544	2,444

Central government's role in cost-effective promotion of the green transition

Due to the difficult situation of general government finances and in order to ensure their sustainability, it is vital to scrutinise the use of central government funds as a whole more closely than before. Rather than being limited to financing, even more crucial aspects of the central government's role include legislation, taxation, other incentives including labour mobility and availability, education, companies' administrative burden, streamlining permit processes, and other measures by which the central government can promote the green transition in the private markets. When planning policy measures, it is consequently vital to assess not only the economic impacts of the measures but also their potential for reducing emissions, environmental impacts and carbon handprint.

Households and businesses are currently taking significant steps on their own initiative to accelerate the green transition and phase out fossil fuels. This is why determining which actions would go ahead without central government funding is challenging. Finland's international climate obligations and the objective of carbon neutrality simultaneously require swift measures to ensure that investments are made. At the current pace, there are uncertainties related to the achievement of the emissions reduction targets set for the effort sharing sector and the Commission's country-specific emissions reduction target of 50% from the 2005 level by 2030.¹³⁹

To ensure that public funds are used efficiently, central government support should in the future be concentrated on activities that would not go ahead without government intervention and where government support can have a significant leverage effect. Similarly, support should be targeted at enabling Finland to meet its national and international climate and environmental objectives and obligations also in the future. Investments in research and development, the benefits of which are distributed widely across society, is one example that can also be useful in the future. Particular attention should be paid to the cost-effectiveness and impact of measures. The incentive effects of public support (including business subsidies) should also be examined as a whole, ensuring that they would take incentives for the green transition into consideration better as a whole. In order to promote policy coherence and a clear vision for investments, it is essential to eliminate or redirect support forms with limited positive effects, or those that are clearly detrimental to the green transition.

Alongside investments in the green transition, a significant amount of subsidies continue to be channelled to activities that harm the environment. Environmentally harmful subsidies refer to those that lead to an increase in the utilisation rate of natural resources and environmental loading in a subsidised company or sector. The OECD defines environmentally harmful subsidies as those causing more environmental damage than what would occur if they did not exist. Environmentally harmful subsidies may have positive impacts on other policy objectives (including food production, security of supply, promoting the use of renewable energy sources, regional economy, employment and growth), which should be taken into account when assessing them. The tax system, in particular, contains such environmentally harmful subsidies. They are also included in budget appropriations, however.¹⁴⁰

139 The Climate Panel 11 February 2022: https://www.ilmastopaneeli.fi/wp-content/uploads/2022/02/VN-990-2022_ilmastotoimien-arviointi_ilmastopaneeli.pdf

140 Budget proposal 2021, General Strategy and Outlook, Chapter 6.

By selecting policy measures that guide households and companies to take cost-effective climate actions is the optimal way of ensuring that the economy incurs as little costs as possible, for example from the emissions reduction path leading to the attainment of climate objectives. A precondition for cost-effective policy is that policy measures are selected and carried out in an order of cost-effectiveness; this means selecting first the measures that will achieve the maximum impact (= e.g. impact on reducing emissions) with minimum cost (= efficiency). In other words, rather than about measures that are the least costly for public finances or the national economy, cost-effective climate and environmental policy is about choosing measures that bring about economic changes through which political objectives can be reached as cost-effectively as possible. The prerequisite for this is that the evaluation and selection of policy measures are underpinned by a cost-benefit analysis.

To carry out a cost-effectiveness assessment, information is needed on the direct and indirect costs and climate and environmental benefits of different types of actions over a period of time. Typically, such information is not comprehensively available. Research evidence has been gathered concerning the costs and emissions reduction potential of many climate actions, however, and more is constantly being produced. The existing information also indicates that the differences between the most and least expensive measures per tonne of emissions reduced can be ten- or even hundred-fold¹⁴¹. Consequently, choosing measures based on their cost-effectiveness matters.

Public authorities do not necessarily possess the best information about precisely where and how emissions reductions can be achieved at the lowest economic cost. For this reason, priority should be given to technology-neutral policy instruments that, for instance, set a price for the emissions or direct consumption. Such tools for pricing emissions include emissions trading and taxes. Incentive mechanisms are also needed in the non-ETS effort sharing sector, such as transport. Their advantage compared to other policy instruments is that they also generate revenues that can, for example, be channelled to financing green transition actions or other public sector needs.

While cost-effectiveness is a guiding principle rather than a policy objective in itself, the achievement of a cost-effective green transition can be seen as including features of fairness for multiple generations. This is due to the fact that after a cost-effective green transition, the economy as a whole will be handed down to the next generations in a better condition than if ineffective options for implementing it had been chosen.

141 [Gillingham, Stock \(2018\)](#): The cost of reducing greenhouse gas emissions. *Journal of Economic Perspectives*.

Principles of using government resources¹⁴²

- When allocating public funds, the cost-effectiveness and impact of the support must be ensured, and its climate and environmental impacts taken into account.
- Rather than having a large number of fragmented individual support forms and grants, more support should be targeted at projects that can contribute to the green transition across a broad front and that otherwise face bottlenecks.
- Instead of direct funding, other means of achieving cost-effective solutions should also be considered, including legislation, taxation or other policy instruments.
- The use of public funds must be transparent and its impact must be monitored.
- Inefficient subsidies that clearly harm the environment should be phased out or redirected.

3.2.2 Municipalities**Financing of municipalities' investments**

In the next few years, local government expenditure will mainly remain at a level that slightly exceeds the revenue. However, substantial investment needs will simultaneously persist due to migration, building stock age and the green transition, among other things. The municipal sector's total borrowings amounted to about EUR 41.17 billion at the end of 2020. The fact that significant investments and activities have been transferred from individual municipalities as basic units to local authority corporations, joint municipal authorities and other bodies is also visible in the trend of municipalities' indebtedness.

Municipalities' investments mainly concern buildings and roads as well as other basic infrastructure that promotes economic development, including energy production. The amounts of municipalities' climate investments are not monitored as a whole. Individual municipalities have prepared climate budgets, in which the amounts concerning operational economy and investments related to climate action are itemised separately from the usual city budget. The City of Tampere, for example, had budgeted around EUR 230 million for climate investments for the entire city group in its financial plan for 2021–2024.

142 Based on a working group discussion

While municipalities cover their investments with borrowings and income financing, long-term lease models are increasingly used instead of investments shown in their balance sheets. No overall estimates exist of how investments related to climate change and green transition in municipalities will be funded. Loans for municipalities are granted by banks operating in Finland, Municipality Finance, the European Investment Bank and the Nordic Investment Bank, which acquire funding in the bond market.

Since 2016, Municipality Finance has granted green funding to municipalities amounting to EUR 2.3 billion based on its reporting in 2021. Most of these projects concern sustainable construction and public transport. The number of projects promoting renewable energy or energy efficiency is clearly lower. The projects in the green finance portfolio are taxonomy eligible regarding climate change mitigation.

Municipalities also tap discretionary government grants, investment subsidies and EU funding to carry out climate and environmental actions. Economic incentives for municipalities' green transition are scattered across multiple different administrative branches and actors, which makes keeping up with and applying for grants difficult, especially for smaller municipalities. From the viewpoint of municipalities' green transition, predictability, long term, minimising the administrative burden as well as coordination and advice related to financing instruments are vital in subsidy funding. Such as the coherent government grant measures designed for the purpose of coordinating more complex entities, which were planned in a project on developing discretionary government grants, have potential to improve the situation of grant applicants while achieving a higher impact, for example regarding climate and environmental themes. In the EU's 2021–2027 funding period, the amount of climate finance has multiplied compared to earlier periods. This is one of the funding sources of which municipalities, companies and other actors should be able to make full use.

The climate agreements recently launched by the EU represent a new type of funding opportunity for some Finnish cities. The European pioneering cities selected by the European Commission for these agreements include Tampere, Turku, Lahti, Lappeenranta, Espoo and Helsinki. Their aim is to achieve carbon neutrality by 2030. The EU finances the agreements and the measures taken under them with EUR 359 million.

3.2.3 Special financing companies and key actors in green transition financing

Finnish and multinational financial institutions as well as special financing companies are public actors which, within the limits of their mission and mandate, can provide financing for the green transition and create leverage effects to obtain private financing. The role of public funding is to complement private financing and, if necessary, it should make room for the development of private financing. Public special financing complements the market and makes up for market failures (subsidies, guarantees, loans, equity capital), although it can also be granted on market terms (incl. Finnish Industry Investment Ltd Tesi).

The purpose of public equity investment activities is to promote the development of the equity investment market and to direct funding to those areas, in particular, where private venture capital is not sufficiently available (market shortfall). Public equity investments are largely made on commercial terms.

