Resource efficiency and circular economy in Europe – even more from less

An overview of policies, approaches and targets of Finland in 2018

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This country profile was prepared as part of the 2019 EEA review of material resource efficiency, circular economy and raw material supply policies, which aimed to collect, analyse, and disseminate information about experience with the development and implementation of these policies in EEA member and cooperating countries.

At the time of writing, a summary report is being finalised. The report reflects on trends, similarities and differences in policy responses, showcases selected policy initiatives from member countries and identifies possible considerations for the development of future policies.

These country profiles were compiled and finalised by members from the European Topic Centre on Waste and Materials in a Green Economy, namely Bart Ullstein, Bettina Bahn-Walkowiak, Jeroen Gillabel, Margareta Wahlström, Jutta-Laine Ylijoki, Dirk Nelen, Theo Geerken, Veronique Van Hoof and Evelien Dils. The responsible EEA project managers for the work were Pawel Kazmierczyk and Daniel Montalvo.

Finland, facts and figures

Note: data in this section was sourced from Eurostat databases (April 2019), except where noted otherwise

GDP: EUR 223.9 billion (1.41 % of total EU28 in 2017)

Per capita GDP: EUR 40,600 (purchasing power standard) (135.3 % of EU28 average per capita figure in 2017)

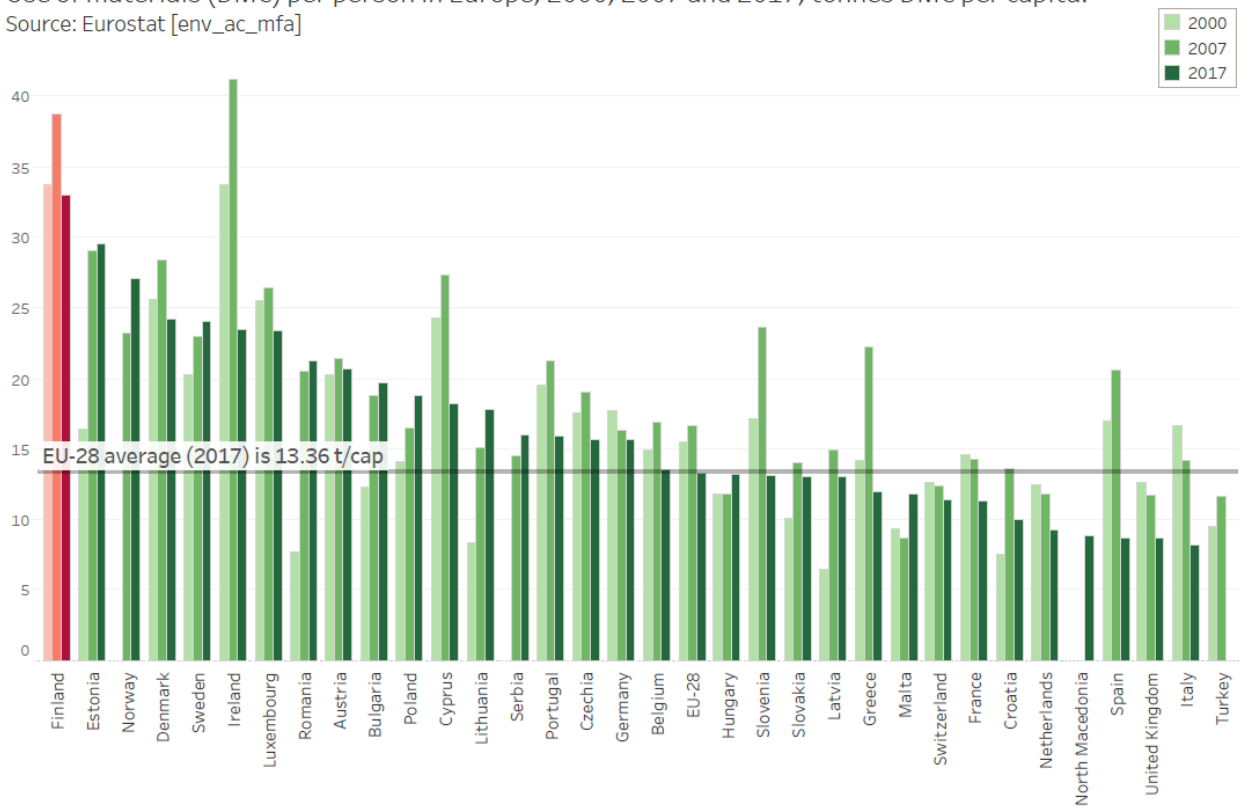
Use of materials (domestic material consumption (DMC))
181.8 million tonnes DMC (2.7 % of EU28 total in 2017)
33.0 tonnes DMC/capita (247.0 % of EU28 average per capita in 2017)

Structure of the economy:
agriculture: 2.8 %
industry: 28.2%
services: 69.1 %

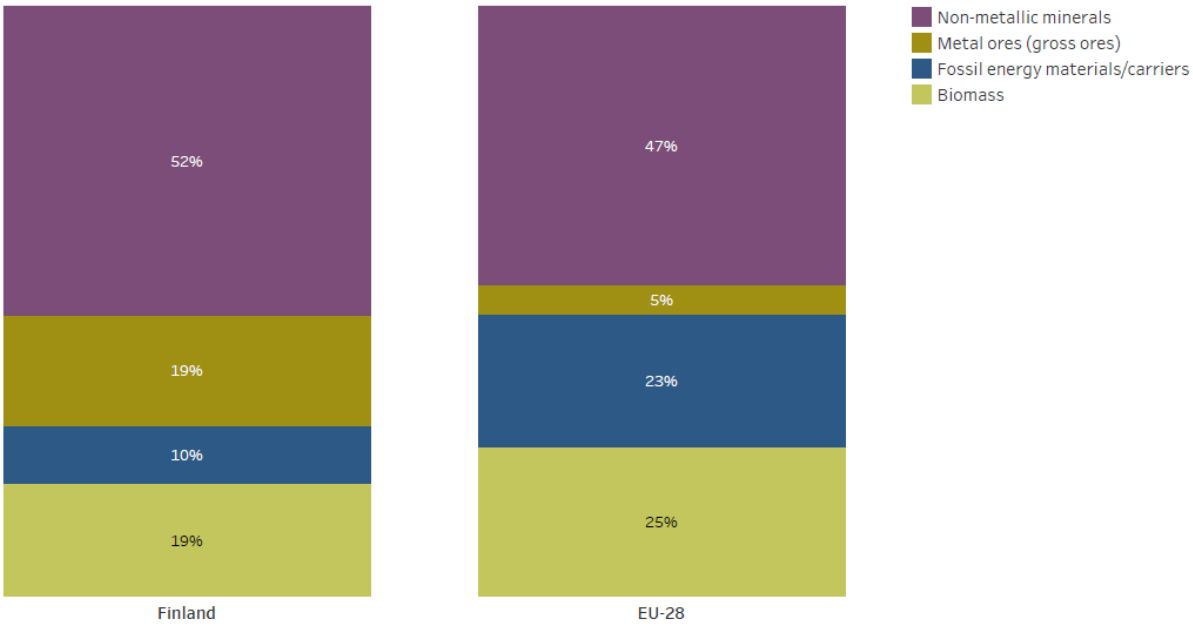
Surface area: 337.5 thousand square kilometres (km^2) (7.7 % of total EU28)

Population: 5.5 million (1.1 % of EU28 total in 2017)

Use of materials (DMC) per person in Europe, 2000, 2007 and 2017, tonnes DMC per capita.
Source: Eurostat [env_ac_mfa]

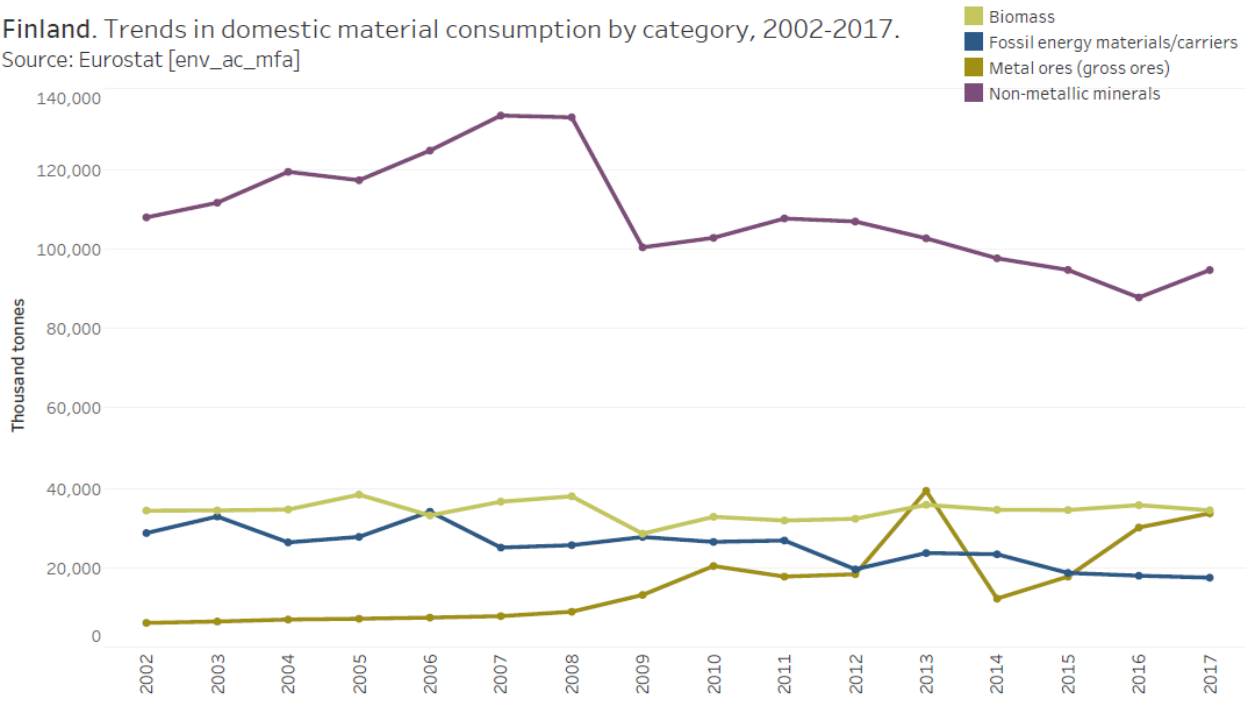


Finland & EU-28. Domestic Material Consumption by material category, 2017.
Source: Eurostat [env_ac_mfa]