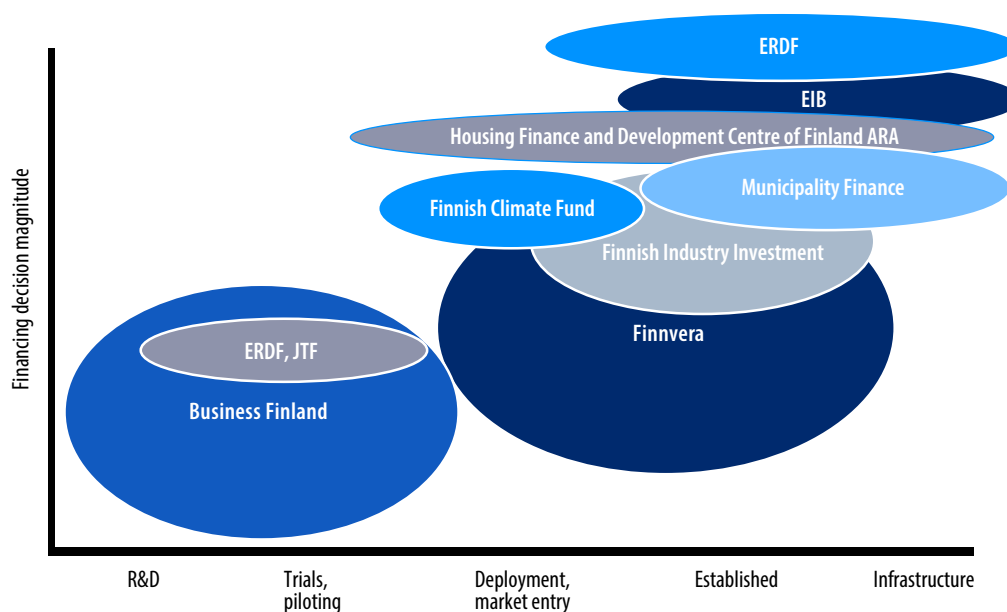
The Ministry of Economic Affairs and Employment is responsible for ensuring that the central government's domestic business financing and export financing work as well as possible, taking into consideration companies' financing needs at their different stages of development as well as national and international regulations that govern business financing. (Actors under the ministry: Finnvera, Finnish Industry Investment Ltd Tesi, BusinessFinland, Centres for Economic Development, Transport and the Environment and the Finnish Climate Fund).

The Ministry of Finance is responsible for steering international financial institutions, key ones of which in terms of investments in Finland are the EIB Group and the NIB. However, it is also important to look at international special financing institutions in which Finland is a co-owner and which channel funding from outside Finland. The Asian Infrastructure Investment Bank (AIIB) operates under the direction of the Ministry of Finance. The World Bank Group, the European Bank for Reconstruction and Development (EBRD) and the Council of Europe Development Bank (CEB) operate under the guidance of the Ministry of Finance and the Ministry for Foreign Affairs.

The operations of regional development banks and the Green Climate Fund as well as the Nordic Development Fund (NDF) are guided by the Ministry for Foreign Affairs. Finnfund is a key actor in external climate finance. While development finance institutions are not discussed in this report, their role in green transition financing should be taken into account in further work.

Responsibilities in the Ministry of the Environment's administrative branch are linked to construction and housing production, built environment development and promoting the circular economy, among other things. (ARA Housing Finance and Development Centre of Finland, ELY Centres, Metsähallitus and NEFCO).

Figure 4. Special public financing for the green transition.



Business Finland (BF) provides loans and grants for research, development and innovation, offers internationalisation services and promotes tourism and investments in Finland. Business Finland has around 10,000 customers, of which some 4,000 are financing customers. The total amount of funding granted by Business Finland was EUR 706.9 million in 2021.¹⁴³

Business Finland Venture Capital Oy is a company fully owned by the State of Finland. Business Finland is in charge of the ownership steering of this company, which invests in equity funds targeting young start-ups. The company's mission is to promote start-up business by investing in equity funds. In this role, the company may set up new funds administrated by private management companies. Business Finland Venture Capital Oy has investments in 13 funds that make investments in start-ups in Finland. The total capital of these funds exceeds EUR 200 million, of which private investors account for one half.¹⁴⁴

¹⁴³ https://www.businessfinland.fi/492b59/globalassets/finnish-customers/about-us/tulosohjaus/bf_tilinpaaatos_2021.pdf

¹⁴⁴ <https://www.businessfinland.vc/en/frontpage>

Finnvera provides financing for the early stage, growth and internationalisation of businesses and protection against export risks. Finnvera improves the operating conditions and bolsters the competitiveness of Finnish companies by offering loans, guarantees and export credit guarantees. Finnvera shares the financing risks with other funding providers. Finnvera's strategy will direct the company's financing towards low-emission investments in the future and encourage businesses to take action for climate change mitigation. Finnvera has approx. 25,000 customers with outstanding liabilities of EUR 2.7 billion in domestic financing (loans and guarantees), export credit guarantees and special guarantees, including SME and midcap export credit guarantees of EUR 22.4 billion and EUR 7.6 billion in withdrawn export credits (6/2022).¹⁴⁵

Finnish Industry Investment Ltd (Tesi) invests in equity funds and directly in growth-seeking companies on market terms with the same conditions and profit expectations as private investors. In addition to economic performance, the company's mission is to develop the Finnish equity investment market and to promote business renewal and economic growth. The equity investments managed by the company totalled EUR 2,352 million at the end of 2021. Its investments included 109 funds and direct investments in 119 companies.¹⁴⁶

The mission of the **Finnish Climate Fund** covers climate change mitigation and acceleration of low-carbon industry as well as promoting digitalisation related to these goals. The Finnish Climate Fund uses subordinated loans and other instruments to finance emissions reduction measures and other projects with positive impacts. Among central government actors, the Finnish Climate Fund consequently is the one that exclusively concentrates on and specialises in green transition financing. Its financing operations were launched in 2021, and the annual target for its financing volume increased to EUR 80 million in 2022. The Finnish Climate Fund's operations are guided by funding criteria whose baseline terms state that the objects to be financed must have a credible repayment plan, and that the Climate Fund's co-financing should make it possible to implement the project earlier or on a larger scale than what could otherwise be done. Additionally, Climate Fund financing may not cause significant harm to the environmental objectives listed in the EU's Sustainable Finance Disclosure Regulation ('Do no significant harm' principle).¹⁴⁷

145 <https://www.finnvera.fi/eng/finnvera/annual-reports-and-financial-reports>

146 <https://www.tesi.fi/en/about-tesi/financial-figures/>

147 <https://www.ilmastorahasto.fi/en/finances/>

Municipality Finance funds investments in the Finnish local government sector and state- subsidised housing production. In 2016, Municipality Finance was the first credit institution in Finland to launch green funding aimed at financing climate and environmentally friendly investments. The projects to be funded fall under the categories of construction, public transport, renewable energy, and water supply and wastewater management. By the end of 2021, the company had granted green funding to 195 projects, totalling approx. EUR 2.3 billion.

European Investment Bank (EIB) The EIB Group comprises the European Investment Bank (EIB) and the European Investment Fund (EIF). The EIB grants loans to public sector organisations, companies and banks (for sub-lending to SMEs). As the EU's climate bank, promoting the green transition is the EIB's main priority; its goal is that by 2025, more than 50% of the funding will be directed at climate action and sustainable environmental projects. The EIF invests in equity funds and guarantees financial institutions' SME loan portfolios. In addition, the EIB Group implements 75% of the InvestEU Programme. The European Investment Bank (EIB) has extensive experience of financing projects in Finland, going back to 1994. The EIB has funded a total of 245 projects with more than EUR 25 billion in Finland. The EIB's subsidiary, the European Investment Fund (EIF), is additionally active in the Finnish equity market and offers guarantee products to Finnish financial institutions for SME financing. Bolstered by its AAA credit rating, the EIB borrows from international financial markets at a low cost, enabling it to provide competitive financing to its customers. The EIB serves both public and private customers. The bank's strength lies in its ability to promote the green transition across a broad front with three different approaches: 1. Project finance (Lending), 2. Financial instruments (especially using EU financial instruments) (Blending), and 3. Advisory services (Advising).

The Nordic Investment Bank (NIB) funds projects aiming to improve productivity and benefit the environment. The NIB is an international financial institution jointly owned by Denmark, Estonia, Finland, Iceland, Latvia, Lithuania, Norway and Sweden with a vision for a prosperous and sustainable Nordic and Baltic region. The bank has an environmental mandate, and its strategy supports the objectives of the green transition. The NIB supports sustainable growth and green transition in its member countries, especially through long-term project funding and various financial instruments. Since 1976, the NIB has granted loans for nearly 600 projects in Finland, amounting to more than EUR 12 billion. Thanks to its AAA credit rating, the NIB obtains the assets it needs for its lending at a low cost in international financial markets. The NIB creates added value to and complements other sources of financing by offering long-term loans and guarantees to both private and public customers on competitive market terms. The NIB assesses all projects it finances from the viewpoint of sustainable development. The NIB also promotes the green transition by issuing green bonds whose total value since 2011 has amounted to approx. EUR 6.7 billion.

The Nordic Green Bank Nefco: Nefco funds the initial scaling of Nordic environmental solutions for the world market. Founded in 1990 by the five Nordic countries, Nefco offers exclusively green funding. Nefco has funded and implemented more than 1,500 projects that have concerned energy efficiency, renewable energy, wastewater treatment, waste management, resource efficiency, circular economy and cleaner industrial processes to mention a few. In line with its new strategy launched in 2021, Nefco is increasingly financing small and medium-sized Nordic companies whose solutions have positive environmental or climate impacts. By offering risk financing for the internationalisation of growing businesses, the company supports the growth of Finnish companies in Finland. Since 1990, Nefco has financed 105 projects with a total of EUR 73 million, thus contributing to the scaling of green technologies and solutions. Nefco concentrates on providing growth funding, especially for SMEs. The company assesses the environmental impacts of project proposals in relation to the EU taxonomy and the UN Sustainable Development Goals as well as by following its in-house environmental assessment method.

The Housing Finance and Development Centre of Finland (ARA) is a key agency responsible for implementing the central government's housing policy and administrating housing subsidies. ARA operates in the Ministry of the Environment's administrative branch. It provides grants, subsidies and guarantees related to housing and construction as well as directs and supervises the use of state-subsidised housing. ARA works to promote socially and ecologically sustainable, high-quality and affordable housing in Finland. Grants that support the green transition, in particular, include energy subsidies for renovation projects to improve the energy efficiency of residential buildings, grants for transitioning to low-temperature district heating, and subsidies for electric car charging infrastructure.