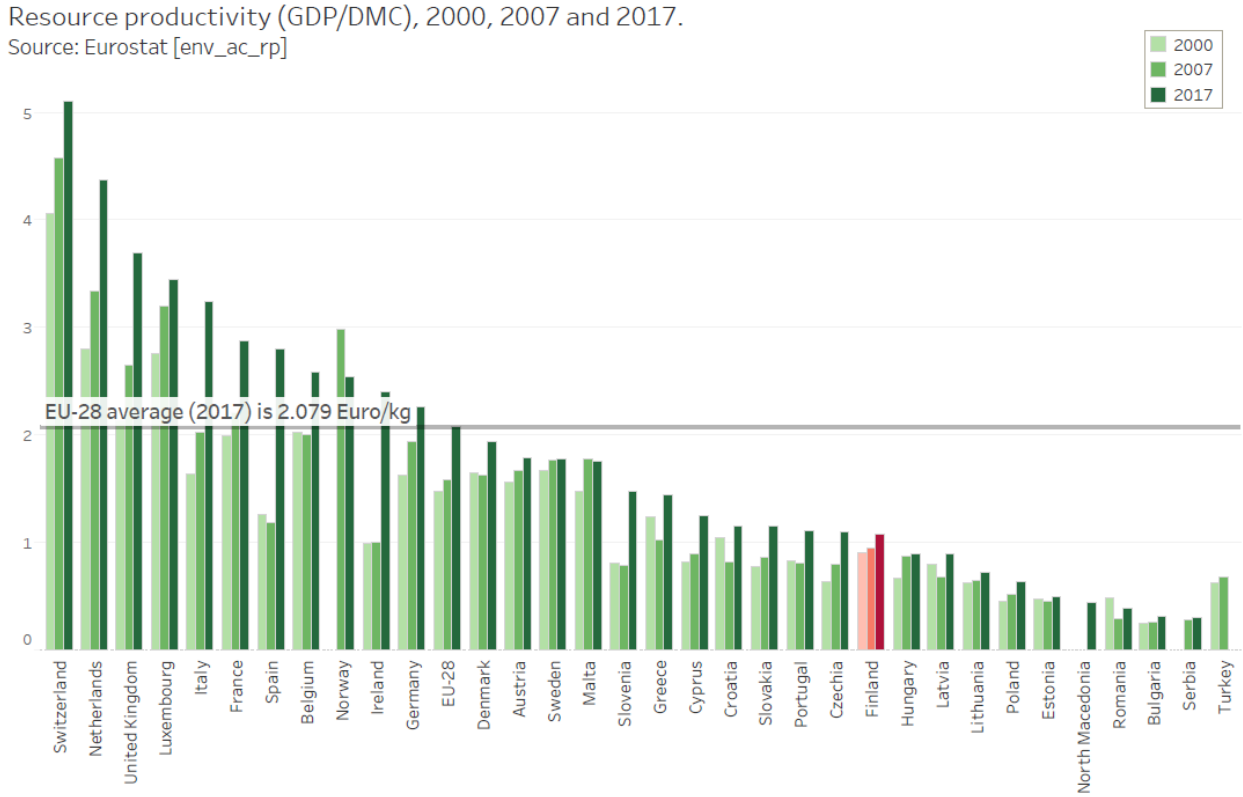
Note: The domestic material consumption categories 'other products' and 'waste for final treatment and disposal' are excluded from the figure.

Finland. Trends in domestic material consumption by category, 2002-2017.
Source: Eurostat [env_ac_mfa]



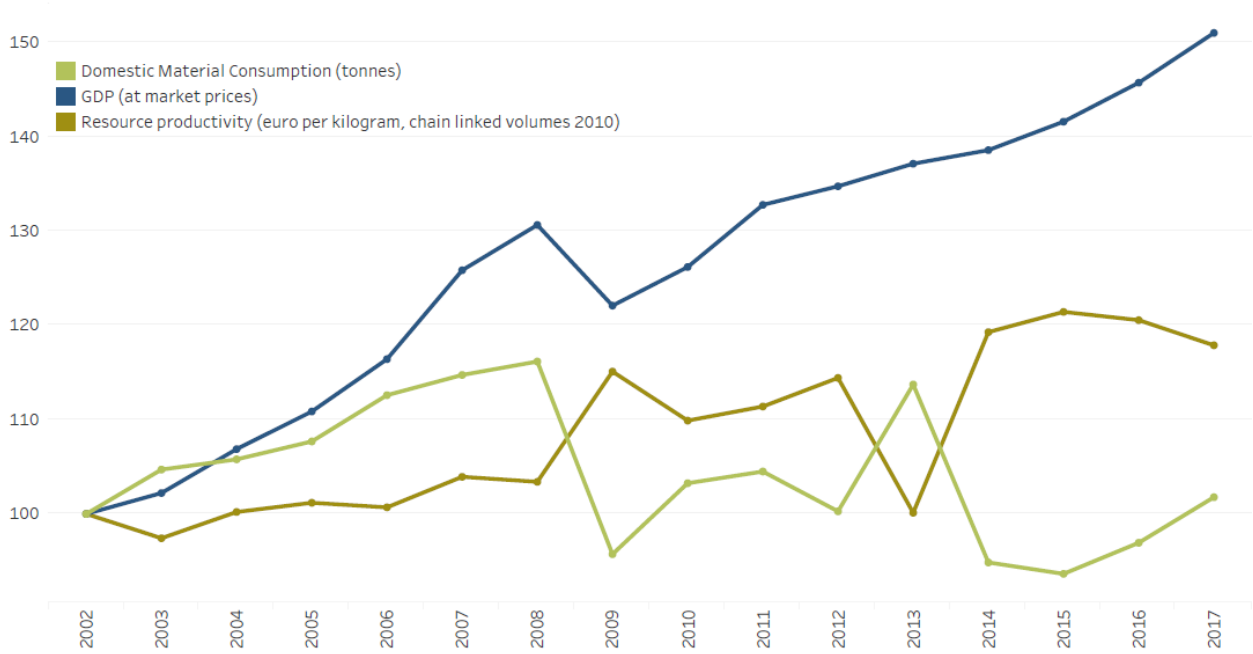
Note: The domestic material consumption categories 'other products' and 'waste for final treatment and disposal' are excluded from the figure.

Resource productivity (GDP/DMC), 2000, 2007 and 2017.
Source: Eurostat [env_ac_rp]