Summary of the specialised financial institutions and their significance

Climate and environmental objectives are horizontal goals, and all public funding instruments have a potential role to play in promoting their achievement. For example, Municipality Finance, the EIB and the NIB finance around EUR 2 to 3 billion worth of infrastructure investments in Finland each year, a significant part of which supports the green transition. They also issue green bonds and make green investments. This way, financial institutions can promote the green transition. Financial institutions should create added value for the green transition, each within its own purview; they should work together when necessary but, in particular, specialise in their funding and find a role in the financing system in which they can complement each other and private funding. The aim should be at ensuring that publicly-owned financing instruments systematically and as efficiently as possible guide the channelling of funding towards green economic growth, achievement of climate and environmental objectives, and increasing Finland's carbon handprint.

A coherent approach to public special financing institutes and instruments is needed to channel funding to the green transition. The roles of all public finance providers in funding green transition investments must be identified, used and harnessed extensively into promoting the attainment of cross-cutting climate and environmental objectives.

The Finnish Climate Fund, for example, has a comprehensive framework for assessing and monitoring environmental impacts, which has been tested with and used for a funding volume of about EUR 100 million. However, the assessment practices related to climate and environmental objectives of most publicly owned special-assignment companies require further development. The big picture regarding the range of instruments and funding options for the green transition should also be complemented.

3.2.4 Opportunities offered by EU funding

Significantly more EU funding in the form of grants is available than before, for example for research, development and innovations that serve the green transition as well as for environmental infrastructure and ecological projects. Finnish actors should be able to make more efficient use of EU funding with a higher impact, especially through the instruments provided by the European Green Deal. The goal of the European Green Deal published by the Commission is to launch investments amounting to EUR 1,000 billion in the EU by 2030.

A precondition for the strategic use of EU funding is examining it as a whole. To channel EU funding, different Finnish agencies' competence related to it and their capabilities for also using the funding in their own activities must be built up. Currently, activities relating to different financial instruments are siloed; parallels are not recognised, and synergies are not sufficiently exploited. To seize the opportunities, prioritisation and new public-private models for boosting investments in line with the green transition objectives may be needed. Investments can also be promoted through a credible, comprehensive and clear strategic direction and continuity of policy measures. When more extensive use is made of EU funding, this also offers an opportunity to leverage it to achieve the target of 4% of GDP set by the Parliamentary RDI working group.

Finland's funding under the EU Recovery and Resilience Facility

In May 2021, Finland submitted to the Commission its final National Recovery and Resilience Plan outlining how the EU Recovery and Resilience Facility (RRF) funding would be used in Finland.

Initial estimate put the funding Finland would receive under the EU Recovery and Resilience Facility at around EUR 2 billion. According to the RRF criteria, at least 37% of this funding should be allocated to projects and measures that promote the green transition. The target set by Finland in its national plan is that at least one half of the total funding received should promote the green transition. According to the plan, appropriations contributing to the green transition would be in the range of around EUR 1 billion. Roughly one half of this amount would be spent on energy subsidies that would promote the decarbonisation of industry and investments in new energy technology and energy infrastructure as well as in low-carbon hydrogen. Other expenditure items with the most significant amounts of appropriations would include gypsum treatment of fields and green RDI investments. Finland's final funding amount was confirmed in summer 2022 and, as the Finnish economy developed faster than previously estimated, this amount decreased to EUR 1.823 billion. The policy decided by the Ministerial working group on sustainable growth in June 2022 is that the national Recovery and Resilience Plan will be updated to reflect Finland's final funding amount while maintaining the 50% share for the green transition. According to the updated Recovery and Resilience Plan, the green transition will be promoted with slightly over EUR 900 million.

InvestEU

InvestEU is a funding programme for programming period 2021–2027 aimed at encouraging public and private investors to participate in financing and investment actions through guarantees provided from the EU budget. The EU's budgetary guarantee of EUR 26.2 billion is expected to generate investments of around EUR 370 billion. The purpose of the guarantee mechanism is to attract private capitals to investments that involve a high risk or promote policy objectives but are not adequately financed on market terms. It offers funding possibilities for all administrative branches.

InvestEU is the European Green Deal Investment Plan's key instrument for mobilising funding for the green and digital transition objectives in the EU. At minimum 30% of the total appropriations under the InvestEU programme are earmarked for investments in line with the EU's climate objectives. InvestEU opens up new possibilities for boosting sustainable investments and making more effective use of financial instruments provided on commercial terms for the green transition. The InvestEU Fund has four thematic priority areas or 'policy windows': 1) Sustainable infrastructure, 2) Research, innovation and digitalisation, 3) SMEs and 4) Social investment and skills.

Financing offered by the EIB Group

The EIB Group implements 75% of the InvestEU Programme. Under the Lending action, the EIB provides funding covering various financing solutions, including senior corporate loans, Venture Debt products, spending limits loans (for the public sector), project financing and guarantee instruments. Loans and guarantees are available for small and medium-sized enterprises through Finnish financial institutions. As part of the Blending action, the EIB structures various financial instruments that make use of EU funding, in particular (EFSI and InvestEU as well as the SME Initiative in Finland as examples). The public sector often carries a higher risk (first loss), which facilitates the participation of private funding in projects with a higher risk level. Guarantee instruments in which the public sector covers part of the risk can promote the private sector's willingness to invest. The EIB is already granting guarantees for Finnish banks' green SME sector loans, and it has in place co-financing and guarantee programmes with Finnish Industry Investment Ltd and Finnvera.

The EIB also provides a range of expert services aimed at supporting and accelerating brainstorming, preparation, development, implementation and access to finance in investment projects that meet the EU and EIB priorities. EIB expert services are often delivered in cooperation with the European Commission under various programmes. During the current EU funding period, InvestEU provides the most comprehensive palette of expert services in support of investment projects carried out in the EU. While the projects benefiting from the advice must meet the InvestEU criteria, projects to be funded with EIB/EU funding outside the InvestEU programme are also eligible for these services.

The expert services are free of charge for public sector actors and, to a certain extent, also for private sector representatives.

Advice is available for the technical planning and implementation of a project, examination and confirmation of eligibility for funding, and assessment of the possibilities provided by EU funding and funding instruments alike. In addition to expert assistance specific to each investment project, project implementers can also avail of support for building up their general competence, organisational capabilities and knowledge of the operating environment. While project-specific assistance is targeted at large infrastructure projects, in particular, the creation and implementation of smaller investment projects are supported by also offering expert services to various intermediary organisations, including financial institutions.

As the EIB and the EU set challenging climate objectives, supporting the green transition is one of the key themes of InvestEU. The EIB also offers a comprehensive range of expert services. All the services listed above are available for eligible projects that support the green transition. In addition, the EIB strives to reinforce its support by means of targeted

experts services, especially in those areas where the risks are higher from the viewpoint of achieving the objectives. The recently launched ADAPT (Climate Adaptation Investment Advisory Platform) is an example of this. ADAPT provides centralised information on the type of expert services the EIB offers for investment projects that support climate change adaptation. Another example is C3, a knowledge platform focusing on

the circular economy that shares information and best practices, organises webinars and helps actors find relevant financing and expert services. The Green Gateway is targeted specifically at financial institutions to support smaller actors' green investments. Among other things, it helps financial institutions to identify and assess green projects funded with EIB support and to report on them.

Improving energy efficiency of buildings is one of the key means of mitigating climate change. In this context, one of the focus areas of EIB expert services is Energy Performance Contracts (EPCs) and supporting their deployment in the public and private sectors. A recent guide produced in cooperation with Eurostat illustrates how EPCs should be accounted for in public sector budgets and shows how it can be used without increasing public sector debt or deficit. In addition, green hydrogen and support for a just transition are some of the current priorities of EIB expert services.

EIB's role in promoting green transition financing in Finland

The financial markets in Finland function well in general, and eligible projects receive funding on acceptable terms. For example, wind power projects carried out on project funding do not, as a rule, have problems accessing private funding. In fact, the problem is partly reversed – finding green transition projects to fund is challenging for finance providers.

On the other hand, finding funding for new technology projects with a higher risk is difficult. Venture capital provided on market terms is not prepared to take a technology risk, which is why there would be a demand for public sector risk-sharing instruments to promote projects of this type. Different guarantee instruments in which the public sector covers part of the risk could encourage private sector investors. This is where the EIB Group can step in, as it has extensive experience of structuring such financial instruments in a number of EU countries. As guarantee capital for this type of financial instruments can be used ERDF or Sustainable Growth Programme funds, for example.

Smooth cooperation between different national actors (incl. ELY Centres, Business Finland, Finnvera, Finnish Industry Investment Ltd, Finnish Climate Fund) and international operators (EIB, NIB) is also essential. Seamless support for possibilities of obtaining grants and funding for projects that promote the green transition at different stages of a company's development will enable the launch, commercialisation and growth of projects.

3.2.5 Significance of public procurement

Improving procurement competence in the public sector is an important factor for enabling the green transition to make headway. Public procurement amounts to around EUR 45 billion each year. The share of municipalities and joint municipal authorities in this amount is roughly two thirds, while the share of the central government sector is one third. Purchases from companies amount to approx. EUR 30 billion. It is vital that this economically significant part of public sector activity is also harnessed into boosting societal and economic development towards sustainable growth. A report

that surveyed the innovativeness and sustainability of procurement found that sustainability criteria had been set in as few as 30% of public procurements in 2020. The Act on Public Procurement and Concession Contracts is currently undergoing a reform that will allow it to take environmental aspects and quality factors into consideration better in procurements.