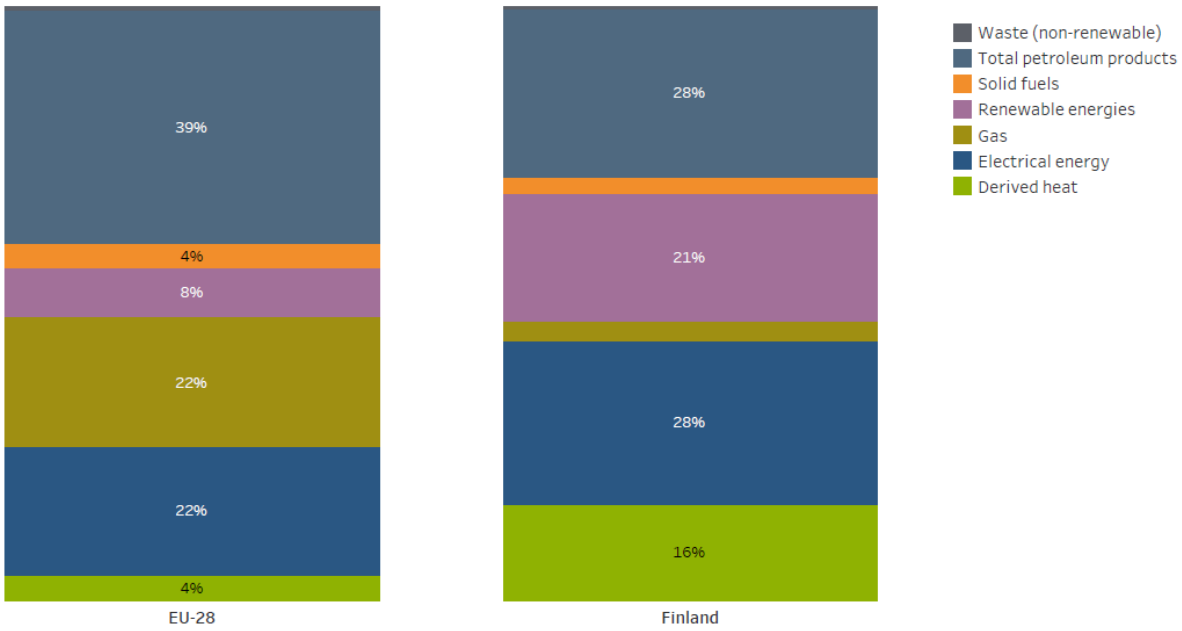


Note: GDP expressed in chain linked volumes 2010.

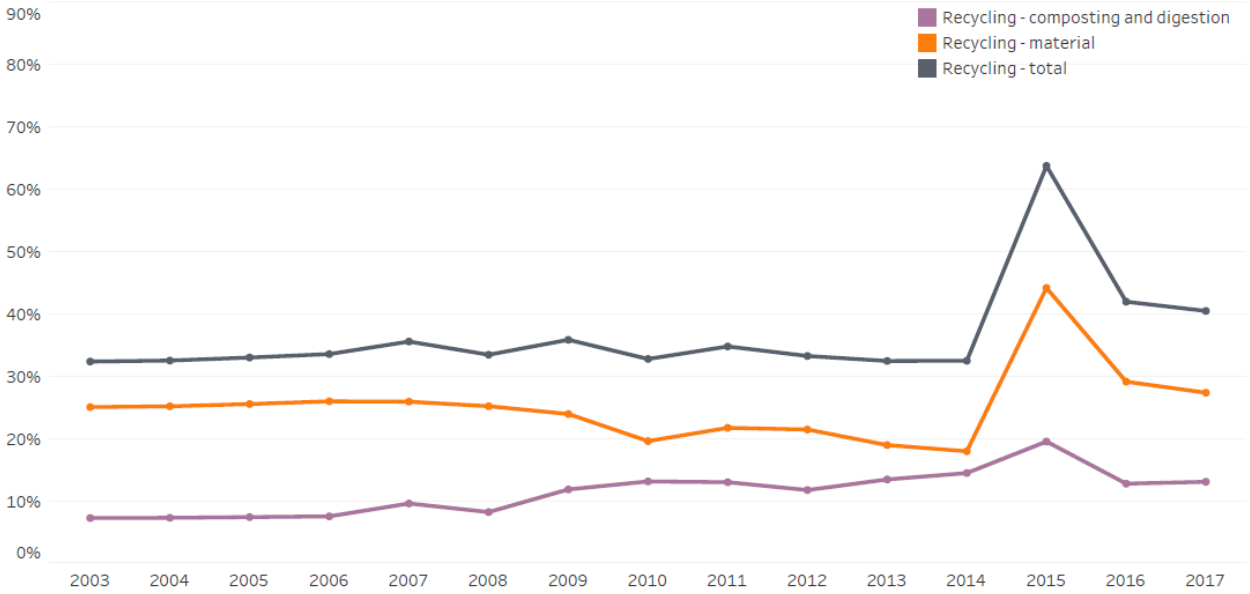
Finland. GDP, DMC and resource productivity trends, 2002-2017, index 2002=100.
Source: Eurostat [env_ac_mfa], [env_ac_rp] & [nama_10_gdp]



EU-28 & Finland. Primary energy consumption by energy product, 2016.
Source: Eurostat [nrg_100a]



Finland. Recycling of municipal waste, 2003-2017, as share of total waste treatment.
Source: Eurostat [env_wasmun]



Note: The amount of municipal waste treatment is reported for the treatment operations incineration (with and without energy recovery), recycling, composting and landfilling.

Policy framework

Driving forces for material resource efficiency and circular economy

Finland differs from most other European Union (EU) Member States with respect to its consumption of materials. The country produces paper for more than 100 million people around the world and aims to meet a significant portion of its renewable energy target sustainably with domestic bioenergy.

According to the **Material Efficiency Programme**, material efficiency in production means the sparing use of natural resources, the effective management of secondary flows and wastes, a reduction in the volume of waste and the recycling of materials at different phases of a product's life cycle. The goal is also to reduce the harmful impacts on the environment of products throughout their life cycles. Material efficiency can be seen at different phases of the value chain: in the production, refining, trade and consumption of raw materials as well as the sustainability of products or opportunities for reuse, recycling and waste recovery.

Finland sees resource efficiency as an opportunity to solve many challenges. The government objective is to replace imported fossil fuel-based energy with clean and renewable domestic energy and to see a growth in clean-tech enterprise, the sustainable use of natural resources, diversified rural enterprises and an efficient circular economy, all contributing to the creation of new jobs.

Bioeconomy, as a key strategy in Finland, is strongly connected to resource efficiency. Over the decades, Finland has accumulated considerable expertise in refining biomass, and a strong industrial framework. Finland is one of the EU's most forested Member States and wood plays an important role in the Finnish economy. A sustainable and cascading use of wood is reflected in the Finnish Bioeconomy Strategy and National Forest Strategy 2025.