3.2.6 Public-private financing models

3.2.6.1 Special funding that complements private funding

The central government and, consequently, public funding serve as facilitators in the Finnish business financing sector and encourage companies in renewal and striving for sustainable growth and productivity. The central government is also responsible for ensuring that business and export financing provided by it works as well as possible, taking into account companies' financing needs at different stages of their development. The central government is additionally responsible for national and international regulations on corporate financing.

The task of public funding consequently is to complement private financing by sharing the risk and having a leverage effect, especially in areas with bottlenecks. Government actors currently discharge this duty across a relatively broad front, and this Chapter has provided an introduction to some of them. This means that the government has a wide range of instruments at its disposal for this purpose; it provides direct grants, loans and guarantees and makes equity investments. The funding consists of grants and market finance.

Public business financing plays an important role in risk-sharing with private funding. Among public funding providers, Finnvera is an example of an actor that complements the financing services of banks and other finance providers. Almost one out of three of SMEs that had applied for bank financing said that Finnvera's guarantee was a precondition for their access to funding (SME Barometer, autumn 2022). It is also important to maintain this high level of cooperation with banks in the future and to ensure the availability of funding throughout Finland. Through its financing solutions, the public sector consequently diversifies the financial markets and shares the financial risk with other providers. Rather than competing with private financing providers, public funding complements the financial markets in close cooperation with them.

In addition to this bank financing, the task of public equity investing is to identify market shortfalls and, through its investments, to address market failures and the challenges faced by growth-oriented companies. The mission of Finnish Industry Investment Ltd., for example, is to promote the growth and internationalisation of Finnish companies and to develop the Finnish equity investment market. It makes investments in target companies directly and through venture capital funds, whereas the mission of Business Finland Venture Capital Oy is to develop the venture capital market by making up for any shortfall in early-stage financing available for businesses. The company carries out this task by investing in early-stage private equity funds. In contrast, the Finnish Climate Fund focuses on climate change mitigation, accelerating the decarbonisation of industry and promoting digitalisation.

A public equity investor always makes its investments either on market terms or together with a private investor. While Finnish Industry Investment Ltd. and the Finnish Climate Fund provide funding on commercial terms, Business Finland Venture Capital Oy's investments in funds may also involve grant funding. As a rule, equity investors are minority investors. The purpose of their activities is to leverage private funding for the target companies or funds in those market shortfall areas where, for one reason or another, the amount of private funding does not meet the market needs. If sufficient private national or international capital can be found in the market, public capital will not replace private capital. Once the market has evolved, a public equity investor's role is to withdraw from it.

An Act on the Finnish Climate Fund is under preparation and was debated by Parliament in autumn 2022.¹⁴⁸ This Government proposal would provide for the use of State aid in the Finnish Climate Fund's investments, adding to the company's range of instruments the possibility of speeding up the attainment of Finland's carbon neutrality target with asymmetrical funding regarded as State aid.

The use of State aid would make it possible to support projects that either would not go ahead at all without the Finnish Climate Fund's involvement, or that would be carried out on a smaller scale or at a later date.

Overall, it is important to ensure the coverage and competitiveness of the public sector business financing system, taking into account such changes in the operating environment as the green transition and EU funding instruments. This is why situational awareness of the need for public funding should be continuously updated.

3.2.6.2 Impact investing

In addition to the public-private financing models discussed above, it is also a good idea to consider new models for developing public funding to support private financing. Impact investing is an example of these cooperation models, the purpose of which is to create positive impacts on the environment and society while generating commercial returns.

Procurement of impact and outcome-based funding models offer new opportunities for solving environmental challenges while enhancing the impact of public financing. Impact investing models can integrate private capital into a solution and thus expand the funding base in pursuit of measurable societal benefits. Consequently, outcome-based funding solutions are one way of responding to the welfare society's funding shortfalls.

Finland has competence and experience that is exceptional even by international standards of outcome-based financing agreements aimed at promoting social well-being. Various models typically bring savings to the central government (or other public body) as public money is used to pay for impacts or outcomes rather than performances. Due to the large scale of the measures and financial investments required for responding to climate and environmental challenges, ways of channelling private funding towards solving these problems need to be identified. Outcome-based financing models should consequently be used more extensively, not only because of the sustainability gap in general government finances but also because more and more investors are striving for

148 https://www.eduskunta.fi/FI/vaski/HallituksenEsitys/Documents/HE_116+2022.pdf

societal impact in addition to returns, and the interest in impact investing is on the rise. Such models would turn environmental challenges into attractive investments. The Global Impact Investing Network (GIIN) put the value of impact investing at around USD 715 billion globally in 2020.¹⁴⁹

In general, four types of outcome-based public funding models are in use:¹⁵⁰

- **outcome-based grant:** an NGO or company is paid for reaching pre-defined outcomes;
- **outcome-based procurement:** rather than performances, desirable changes that lead to societal or environmental benefits are set as the objective of the procurement;
- **impact bond:** complements outcome-based procurements with investor capital as investors share the financial risk with the service providers
- **outcome-based purchase fund:** a financing mechanism that can be used to pay for the results of several outcome-based projects and procurements simultaneously, applying a common framework.

These models differ from each other, particularly in terms of what share of the project risks is carried by private investors, as well as in terms of the size of the incentive linked to the outcome. The fund model, for example, makes it possible to scale the activities to cover several projects, extensively using funding from different sources, as well as enables coordinated measures to achieve a certain outcome. What all the options for impact investing and outcome-based funding models have in common is that, rather than the implementation of measures, they measure the outcomes and impacts of the measures.¹⁵¹

A precondition for using outcome-based funding models to promote the green transition is building up knowledge and competence related to their potential. When preparing measures, the actors should have more expertise needed to identify situations in which different forms of outcome-based funding could be used, together with and complementing budget funding and grants. This way, public funding could be spent on generating outcomes, and funding models could be designed to make it possible for private investors to become involved where appropriate. Any legislative or other obstacles

149 GIIN 2020 Annual Impact Investor Survey, 2020

150 Tulosperusteiset rahoitusmallit kalastonhoidon vauhdittajina, Louhi, P; Hilli, P; Järvelä, E; Hakola, S; Lappalainen, A; Iho, A; Veneranta, L; Huusko, A; Kallasvuo, M; Halonen, T. Ministry of Agriculture and Forestry publications 2022:19.

151 Tulosperusteiset rahoitusmallit kalastonhoidon vauhdittajina, Louhi, P; Hilli, P; Järvelä, E; Hakola, S; Lappalainen, A; Iho, A; Veneranta, L; Huusko, A; Kallasvuo, M; Halonen, T. Ministry of Agriculture and Forestry publications 2022:19.

whose dismantling could promote the wider use of outcome-based funding models should also be identified. Motiva, the central government's sustainable development company, supports the development of impact-related competence in the public sector and the designing of impact investment models.¹⁵²

3.2.6.3 EU-funded risk-sharing instruments

As part of EU and national funding, Financial Instruments can be created in which the public sector often bears the greatest risk in guarantee arrangements, making it possible for the private sector to participate in projects. An example of these models is the SME Initiative, a joint financial instrument of the State of Finland, the European Commission and the EIB Group. By making more credit available for companies, it aims to create jobs and promote growth. With the support of this programme, the EIF shares financial institutions' risks arising from loans granted to SMEs through its guarantees. Banks that have concluded an agreement with the EIF are intermediaries of this financing in Finland. These intermediaries make credit decisions relying on the SME Initiative in accordance with their lending policies and within the framework of their agreements with the EIF.

The pending loan guarantee programme aimed at accelerating SMEs', households' and housing companies' clean technology investments and energy efficiency renovations is a new project with similar aims. The Government has approved Finland's participation in this EUR 700 million InvestEU guarantee programme, in which the State allocates EUR 100 million to the Sustainability Guarantee product of the European Investment Fund (EIF).¹⁵³ The leverage effect of the State's co-financing is expected to mean that the volume of loans intermediated by the participating financial institutions will be seven times higher.

152 https://www.motiva.fi/ajankohtaista/tiedotteet/2022/motiva_tarjoaa_jatkossa_asiantuntijuutta_julkisten_hankintojen_vaikuttavuuden_edistamiseksi.18310.news

153 <https://tem.fi/-/uudesta-lainatakausohjelmasta-vauhtia-pk-yritysten-kotitalouksien-ja-asunto-osakeyhtioiden-puhtaan-tekniologian-investointeihin-seka-energiatehokkuusremontteihin>

4 Critical success factors for the green transition and bringing it about

In green transition financing, the primary duty of the public sector is to use cost-effective and consistent means to encourage and promote the channelling of private investments. Public authorities also have a duty to ensure that a goal-oriented but predictable legislative framework is put in place. In national steering, accounting for the central role of EU level steering and EU obligations will be essential. Finland is part of the EU's emissions trading system, which effectively provides an incentive for reducing fossil fuel consumption in the ETS sector. Emissions reductions in the non-ETS effort sharing sector and LULUCF sector are promoted in the EU by imposing binding obligations on the Member States, which emphasises the role of national policy instruments in these sectors.

A precondition for achieving a cost-effective and high-impact set of policy instruments is regularly assessing and benchmarking the instruments. Means for improving the cost-effectiveness of instruments aimed at reducing emissions have, for instance, been assessed and proposed within the framework of the Ministry of Finance's working groups on transport and energy tax (in 2020).