Finland's per person consumption of energy and materials is relatively high compared to most EU Member States and a correspondingly large amount of waste is generated. The reasons for this lie in Finland's production structure and natural and geographical conditions. The Finnish climate, with its cold winters and the sparse population scattered over great distances, demands substantial resources for the road system. For example, due to the need for frost protection, the roads require a thick layer of gravel. The forest industry and mining sectors are major users of natural resources, while infrastructure construction involves conditions that require a large amount of material. However, there is significant potential for a more sustainable use of resources in these and other sectors.

The importance of resource efficiency has recently increased even more in the light of the EU's 2015 Circular Economy Package, as well as with the adoption of the United Nations Framework Convention on Climate Change's (UNFCC) Paris Agreement. Finland aims to be a front runner in a life-cycle driven circular economy, in which a cascading use of resources is commonplace and residual waste is close to zero.

Dedicated national strategies or roadmaps for material resource efficiency and a circular economy

Finland has a dedicated resource efficiency strategy in place. The National Material Efficiency Programme – Sustainable Growth through Material Efficiency[1] was designed to put ideas from the 2012 Rio+20 Sustainable Development Conference and the EU's Sustainable Consumption and Production Action Plan into practice. It was published in 2013 and was updated in 2018[2].

[1] http://tem.fi/documents/1410877/3323088/Sustainable_growth_through_material_efficiency/fd454ebd-49a7-4675-af0d-a897b5aec87a (English)

[2] http://julkaisut.valtioneuvosto.fi/bitstream/handle/10024/160559/TEMjul_5_2018_Kestavaa_kasvua.pdf?sequence=1&isAllowed=y (Finnish)

The 2013 National Material Efficiency Programme proposed eight actions under four themes for the advancement of material efficiency, within which a total of 40 projects were implemented:

Research and education

1. Launch a joint research programme for the promotion of material efficiency (4 projects).

Company tools for developing material efficiency

2. Realise a national operating model to accelerate industrial symbioses as a three-year project (8 projects).
3. Develop an operating model for strengthening resource-wise regional cooperation (4 projects).
4. Launch a five-year subsidised material audit project (5 projects).
5. Trial the material efficiency contract method as a means of accelerating material wisdom (4 projects).

Legislation and seamless administration

6. Launch a project for easing and clarifying the procedure for environmental permits (2 projects).

International and EU influence

7. Anticipate international material efficiency policy and influence the drafting of EU material efficiency policy (10 projects).
8. EU LIFE programme funding for Finnish material efficiency projects (3 projects).

The implementation of the 2013 Programme was reviewed in 2017[3], evaluating how material efficiency should in future be promoted as part of a circular economy. The results clarified the priorities for national material efficiency work and the measures that best respond to the EU Circular Economy Package and the UN Agenda 2030 Sustainable Development Goals (SDGs). It became apparent that there was a need to renew the Programme to bring its measures up to date. It was stated in the review (by Ramboll Ltd) that the actual quality of the projects was good, but that only half of them had a significant impact on resource efficiency. The rest had small or no impacts.

The updated programme, Sustainable growth through material efficiency: Update of the National Material Efficiency Programme 2017[4], published in 2018, is more strategic than the previous one – no individual projects are defined within the Programme, meaning more flexibility. It simultaneously aims at economic growth, the sensible use of natural resources and disengagement from harmful environmental effects. The Programme aims to improve material efficiency through the economic use of resources, efficient management of by-products, a reduction in the volume of waste, and recycling of materials at different phases of the life cycle of products. The focus areas include material audits, voluntary commitment to material efficiency and the development of the Finnish Industrial Symbiosis System (FISS) operating model by companies, with a dedicated budget of EUR 400,000 per year for the three focus areas combined. Other aspects of resource efficiency and the circular economy, such as maximising product life, the closing of loops, new services, industrial renewal and digitalisation, have not been specifically targeted by the Programme and are covered by Finland's Circular Economy Roadmap. The Programme is a stand-alone document but is connected to Finland's Circular Economy Roadmap.

The Programme covers material efficiency themes beyond its own financial capacity. At the practical level, the updated version includes the same eight actions as the original, but will only finance three:

1) material audits;
2) voluntary commitment to material efficiency;
3) development of the FISS operating model by companies.

[3] http://tietokayttoon.fi/documents/10616/3866814/64_Kansallisen+materiaalitehokkuusohjelman+arviointi.pdf/9416e1e8-3afa-417c-ba47-468fb55a0707?version=1.0 (Finnish)

[4] http://julkaisut.valtioneuvosto.fi/bitstream/handle/10024/160559/TEMjul_5_2018_Kestavaa_kasvua.pdf?sequence=1&isAllowed=y (Finnish)

Circular Economy Roadmap

The Strategic Programme of Prime Minister Juha Sipilä's Government (2015)[5] identified the growing opportunities offered by a circular economy. It sets a 10-year objective stating that Finland will be a pioneer in the bioeconomy, circular economy and cleantech. By developing, introducing and exporting sustainable solutions, Finland will improve the balance of current accounts, increase self-sufficiency, create new jobs, achieve its climate objectives and a good ecological status for the Baltic Sea. Concrete action includes increased recovery of nutrients, increased recycling rates of municipal waste to reach at least 50 per cent, and a ban on sending recyclable waste to landfill by 2025. The Finnish government has allocated an extra EUR 300 million to jointly fund strategic development and investments in the bioeconomy, circular economy and cleantech in the period 2016–2018.

In line with the Strategic Programme, The Finnish Innovation Fund (Sitra) compiled the world's first roadmap to a circular economy, Leading the cycle – Finnish roadmap to a circular economy 2016-2025[6]**.** It was drafted under the direction of Sitra in cooperation with the Ministries of the Environment, Agriculture and Forestry and Economic Affairs and Employment, the business sector and other key stakeholders. The process of drafting the roadmap, which was very extensive and involved around 1,000 participants in multiple stakeholder events, came up with 250 ideas for action and 60 initiatives. It took only four months to create.

Sitra is an independent public foundation operating directly under the supervision of the Finnish parliament. Sitra's decision-making processes are tied to parliamentary systems. However, one of its roles is to explore and test new ideas, one of which was the Circular Economy Roadmap.