Other policy measures besides those adopted to reduce climate and environmental impacts may include elements that slow down the green transition. Regulation may create bottlenecks, and subsidy and tax regimes may contain environmentally harmful elements. Identifying, evaluating and redirecting them is important in order to assess the objectives of regulation and subsidies and to propose ways of providing subsidies that would be less harmful to the environment. In addition to legislation, public expenditure and subsidies as well as taxation are key policy instruments of the public sector for creating a setting for and accelerating the green transition. While public procurement can play a significant role in promoting (low-carbon and circular economy) solutions that lend better support for the transition, it must be ensured that they are carried out efficiently.

Finnish society and the entire public sector are undergoing a major transformation due to such reasons as the ageing of the population, migration and the green transition. The pace of this transformation is particularly fast when it comes to technological advancement, low-carbon solutions and digitalisation. It is likely that the phasing out of fossil energy will accelerate these changes further. The public sector plays an important part in the transition to a low-carbon and ecologically sustainable society. The range of measures at the public sector's disposal paves the way for a transition to clean and sustainable solutions.

As the green transformation of financial markets and regulation of sustainable finance are evolving rapidly, all parties would benefit from closer cooperation and exchanges of information and experiences. Closer interaction is needed not only among administrative actors but also with key business and financial sector operators. Cooperation and coordination at the national level need to be stepped up. International experiences and emerging best practices can be tapped to take the first steps. The proposal for a cooperation and coordination model based on reference countries' practices as well as pilots carried out during the project, which was presented in connection with the Roadmap for sustainable financing in Finland, could be used as the basis for discussion and development.¹⁵⁴ However, it should be noted that green transition financing can also have its pioneers, and Finland could be one of them if it actively supports the achievement of its objectives.

Many companies operating in financial markets are required to report on sustainability aspects at international or EU level. Attention should also be paid to information exchanges in order to ensure that the administrative burden and transaction costs of sustainable financing remain reasonable. It is important for companies to have an up-to-date understanding of the information that finance providers need to assess the sustainability of their funding decisions and to fulfil reporting obligations. The preconditions for this include not only developing competence related to green transition financing but improving cooperation and information exchange practices.

4.1 Reconciling sustainability objectives and economic policy

Economic, ecological and social sustainability are prerequisites for the success of the green transition. Attention to climate and biodiversity risks is also emphasised when assessing the country risk. Sustainable public finances will improve the preconditions for solving such problems as climate change and biodiversity loss and help channel public funding to purposes important in terms of ecological sustainability. Over the longer term, climate change, ecological sustainability and the carrying capacity of nature can also be expected to have significant impacts on the sustainability of public finances. Natural capital is a key factor of production and important for people's well-being, which is why integrating its preservation and the perspectives of assessing ecological impacts into impact assessments is vital, considering the fact that long-term development work will be required to achieve this.

¹⁵⁴ <https://tem.fi/kestavan-kehityksen-rahoitusekosysteemi>, Recommendations for how Finland can develop sustainable finance at the national level, 2022.

Reconciling the long-term sustainability goals with the realities of economic policy and coordinating their different time frames is a key question. In a workshop organised by the working group in April 2022, views of improving the coordination of sustainability objectives and economic policy were brought up. To accommodate the disparity between the time spans associated with the short term of economic policy decision-making and the longer time line of climate and environmental objectives, it should be accepted that the 'returns' of the green transition may not be realised over the short term. In addition, they may be non-monetary benefits, including positive health impacts of improved ecological status or opportunities for recreational use. Climate change policy must be prioritised over short-term political compromises and economic profits. What makes this equation even more challenging is that promoting sustainability is not about only resolving a single issue, or climate change. Some climate measures may significantly reduce biodiversity. There are strong links between the measures aiming to combat climate change and halt biodiversity loss. This is why environmental and climate impacts must be examined together.

Otherwise, irreversible changes may be caused to natural ecosystems and similar, which cannot be restored at any price. A framework should be created for the identification as well as ex ante and ex post monitoring of the long-term national economy impacts and risks of climate change and biodiversity. Developing models and methods requires expertise, national and international cooperation, and long-term development work. Studies on the overall economic impacts of climate change and its effects on general government finances are under way. A project coordinated by the Research Institute of the Finnish Economy will also draw on data concerning global and local climate risks to put together different scenarios and produce more accurate information on the impacts of climate risks on Finland, different sectors of the national economy and public finances. Additionally, the Ministry of Finance is currently working on a development project relevant to this issue. A report on methods for assessing the long-term impacts of climate change on public finances and the link between biodiversity loss and the economy was produced by the Coalition of Finance Ministers for Climate Action. The Ministry of the Environment is also working on studies on these questions.¹⁵⁵ This is an assessment that goes both ways: when considering climate policy and biodiversity measures as well as the measures affecting them, impacts on general government finances and the national economy also need to be assessed more systematically, paying more attention to the cost- effectiveness and impact of individual measures and the achievement of the set objectives.

155 <https://ym.fi/-/ymparistoministerio-kaynnistaa-selvityksen-luonnon-monimuotoisuuden-talouselottuvuuksista>

The coherence of policies is another key issue in terms of ensuring that there will be no conflict between the sustainability objectives and economic policy. In addition to general sustainability objectives and economic policy dimensions, it is essential to also examine coherence with other policy areas, including social security and health policy, which are crucial for transition processes.

Looking at the revenue perspective helps to recognise the fact that investments in the green transition will be recovered over a longer period of time. The revenue potential should be exploited in projects assessed as necessary for long-term competitiveness and sustainability objectives while also investing in developing new solutions to avoid putting all eggs in one basket. This necessitates investments in RDI to enable innovation.

Regulation plays its own role in promoting ecological sustainability objectives and economic sustainability. The juxtaposition of linear economy and circular economy forces us to rethink things and requires regulation that supports the circular economy. Whereas current support forms are based on ownership, there are no solutions that promote sharing and circular economy. Long-term development of regulation is important. Regulation also supports the mainstreaming of sustainability. Among other things, the forthcoming EU Corporate Sustainability Due Diligence Directive as well as the obligation of producing an adjustment plan for limiting global warming to 1.5 degrees and directors' duties associated with it are important policy instruments.

Valuation of impacts is a means of reconciling economic decision-making and sustainability objectives. The spin-off and side effects of decisions should be identified and, by assigning a value to social and ecological factors, including priceless ecosystem services, an effort should be made to incorporate them into economic decisions. As there are no simple and straightforward solutions for this, the models are apt to be complex. The measurement and accounting related to ecosystem services and incorporating them into national accounts would build a knowledge base for valuing sustainability impacts. It is still premature to assess whether this would be possible, as the development of ecosystem accounting is still a work in progress.

In general, it is important to measure, monitor and reassess the impact of investments. Various parties making and supporting investments would benefit from evidence-based, easy-to-use tools that combine the assessment of impact and financial aspects. Long-term cooperation between experts in many different fields promotes dialogue on taking different dimensions of sustainability into account and developing assessments. More evidence to support decision-making could be produced if there were more focus on communication by researchers and decision-makers, especially in the planning phase, by means of co-creation, verbalising research findings into an easily usable form, and market dialogue.

4.2 Competence and education

Improving competence, education and continuous learning throughout society will be prerequisites for the green transition. Among other things, technological development, solving such wicked problems as climate change and biodiversity loss, innovation, and generating circular economy business will require in-depth exploration, learning and different professional skills in increasingly narrow fields. As part of this transition, labour market transformation will create needs for retraining and continuing education.

In general, understanding of the green transition's systemic significance should be strengthened through continuous learning open to everyone and teacher's in-service training. Associations and museums that provide environmental education will also play a key role in this. Companies have a growing need to improve their awareness of biodiversity loss and the significance of natural capital for their business and its continuity.

The changing skills needs brought about by the green transition will affect jobs and workers. The European Commission has estimated that climate change mitigation will create slightly more jobs than it will destroy in the European Union (European Commission, 2019). This development will depend on the sector, however. Especially in those industries and regions that are unable to phase out fossil fuels, jobs will at least be transformed, or disappear altogether. Studies have found that the largest emissions reduction targets will be imposed on industry and transport, and these sectors are also subject to the greatest number of climate policy measures.

A just transition will be highly important in terms of citizens' livelihoods and employment. It will also have spill-over effects on political support for the green transition, for example if there is resistance to a transformation resulting in long-term unemployment, and on labour availability for companies. Consequently, investments are also needed in actions that help workers meet the skills needs created by the green transition (adult education, continuing education, labour market training, etc.).

The transformation of skills necessitated by the green transition will have an impact on qualification requirements, curricula and degrees at all levels of education and in all competence areas. In late 2021, the Ministry of Education and Culture and the Finnish National Agency for Education launched a major climate and sustainability project in education. This project supports a change in the operating culture of comprehensive schools and secondary level educational institutions towards a more ecologically sustainable way of living and improves students' skills related to climate change mitigation. Sustainability and environmental education are already recognised in the National core curriculum. The activities remain fragmented, however, and scattered across multiple administrative branches.

By building up competence, society will secure its ability to address the elements of the green transition in decision-making and promote the transition.

4.3 Knowledge and research

A successful green transition will require strong expertise, which is already available in Finland. Finland has extensive expertise in climate and environmental matters. The Natural Resources Institute Finland (LUKE) has approximately 1,300 employees (researchers and specialists), and around 700 professionals work at the Finnish Environment Institute (SYKE). These institutes offer evidence-based information to support decision-making on climate and environmental policy. VTT Technical Research Centre of Finland, which employs approximately 2,000 people, produces RDI expertise to support green transition solutions.