The Roadmap highlights best practice and pilots that can be easily replicated and provide added value on a national scale. It identifies action that can accelerate the transition to a competitive circular economy. Finland will seek a pioneering role by focusing on five linked focus areas, as well as finding synergies between them. The actions in each focus area are divided into three groups: **policy measures**, **key projects** and **pilots**. Responsible parties are listed for each pilot – such as institutions, non-governmental organisations (NGOs), foundations, companies or municipalities – that are well-positioned for implementing the pilots. The focal areas are listed below, along with selected examples of possible action. Details can be obtained from the Roadmap. It has to be noted that the choice of which actions the government decides to concentrate on in the future it is a political question. The role of education and changing mindsets, however, is very important.

A multi-stakeholder steering group lead by Minister of the Environment, Energy and Housing Kimmo Tiilikainen monitors the implementation of the Roadmap.

1. Sustainable food system focus area

Goal: consumers choose food that has been produced through a wiser use of raw materials that starts in primary agricultural production; emissions and resource consumption will be lower; focus on nutrient recycling.

Key project: a regional sustainable food system.

Policy action: create a market for organic recycled nutrients; minimise food waste by eliminating barriers and creating incentives; support biogas systems and other renewable energy solutions to replace the use of fossil fuels in agriculture.

Pilots

Food waste: expand the Shared Table project (centralised distribution of waste food) to reduce food waste.

[5] http://valtioneuvosto.fi/en/sipila/government-programme (English)

[6] https://media.sitra.fi/2017/02/28142644/Selvityksia121.pdf (English)

Nutrient recycling: promote nutrient recycling in domestic fish farming; thermal sludge processing and construction of the appropriate pelleting plant; a biogas system and the symbiotic utilisation of food and fertiliser nutrients; more efficient collection and use of municipal biowaste.

Diet: public procurement encouraging the use of sustainable food; natural resource consumption calculators for consumers; an open-data competition for food and nutrients; promotion of communal food production, new ownership models and shared consumption.

2. Forest-based loops focus area

Goal: Finland is a circular bioeconomy leader because of its forestry and forest industry; global competitiveness will increase with new commercial products, services, cooperation models and digital technology.

Key project: an international demonstration platform for new bioproducts.

Policy action: making the main target of the national forest strategy the overall value of Finnish forest-based products and services rather than maximising the amount of wood; encouraging the use of wood-based and other products made from renewables in public procurement; support investment aimed at demonstrating bio-products and bio-services on a commercial basis; create incentives to develop Finnish wooden construction and the wooden furniture and interior design sectors.

Pilots

Industrial symbiosis: a showcase network that makes use of side streams; a regional cluster of companies, ECO3, as an industrial-scale bio- and circular economy business environment.

Innovation: building a Packaging Valley in Finland, which would be a unique packaging sector ecosystem; development of a lignin ecosystem; cellulose from Finland/DWoC (multidisciplinary research collaboration project aimed at finding new innovative applications for cellulose-based materials); export support for innovative bioproducts and technologies.

Ecosystem services: forest ecosystem services – OPENNESS EU project.

Digitisation: a biomass atlas – a browser-based online service that promotes the sustainable use of biomass.

Nutrient recycling: switching to the use of recycled nutrients in wastewater treatment plants at forest industry plants.

3. Technical loops focus area

Goal: minimise the use of virgin raw materials to create a competitive edge, while maximising material and product life cycles and opportunities for reuse.

Key projects: circular economy demonstration plant; the Arctic industries ecosystem and Kemi-Tornio circular economy innovation platform.

Policy action: promoting the use of secondary raw materials, including Waste Act interpretation and streamlining the environmental permit procedure, leading to the utilisation of secondary raw materials, such as industrial side streams, as effectively as possible by actively seeking uses for side streams instead of allowing them to become waste; the use of side streams produced during the project, such as surplus spoil, should be planned and described in the environmental impact assessment (EIA) and environmental permit processes; include ecodesign requirements in product design and construction and at the material development phase.

Pilots

Industrial and construction material flows: create regional markets for secondary materials; voluntary material efficiency agreements; use of secondary materials in earthworks; increased utilisation of industrial excess heat, for example in the Kilpilahti industrial area.

Construction and property use: resource-efficient construction through better town, building and project planning; technical departments in towns and cities as circular economy enablers; maximising use of the existing building stock and joint use of facilities.

Increasing knowledge: training for vocational teachers in cleantech and circular economy themes.

Business-to business (B2B) and consumer interface: a circular economy shopping centre, for example the Mylly Shopping Centre in Raisio, enabled by digital applications or shared logistics.

4. Transport and logistics focus area

Goal: transport will develop into a seamless, smart system that uses fossil-free fuels; Mobility as a Service (MaaS), the sharing economy, and optimised and clean transport will take mobility to a new level.

Key project: promoting and prioritising MaaS in the Helsinki Capital Region.

Policy action: develop incentives and policy instruments to accelerate a radical change towards a more service-based transport system; develop tax and other steering to support the termination of fossil-fuel use in private cars by 2040 and promote the use of biofuels produced in a sustainable manner.

Pilots

Energy: make Central Finland a model province for transport biogas; use of high-blend biofuels in buses and the City of Helsinki fleet (BioSata project); use of renewable energy to manufacture alternative transport fuels and creating a market for transport use of methane.

Regional trial: cities and towns show the way for sustainable transport, including sharing concepts, more attractive public transport and MaaS.

Logistics: making water transport in the Saimaa region a resource-efficient alternative to land transport.

Alternative forms of transport: self-driving robot buses on the streets of Finland as part of service-based transport and logistics (SOHJOA project).

5. Common action focus area

Goal: legislators, companies, universities and research institutes, consumers and citizens, and vibrant regions are all needed to achieve systemic change; communication and diverse interaction are particularly important when implementing joint action.

Key project: World Circular Economy Forum 2017 and Finland as a circular economy host country.

Policy action: public procurement should focus on purchasing new solutions and products that support the circular economy; an education and research policy that enables the circular economy; dismantling regulation barriers and creating incentives; changing the focus of taxation; guidelines and synergies with initiatives in other parts of administration; a digital and service-centred circular economy; circular economy indicators.

Pilots

Market creation and export: an economic steering toolbox for the circular economy; a circular economy networking platform; Finpro's, now part of Business Finland, growth programmes in the circular economy field; funding for new circular economy business models.

Increasing knowledge, market creation and export: circular economy consumer trials; establishing a centre of expertise for carbon-neutral circular economy in Finland.

Regional trial: planning and implementation of a zero-waste pilot in the city of Turku.

Short-term challenges

Finland has a real opportunity to create sustainable well-being and a successful carbon-neutral circular economy over the next five to ten years. It maximises the conservation of materials and their value in

circulation for as long as possible which, in turn, keeps the volume of emissions to a minimum. Rather than offering products, the foundation for earnings in a circular economy will be services and intelligence-based digital solutions. A proposition of how to make the transition to a circular economy is outlined in the Roadmap, though it also highlights the short-term challenges that will hinder the transition. These can be summarised as follows:

- the complexity and rebound effect of promoting systemic change, in which the savings obtained from improving the resource efficiency of individual parts can eventually lead to more production and material consumption;
- economic challenges because circular economy business may be unprofitable in the short term;
- imperfect markets, including a lack of the necessary products and infrastructure, competition, knowledge and/or incentives;
- imperfect regulation due to inadequate legislation and/or implementation;
- social factors including insufficient knowledge and skills related to the circular economy;
- as a result of the above, inadequate waste sorting, the difficulty in obtaining suitable financing, and a lack of harmonised procedures in different areas.

An official action plan[7] based on the Roadmap was published by the government at the end of 2017.

Finland became a global host nation for the circular economy in June 2017[8], when Sitra held the world's first international circular economy conference in Helsinki.

Overview of dedicated national or sectoral strategies for raw materials

Finland has several strategies for raw materials in place for both renewable and non-renewable natural resources. The strategies relate to Finland's list of priority materials:

- natural resources: water, forests, minerals and other natural products;
- energy carriers like fossil fuels, and renewable and indigenous energy sources;
- resources used in construction and the built environment;
- waste (prevention, recycling, reuse).

The composition of priority materials reflects Finland's raw materials-related strategies, such as the Programme to Promote Sustainable Consumption and Production (2005, updated in 2012), the original Natural Resources Strategy: Using Resources Intelligently (2009), the Mineral Strategy (2010), the Bioeconomy Strategy (2014), the National Forest Strategy 2025 (2015) or the recently updated version of the National Resource Strategy: Sustainable growth through material efficiency (2018). More details on the strategies follow.

Non-renewable natural resources

Finland's Mineral Strategy (2010) and its follow-up

Up to 60 per cent of critical raw materials, as specified by the EU, are either mined in or have known deposits in Finland. The vision of the Minerals Strategy[9] is that Finland will be a global leader in the sustainable utilisation of mineral resources and the minerals sector will be one of the key foundations of the Finnish national economy by 2050.

Strategic objectives:

- promoting domestic growth and prosperity;
- solutions for global mineral-chain challenges;
- mitigating environmental impact.

[7] http://www.ym.fi/en-US/The_environment/Circular_economy (English)
[8] www.wcef2017.com (English)
[9] http://projects.gtk.fi/export/sites/projects/minerals_strategy/documents/FinlandsMineralsStrategy_2.pdf (English)

Themes of proposals for action:

- strengthening minerals policy;
- securing the supply of raw materials;
- reducing the environmental impact of the minerals sector and increasing its productivity;
- strengthening research and development (R&D) capabilities and expertise.

Coordinated measures have been implemented on the basis of the overall objectives set out in the Mineral Strategy. The Strategy has been updated with an operational programme with 35 concrete proposals for action, including proposed changes on value added tax or national land-use targets.

The Minerals Strategy directly or indirectly fed into several further documents. These are the Government Report to Parliament on natural resources (2010)[10], the recognition of the minerals sector in the 2011 Governmental Programme, the New Mining Act (2010)[11], the action plan Making Finland a leader in the sustainable extractive industry (2013)[12], and the updated version of the 2010 report on natural resources (2014, Suomi kestävän luonnovaratalouden edelläkävijäksi 2050[13]), which supported the implementation of the 2013 Action plan for Finland's research strategy for mining[14] (2015, Suomen kaivannaisalan tutkimusstrategia).

An example of a voluntary instrument is the Finnish Network for Sustainable Mining[15], which brings together stakeholders affected by and involved in mining. The focus of activities is on voluntary action and self-regulation.

General information on Finland's minerals policy can be found on the website of the Ministry of Economic Affairs and Employment[16].

Renewable natural resources

Increasing the use of wood for various purposes has been set as the target of many strategies, including the National Forest Strategy 2025 and the Finnish Bioeconomy Strategy. Among the objectives of the Government Programme of Prime Minister Sipilä are the diversification and increase of the use of wood and raising its added value. One of the government's key projects is Wood on the Move and New Forest Products. By increasing the use of wood Finland aims to reduce the use of unrenewable natural resources, create new jobs and decrease the carbon footprint of various products.

The Finnish Bioeconomy Strategy (2014)[17]

Finland has set the course for a low-carbon and resource-efficient society and a sustainable economy. A key role in reaching this goal is played by a sustainable bioeconomy.

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[10] https://www.motiva.fi/files/4885/Valtioneuvoston_luonnonvaraselonteko_eduskunnalle_Alykas_ja_vastuullinen_luonnonvaratalous.pdf (Finnish)

[11] http://www.finlex.fi/fi/laki/alkup/2011/20110621?search%5Btype%5D=pika&search%5Bpika%5D=kaivoslaki (Finnish)

[12] https://tem.fi/documents/1410877/3437254/Making+Finland+a+leader+in+the+sustainable+extractive+industry+04072013.pdf (English)

[13] https://tem.fi/documents/1410877/2859687/Suomi+kestävän+luonnonvaratalouden+edellakävijäksi+2050+14112014.pdf (Finnish)

[14] http://julkaisut.valtioneuvosto.fi/bitstream/handle/10024/75027/TEMjul_27_2015_web_21042015.pdf?sequence=1&isAllowed=y (Finnish)

[15] http://www.kaivosvastuu.fi/ (Finnish)

[16] http://tem.fi/en/minerals-policy (English)

[17] http://www.bioeconomy.fi/facts-and-contacts/finnish-bioeconomy-strategy/ (English)

Bioeconomy refers to an economy that relies on renewable natural resources to produce food, energy, products and services. The bioeconomy will reduce Finland's dependence on fossil natural resources, prevent biodiversity loss and create new economic growth and jobs in line with the principles of sustainable development.