Competence related to financing the transition and economics is scarcer, however. National expertise in these fields of science and forging a link between research and policy-making will help bring about the green transition and support decision-making and impact assessment in Finland. This is partly a global challenge, and in order to boost Finland's competitiveness, it will be important to ensure that the country has the highest possible level of expertise and research. For these reasons, it is important to analyse the situation of expertise and research in finance and economics relevant to the green transition in Finland and to develop it to the required level. The Climate Coalition of Ministries of Finance considers ways to strengthen expertise and research in the areas of economic policy and financing, for example through international cooperation and networks.

The green transition will transform society, the labour market and the business sector in ways that are not fully known and that are difficult to anticipate completely. To achieve a just transition, it must be ensured that its impacts are distributed fairly between the population groups and regions, and that no one will suffer from the change disproportionately. In terms of Finland's competitiveness and public finances, it is similarly vital to know how companies will react to environmental regulation and new markets. Finland has exceptionally good prerequisites for obtaining information and studying the distribution of impacts by using and combining Statistics Finland's datasets. The Data Room pilot of VATT Institute for Economic Research, Helsinki GSE and Statistics Finland, and especially the work carried out by its Environmental and Energy Group, is an example of interaction between decision-making and research that supports the green transition. Up-to-date statistics, resources and expertise lay a foundation for assessing the impacts of the transition to support policy-making and funding solutions.

4.4 International practices, cooperation and influencing

Green transition solutions have important international linkages. Efforts to develop sustainable financing are international, and the importance of the EU, in particular, is emphasised for Finland. It is important to deal with green transition solutions, and the financing solutions associated with them, as a whole. International institutions and forums engage in cooperation and produce reports on the green transition and its financing, the contents of which Finland can also influence.

Key forums for exerting influence include the EU, UN and UNEA, the Nordic Council, international climate biodiversity negotiations (incl. COP), the Coalition of Finance Ministers for Climate Action, the Network for Greening the Financial System (NGFS), Sitra's World Circular Economy Forum, the OECD and international financial institutions.

Particular attention is paid to good practices of and cooperation with Finland's reference countries. Recently, Sweden and the UK have launched studies on ways to increase green transition financing.¹⁵⁶

In autumn 2022, the OECD published a report containing guidance on green transition financing.¹⁵⁷ This report surveys and compares different approaches to transition financing, including financial instruments, analyses challenges and obstacles, and lists the main features of good transition plans for companies.

4.5 Permits and licences

With regard to international investment in Finland, the OECD¹⁵⁸ has highlighted a number of regulative bottlenecks and challenges. According to the OECD report, they include challenges related to setting up businesses and their administrative burden, labour market rigidity, availability of skilled labour and labour mobility, long processing times of environmental and other permits, and regulation that restricts competition in downstream service sectors.

156 Utredning: Finansiering av näringslivets gröna omställning, Lindblad, Karltorp, Janhäll, August 2022; the Green Transition Plan Task-Force in the UK, 25 April, 2022

157 OECD Guidance on Transition Finance, October 2022.

158 [Report Highlights – The Impact of Regulation in International Investment in Finland \(oecd.org\)](https://www.oecd.org/)

Over a period of more than ten years, environmental procedures have been streamlined and developed in Finland through a variety of measures, including reducing requirements, coordinating procedures, developing practices and developing electronic procedures. The aim of this work is streamlining processes without compromising on regulatory content. As one of the most recent measures for boosting investments, the Government decided in its spending limits discussion of 2022 to accelerate green transition investments that will improve Finland's self-sufficiency by preparing, for a fixed term, to prioritise these investments in the processing of permits and appeals. Through legislative amendments, efforts will additionally be made to ensure closer contacts and exchanges of information between the authorities. The Government also decided to increase the resources for permit and other administrative procedures, digitalisation and administrative courts for a fixed term.

To carry out an investment project, a number of official procedures both at the planning stage and at the permit application stage are required. The current administrative structure based on regional competence (17 regional state administrative agencies) and personnel resources confined within regional boundaries, as well as the current digitalisation investments do not optimally support streamlined permit procedures. With regard to developing permit procedures, the aim is to ensure that an operator could in the future have the permits and notifications related to their activities processed more smoothly and rapidly at a one-stop shop and possibly even in a single permit procedure (integrated procedure) without compromising on the level of environmental protection. In the one-stop shop model, the current regional differences in the processing times of permit applications could be levelled out, different procedures could be combined, and equal treatment of customers could be ensured. The best experts could be assigned to investment projects, regardless of their location. This would mean that a single central government authority would be responsible for processing key environmental permits, including both *ex ante* and *ex post* supervision.

A high-quality environmental permit process would be consistent with the interests of both the environment and companies. Investing in the permit procedure is worthwhile as this will speed up the launch of investments as a whole, increase tax revenue and create more jobs. Appeals against good quality permits are less frequent, and they also stand the scrutiny of administrative courts.

Clear marginal conditions associated with the quality of legislation can be identified for streamlining regulation. These conditions include requirements applicable to regulatory decisions arising from the Constitution and rule of law, a high level of environmental protection, and preconditions associated with implementing EU regulation. In terms of streamlined procedures, it is also important to ensure that the person responsible for a project has adequate knowledge required to implement the procedures related to it.

Municipalities also play a significant role in speeding up permit procedures for green transition investments (incl. zoning, building supervision). There are around 280 building supervision units and more than 200 environmental protection units in Finland, and the resources available to these units vary significantly. With regard to local governments' environmental, zoning and building permit services, it should be ensured that the municipalities have assigned personnel with sufficient expertise to these tasks, for example by developing cooperation or increasing resources.

Parliament's Environment Committee¹⁵⁹ considers that, in addition to up-to-date legislation, essential factors for well-functioning and streamlined environmental procedures are administrative clarity, authorities' sufficient resources, and efficient use of digitalisation. The Committee has also previously found that the model of a single national agency prepared during the last parliamentary term, which would combine expertise in permit issues and supervision, would ensure that the best expertise would be available for each matter being considered and step up cooperation between the environmental sector's permit and supervision tasks in ex ante and ex post control tasks. A national authority would make it possible to develop environmental procedures further towards one-stop shop legislation and permits.

159 [YmVM 8/2022 vp \(eduskunta.fi\)](#)

5 Development needs and recommendations for achieving key objectives identified by the working group

5.1 Summary of the challenges and development needs of green transition financing

The working group identified the following key development needs related to green transition investments and financing. They were grouped into four areas:

An operating environment that supports green transition investments:

- The green transition will necessitate a system-level structural change, and extensive investments will be needed to bring about the sustainability transformations. Investment certainty could be improved if the central government had a long-term vision for a climate and nature positive society.
- Public sector policy instruments and measures are not fully consistent from the green transition perspective, and they do not allow for sufficient mainstreaming of the circular economy.
- The measures that support the development of a green transition market should be targeted cost-effectively, with a high impact and fairly from the perspective of sustainability in public finances.
- To make full use of Finland's potential, a long-term and goal-oriented transition towards a low- carbon and circular economy and, consequently, investments in the renewal of production technology and RDI activities will be required.

Seizing the market opportunities created by a global green transition:

- Insufficient investments in green transition and circular economy RDI.
- Mutually complementary private and public funding, in particular for placing new proven solutions on the market.

Addressing sustainability perspectives in funding decisions and public finance providers as pioneers:

- Due to the high risks associated with new clean technologies, many investments required for the green transition are not yet seen as sufficiently attractive, and while there is a great deal of funding available in principle, there is a mismatch between the supply and demand in the market.
- Knowledge gaps and a lack of common definitions and shared information increase the risks of greenwashing and uncertainty for investors. Lack of data makes it difficult to assess the targeting of funding.
- Controlling the transaction costs of green project financing to ensure that small projects can also access funding.
- A consistent approach to public sector financial instruments would be needed to channel funding to the green transition, making the most of all public finance providers' roles in funding green transition investments and promoting the attainment of cross-cutting climate and environmental objectives.
- Inadequate exchanges of information and cooperation between key actors.
- While EU funding offers many opportunities to increase the funding base for green transition investments, competence and cooperation need to be improved to make better use of it.

Knowledge base in support of decision-making:

- To predict and avoid climate and biodiversity loss risks over the long term, coordination with economic policy decision-making with its shorter time span is needed.
- The big picture of investment needs and the investment shortfall in relation to international obligations and policy measures already agreed upon is incomplete.
- Skills gaps in the financial sector, companies and more extensively in the labour market.
- Shortcomings in the knowledge base and research relating to the green transition, especially in the areas of economics and finance.

Several studies important for green transition financing are under way, which it is not appropriate to discuss in detail in this report. However, the working group recognises that they will contribute to meeting some of the identified development needs. See the Appendix for a list of on-going studies.

5.2 Recommendations

5.2.1 Objective 1: Green transition investments will go ahead in Finland at a pace that will enable the attainment of carbon neutrality and environmental objectives

A predictable and stable operating environment is a prerequisite for investment certainty, which is needed to carry out large-scale projects. **By using and allocating public funds efficiently**, significant leverage effects on green transition investments can be achieved. During the transition, there will additionally be a particular need to ensure the **long-term sustainability of public finances**.

Investments in accelerating the essential transformations of the green transition are the key to achieving climate and environmental objectives, halting biodiversity loss and speeding up the green transition. Accelerating investments in renewable energy while phasing out fossil fuels is the key to the transformation of the **energy system**. Large-scale investments in sustainable production methods of energy-intensive **industry** will be the central issue in cutting industrial greenhouse gas emissions over the next few years. A great deal of natural resources and energy are consumed in **construction and buildings**, in addition to which there will be considerable investment needs in renovations over the next few decades. Similarly, sustainable driving powers and modes of travel in **transport** as well as urban planning solutions will be crucial in the green transition. Green transition solutions in the **food system and the land use sector** will be important in terms of not only the climate objectives but also biodiversity, status of the environment and Finland's self-sufficiency in raw materials.

Transitioning to a carbon-neutral **circular economy** is an important means of tackling overexploitation of natural resources and achieving climate objectives, and the transition to a circular economy should be accelerated in all sectors. Long-term development of regulation, policy instruments and incentives will be essential for the transition to a circular economy. In the new geopolitical situation, solutions are needed to reduce not only energy dependence but also material dependences, in which promoting the circular economy is part of the solution.

1. Improving investment certainty by means of a predictable regulatory environment and long-term commitments to promoting sustainable solutions

- Key structures and regulatory or administrative bottlenecks with adverse effects on the green transition will be identified. Determined efforts to accelerate investments in the green transition will be continued, for example by streamlining the permit procedures and other administrative processes for these projects.

- By means of regulation that supports the green transition, predictability will be created in the demand for sustainable products and services, which will promote the emergence of markets. Sudden changes in regulation that promotes the green transition will be avoided.

2. Promoting the green transition will be set as an objective in public funding, subsidies, investments and procurement

- To ensure the sustainability of public finances, it is important that central government investments aimed at promoting the green transition will primarily be assessed from the perspective of the impact and efficiency of the funding. This is why public funding should be targeted especially at projects which would not go ahead without the central government's involvement and in which central government funding creates obvious added value. The criteria for public support must be developed to account for climate and environmental objectives more consistently. Harmful subsidies will be identified and redirected.
- Public procurement will be used systematically to promote the green transition, and the possibilities of incorporating the carbon and environmental footprint in procurement criteria more comprehensively will be examined, with emphasis on life cycle costs.
- Public funding may only be granted for projects related to fossil fuels on a temporary basis and for weighty reasons, including safeguarding continuity and security of supply, provided that no zero-emission solutions are currently available. Allocating innovation funding for fossil fuels is no longer justified in the current situation. Instead, it will be ensured that a sufficient share of the total volume of innovation funding will be allocated to developing, testing and marketing solutions required for the green transition.
- It must be ensured that public sector policy measures (regulation, steering, financing, taxation, other measures) as a whole consistently promote a good status of ecosystems and the maintenance and growth of natural capital. Both private and public sources will be tapped in an effort to obtain adequate funding for environmental investment. The Commission estimated in its Country Report on Finland that Finland's target should be approx. 1% of GDP.¹⁶⁰
- Efforts to develop the tax system, and especially the energy tax system, will be continued, taking into account climate objectives and obligations as well as environmental objectives.

160 Environmental Implementation Review, https://environment.ec.europa.eu/law-and-governance/environmental-implementation-review_en

3. Supporting the mainstreaming of the circular economy as part of a sustainable economy and promoting investments in circular economy solutions

- Both economic incentives and policy instruments as well as guidance by information will be developed to ensure that, by supporting economical use of natural resources, they will reduce carbon dioxide emissions, enhance biodiversity and promote the spread of circular economy service models. Reducing consumption and making the best choices for the environment will be made easy, attractive and economically feasible.
- Allocation of funding to research, development, innovation and ecosystem activities as well as to demonstrations and plant investments that promote the green transition and a low-carbon circular economy will be encouraged. The carbon and environmental handprint potential should be emphasised in assessment criteria for projects.
- Low-carbon circular economy solutions will increasingly be deployed in such areas as public sector construction, energy and infrastructure projects and service procurement.

4. Other requisite measures

- Exploring risk-sharing instruments for large-scale investments in sustainable production methods in heavy industry. Examples of this include various instruments that increase the predictability of business models, such as carbon contracts for difference, which offset the price disparity between low-emission and high-emission products.
- Investigating effective measures for promoting the green transition of the largest emissions sources in energy-intensive industries.
- Inviting key sectors to update their low-carbon roadmaps while expanding them to include not only climate objectives but also sustainable use of natural resources, tackling biodiversity loss, and transition to a circular economy.
- Producing an additional study on municipalities' financing and investment needs and prerequisites for obtaining funding based on case experiences.

5.2.2 Objective 2: Finland will be a pioneer in scaling sustainable solutions to gain global benefits

Finland will assume the role of a pioneer in finding green transition solutions. To enable us to produce global climate and environmental solutions, we must focus more systematically on developing new sustainable solutions and seizing opportunities for exporting them. A precondition for placing new solutions on the market and scaling them is proving that they work, which is why public finance providers should participate in risk sharing for a sufficient period of time.

Finland should also actively engage in international cooperation to promote the dissemination and introduction of good practices in green transition financing. Circular economy solutions play a central role in this, as they are the key to reducing unsustainable use of natural resources and material dependences globally.

Green transition solutions have important international linkages. The importance of international cooperation is, in particular, emphasised in the development of analysis and assessment frameworks, international climate finance solutions, regulation, development of best practices and the areas of learning and research. The significance of regional cooperation is stressed, especially in the EU as well as the Nordic and Baltic countries, which have specific strategic interests and objectives relating to the green transition. International institutions and forums engage in cooperation and produce studies on the green transition and its financing.

1. Systematic inputs will be made into developing sustainable solutions and seizing their export opportunities

- To prove that new clean solutions work, their testing, piloting and demonstrations on a large scale will be adequately supported. This will create preconditions for the participation of finance providers operating on commercial terms, including venture capital investors, in placing on the market and scaling of a new solution. Where possible, estimates of the carbon and environmental handprint of projects will be used when making green transition financing decisions.
- The recommendation made by the Parliamentary RDI working group to increase research and development inputs to 4% of GDP is also crucial for the green transition in terms of developing new sustainable solutions and achieving global climate and environmental benefits (handprint).
- To promote the exports of Finnish carbon and environmental handprint solutions, a stronger strategic foundation will be built, taking into consideration different operating possibilities and the roles of various actors.

2. Finland will engage in active international cooperation on developing good practices in green transition financing and influencing

- In order to promote the elements of sustainability and responsibility in financing, Finland will actively exert influence in key international forums and step up cooperation with reference countries.
- A situational picture of good practices of green transition financing in Finland's reference countries will be maintained, and both domestic and international decision-makers will be informed of these practices.
- Finland will promote the global scaling of circular economy solutions, in particular, as they are crucial for reducing unsustainable use of natural resources and material dependences.

5.2.3 Objective 3: A well-functioning and stable financing system will enable the financing of green transition investments

Developing the financing system by linking sustainability aspects more closely to financing decisions, services and risk management will be essential for market operation and financing green transition investments from private sources. Without a stable financial system, investments in the green transition may not go ahead, as uncertainty discourages investment decisions and makes anticipation challenging. In a situation of rapidly evolving financial markets and market regulation, all key parties will benefit from closer cooperation and **exchanges of information**. While widespread introduction of sustainability reporting will be important for promoting green transition financing and business competitiveness, attention should be paid to the administrative burden associated with it, as well as the **clarity of reporting requirements**.

The green transition should be a factor in all decision-making involving the use of public funds. All **public finance providers** have a role to play in financing green transition investments, and the existing instruments must be harnessed to promoting the achievement of cross-cutting green

transition objectives in a comprehensive, coherent and mutually complementary manner and with verifiable impacts. To make better use of different funding models and structures, including **EU funding** which may provide significant additional volume for green transition investments, the preconditions include competence development in administration, an ability to put together larger funding packages and closer cross-administrative cooperation.

1. Consideration for sustainability perspectives in financial markets will be promoted by means that enhance trust and stability in Finland, internationally and especially at the EU level

- Ensuring the preconditions for financial stability in a changing operating environment to enable financial system actors to maintain their ability to finance the green transition also in the event of future shocks. Participating in work in European and international forums and building up competence related to climate and other sustainability risks at the national level.
- Maintaining up-to-date information on sustainability reporting and other developments in the regulation of sustainable financing and ensuring that this information is accessible.
- Investigating ways of reducing the administrative burden and improving cost-effectiveness in proving that investments are green, without forgetting the risks of greenwashing.

2. Continuous practices will be created for information exchanges and cooperation related to sustainable financing

- Strengthening coordination at the national level to promote sustainable financing while addressing the needs of the administration and different stakeholders, drawing on the work carried out to prepare Finland's roadmap for sustainable financing and other countries' experiences when developing the practices.
- Improving exchanges of information between businesses, the financial sector and the administration to ensure that the administrative burden and transaction costs of sustainability reporting remain reasonable. The preconditions for this include developing competence related to green transition financing and the strategic competitive advantages it enables in companies. Supporting SMEs in developing their sustainability reporting.
- Stepping up cooperation between central government actors to promote exchanges of information and the forming of a shared view of green transition financing. The primary objective of the cooperation will be maintaining a common situational picture and ensuring smooth information flows and mutually complementary public financial services.
- Organising an annual cooperation and coordination event for public finance providers on green transition issues; the aims of this event would include improving information exchanges, expertise, instruments and cooperation. The event would be organised by the responsible ministries and the Government Ownership Steering Department in cooperation.

3. The steering and cooperation of publicly owned financial institutions will be developed to support the objectives of the green transition more coherently

- In publicly owned financial institutions, an overarching vision as well as consistent guidance and implementation will be reinforced in the use of green transition incentives and identification of sustainability risks. Assessing the extent to which existing public funding instruments are targeted at the green transition.
- Sharpening the focus on monitoring the achievement of green transition objectives in state ownership steering.
- Developing the assessment and reporting practices of sustainable financing of the public sector and publicly owned financial institutions systematically, avoiding a significant increase in the administrative burden that would slow down investments. Ensuring the controlled and stepwise introduction of new practices (including DNSH). Introducing harmonised definitions and practices for identifying sustainability impacts and risks.

4. EU funding and models for leveraging private funding will be used more extensively to carry out green transition projects

- Striving for more extensive and increased use of EU funding in green transition projects by improving communication and advisory services. Examining EU funding and national public funding as a whole in which the parts complement each other. Ensuring that there are no overlaps between EU and national support programmes. Investigating any bottlenecks relating to national co-financing when applying for EU funding.
- Extending the deployment of different funding instruments and outcome-based funding models to complement grant-based programmes in green transition projects, also paying attention to managing central government risks. Funding models aiming for impact and leveraging private funding will be needed to solve environmental challenges, in particular.

5.2.4 Objective 4: Critical factors of the green transition will have been identified and the actors share a common situational picture

To reconcile the objectives and time frames of economic policy on the one hand and climate and environmental policy on the other, comprehensive examination, impact assessments and continuous monitoring will be needed. A **framework for assessing the impact of the green transition on the national economy**, including on public finances and investments, needs to be developed and introduced. The efforts to design this framework will draw on collaboration in international forums.

Policy coherence across all policy sectors is a prerequisite for a **just transition**, and to achieve this aim, it is essential to identify the social and income distribution impacts of measures. Advancement in sustainability transformations will profoundly change job descriptions both in industry and services. Responding proactively to new competence needs will support not only employees' success in a changing labour market but also business competitiveness and the availability of skilled labour.

1. The link between the green transition and economic policy drafting and decision-making will be strengthened, and the attainment of objectives will be assessed annually

- Preparing a plan for creating an assessment, monitoring and analysis framework to evaluate the overall economic and fiscal impacts of climate and biodiversity loss as well as the policy measures required to reach them. This plan will address the need to identify and monitor risks associated with the transition and investment and financing needs as well as the links to climate and environmental policy objectives and the need for international cooperation.
- Developing budget procedures and building up the knowledge base for channelling green transition financing cost-effectively and boosting Finland's competitiveness. Ensuring better coordination of public sector measures, especially in economic, climate, nature, environmental, industrial and innovation policies, examining systematically not only the economic impacts but also the climate and environmental impacts of measures (funding, legislation, subsidies).

2. The knowledge base of economic policy decision-making in the green transition will be built up and economic research will be stepped up and used more

- Increasing the resources allocated to applied economic research that studies the links between climate change, biodiversity loss and the economy, and creating cooperation networks in which better use can be made of economic and natural sciences as well as cross-administrative expertise and cooperation. To this end, international scientific and research networks will be used.
- Developing environmental and climate data and data resources at the public administration's disposal, ensuring that the data can be accessed better and combined with companies' ESG reporting and other financial statements as well as with carbon and environmental handprint calculations that may be needed under the terms of green transition financing. Developing carbon handprint calculation models, making it possible to apply consistent methods at national level.

3. Building up overall green transition expertise

- Ensuring the availability of sufficient expertise in the green transition and its financing in Finland. Activating key stakeholders (financial sector, business sector, higher education institutions, NGOs, the EU) to improve their competence.
- Investing across a broad front in teaching, education and communication related to sustainable solutions and their benefits.

5.3 Indicators and monitoring

Developing indicators for each key objective for describing and monitoring its attainment is important. Further work will be needed to identify and develop optimal indicators, taking into account such issues as the availability of statistical data in Finland and internationally as well as the ability of statistical systems to collect and produce such data on a regular basis. The problem with measuring sustainable financing lies in that comprehensive, jointly agreed concepts are still taking shape. As detail is added to the obligations of reporting on sustainable financing in the EU, monitoring can also be developed in Finland. See the table below for some indicators for monitoring the achievement of key objectives outlined by the working group.

Table 3. Indicators for monitoring key objectives

Green transition investments will be made in Finland at a pace that will enable the attainment of carbon neutrality and environmental objectives	<p>Green transition investments in individual sectors (ETS, effort sharing and LULUCF) in relation to the estimated need. Assessment of the impact these investments will have on achieving national carbon neutrality and environmental objectives. (incl. the Annual Climate Report)</p> <p>Capacity of new power plants producing zero-emission energy forms, MWh, and emissions from Finland's energy production per MWh. Annual figures, the Energy Authority and Statistics Finland.</p> <p>Level and estimated shortfall in environmental investments (European Commission's Environmental Implementation Review)</p> <p>International green transition investments in Finland</p> <p>Proportion of circular economy materials, Statistics Finland</p>
Finland will be a pioneer in scaling sustainable solutions to gain global benefits	<p>Volume of green solution exports (or their relative share in companies' exports, or Finnish companies' share in the global market for these solutions)</p> <p>Private and public RDI investments in the green transition</p> <p>Number of patents for environmental technology (OECD database)¹⁶¹</p>
A stable and well-functioning financing system is needed for investment in green transition financing	<p>Development of green transition financing per group of actors and type of funding, incl. EU funding (itemisation of EU grant funding and market financing)</p> <p>Situational picture of private sustainable financing based on reporting in compliance with current legislation (incl. taxonomy and SFDR) and other well-known frameworks. (Fund data from Investment Research Finland and similar)</p> <p>Leverage effect of publicly owned actors and increase in private funding</p>
Critical factors of the green transition will have been identified and the actors share a common situational picture	<p>Inputs in relevant education in different sectors</p> <p>Ministries have sufficient resources, expertise and access to data supporting the monitoring of the green transition (qualitative indicator)</p>

161 https://stats.oecd.org/Index.aspx?DataSetCode=PATS_IPC

5.4 Implementation of recommendations and further work

The working group's mandate enabled parties representing different perspectives to green transition financing to meet and discuss the challenges associated with it and the means to implement and finance the transition in a controlled and sustainable manner, consistently with Finland's overall interests. The work was carried out on a tight schedule, considering the challenges involved in it and its horizontal nature. Forming a big picture and a shared view of the nature and challenges of the green transition was an essential part of the work.

Regarding the nature of the work and further efforts, the working group concludes by stressing the following:

- While its members represented a broad-based view of green transition financing, the working group did not include all parties whose contribution will be significant for bringing about the green transition. Such parties include the Ministry of Agriculture and Forestry and the Ministry for Foreign Affairs, the scientific community at large, the financial sector across a broader front, Statistics Finland, the State Treasury and NGOs. Continuing the discussion on the conclusions and recommendations of the report between a group of actors wider than the working group will be important.
- The working group's many recommendations are fundamental in nature, and a great deal of work will be needed to implement them. This is why it will be crucial to determine more specifically the concrete measures with which their implementation could realistically start, as well as their schedule.
- The work has important international linkages, as some of the issues raised in the recommendations will be resolved outside Finland's borders, or the solutions will require extensive international cooperation and research data. In addition, development in the regulatory environment is exceptionally rapid, extensive and international.
- Administratively, the green transition work is led by three ministries. For some of the recommendations, it is not appropriate for the working group to issue recommendations on the responsibilities for and methods of leading the continued efforts. It is vital to consider how horizontal cooperation on implementing the recommendations, monitoring their implementation and object achievement, and assessing the need for updating them should be organised appropriately in the future. The three ministries will convene a meeting of the working group members and other key parties to continue the discussion on implementing the recommendations, also taking into account the ongoing studies.

- This work was carried out in a situation where the pressure to accelerate the green transition is greater than ever; this is why green transition issues – especially from a financial point of view – are of extensive political significance. Inputs in further work are needed, making it possible to take any additional studies and complementary recommendations into account in the preparation of the new Government Programme.

Appendix 1. Ongoing key projects

- **Consumption taxation based on life cycle emissions (EKUVE)**, a project of the Government's analysis, assessment and research activities (Ministry of Finance)
- **Impacts on competitiveness and productivity of the carbon neutral transition**, a project of the Government's analysis, assessment and research activities (Ministry of Finance)
- **Overall economic impacts of climate change on public finances**, a project of the Government's analysis, assessment and research activities (Ministry of Finance)
- Sustainable digitalisation of public services: climate and environmental impacts, a project of the Government's analysis, assessment and research activities (Ministry of Finance)
- Working group on a targeted support system for households based on incomes and regions 20 June 2022–1 March 2023
- Report on green transition investment needs in energy-intensive industries and the preconditions for making the investments. Report commissioned by the Ministry of Economic Affairs and Employment, to be completed in December 2022.
- Dasgupta report:¹⁶²
The Ministry of the Environment launched a study on the economic dimensions of biodiversity in early 2022. The message of the Dasgupta report is that the humankind and the economy depend on the ecosystem services, and that nature should be thought of as one form of capital alongside economic and social capital. The project will examine which proposals for measures in the Dasgupta report are essential for Finland and what types of changes would be needed in such areas as central government finances to address impacts on nature better. The study will be implemented by Natural Resources Institute Finland, and it is to be completed by 31 January 2023.

¹⁶² <https://valtioneuvosto.fi/-/1410903/ymparistoministerio-kaynnistaa-selvityksen-luonnon-monimuotoisuuden-talouselottuvuuksista>

- **Steering methods for sustainable consumption (KULO) project:**
The project will identify and assess effective combinations of policy instruments that could efficiently reduce climate emissions from private consumption by 2035. The Finnish Environment Institute will additionally update the data concerning greenhouse gas emissions from households, public consumption and investments in connection with the project. The project is due for completion by the end of February 2023.
- **Preparation of Ministry of Finance Strategy on Climate and Nature**
The Strategy on Climate and Nature will complement the Ministry of Finance's strategy. It recognises the need to pay attention to climate and ecological issues in economic policy drafting and influencing. The strategy was due for completion in December 2022.

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