Thanks to Finland's plentiful renewable natural resources, high level of expertise and industrial strengths, the country is excellently placed to become a pioneer of the bioeconomy in the world. The principle idea of the Bioeconomy Strategy is that competitive and sustainable bioeconomy solutions for global problems will be created in Finland, and that new business will be generated in both the Finnish and international markets.

Another key aspect of the bioeconomy is not wasting natural resources but using and recycling them efficiently.
The strategic goals of the Bioeconomy Strategy are:

1. a competitive operating environment for the bioeconomy;
2. new business from the bioeconomy;
3. a strong bioeconomy competence base;
4. accessibility and sustainability of biomass.

Policies which include elements of material resource efficiency

Resource efficiency and more recently the circular economy are present in many policies, either directly or indirectly. Here we present selected examples of policies and initiatives that target resource efficiency or circular economy more prominently.

From Recycling to a Circular Economy – National Waste Plan to 2023

The new National Waste Management Plan[18] and Waste Prevention Programme, designed to support the circular economy, was adopted by the government at the end of 2017 and is in effect until 31 December 2023, or until such time as the next Waste Plan takes effect.

The Plan sets out the objectives for waste management and waste prevention and the measures to reach them. Detailed targets are set and measures presented for four key areas: construction and demolition waste, biodegradable waste, municipal waste, and waste electrical and electronic equipment (WEEE).

The National Waste Management Plan also describes the longer-term target situation (to 2030) of waste management, in which, by reducing the quantity and harmfulness of waste:

1. high-standard waste management is a part of the sustainable circular economy;
2. material-efficient production and consumption save natural resources and mitigate climate change;
3. waste quantities have decreased and reuse and recycling have risen to a new level;
4. the recycling market works well; reuse and recycling create new jobs;
5. valuable raw materials present at low levels are also recovered from recycled materials;
6. material cycles are innocuous, and less and less hazardous material is used in production;
7. there is research and experimentation of a high standard in the waste sector and competence in waste issues is at a high level.

The four key areas of the Waste Plan were selected because they present particular challenges in reducing the quantity and harmfulness of waste and in promoting recycling in the coming six years. Packaging waste is addressed as a part of municipal waste even though not all packaging waste is included in municipal

[18] http://www.ym.fi/en-US/The_environment/Waste/The_National_Waste_Plan (English)

waste. While all steps to improve waste management also prevent litter, specific litter prevention measures are also presented.

The targets and measures aim to control the rise in waste quantities and to boost recycling. A further aim is to ensure the safety of materials throughout the cycle. The Waste Plan includes the key means deemed most effective in preventing the generation of waste, and presents financial and administrative policy instruments, as well as a range of voluntary tools such as promotion of R&D, information and communications, and agreements and approaches for the business community.

Through the improved utilisation of waste and secondary flows as well as collaboration between different sectors, landfill will eventually become unnecessary. In fact, landfill of all recyclable waste will be banned from 2025 onwards. Today, a landfill ban exists for biodegradable waste (biowaste), plastic and rubber. The aim is to increase the supply of secondary raw materials; product, processing and service innovation; and circular economy business.

National Forest Strategy 2025 (2015)

The National Forest Strategy 2025 describes priority objectives and other detailed measures that will promote the achievement of the strategic objectives set out in the Government Report on Forest Policy. Thus, the Forest Strategy highlights priority areas for developing the sector and the most urgent needs for change on which the public sector must focus. Implementation of the strategy involves priority measures that have been compiled as a strategic project portfolio which aims to achieve even better conditions for increasing the benefits of forest-based business and activities and to ensure economic, social and ecological sustainability.

New Incentive Schemes and Resource-Efficient Forest Management[19] is an example of a project defined in the Forest Strategy that specifically addresses resource efficiency. The project will prepare a future incentive scheme for forest management that promotes active and resource-efficient forest use and welfare derived from non-market benefits. The timeline for implementation is 2016–2020 and the responsible parties consist of several ministries.

The Programme to Promote Sustainable Consumption and Production (2005) and its follow-up (2012)

Strategic work for sustainable consumption and production has been carried out in Finland since the committee on Sustainable Consumption and Production (SCP) was appointed in November 2003. The Programme to Promote Sustainable Consumption and Production, Getting More from Less, was among the first of its kind in the world when published in 2005. One of the actions undertaken under the programme involved the establishment of a material-efficiency centre in Finland. Based on the programme, the Finnish government passed a resolution on sustainable public procurement in 2009. One of the outcomes was also a tool to assess the environmental impacts of material flows caused by the Finnish economy (applying the environmentally extended input-output ENVIMAT-model)[20].

The revised programme, More from Less – Wisely (Finnish)[21], aims to reduce the environmental impacts and greenhouse gas emissions of households and the public sector. Launched in 2013, the Programme aims to give people new ways of reducing the environmental impact of their everyday lives, especially in three key areas: housing, food and transport. It proposes that the state and municipalities set an example by creating the preconditions for more sustainable solutions. This will also create new jobs in, and

[19] http://mmm.fi/documents/1410837/1504826/National+Forest+Strategy+2025/197e0aa4-2b6c-426c-b0d0-f8b0f277f332 (English)
[20] http://www.ym.fi/en-US/The_environment/Sustainable_consumption_and_production/Programme_to_Promote_Sustainable_Consump%2810503%29 (English)
[21] http://www.ym.fi/download/noname/%7B8B5DC698-70AE-4547-83E1-7F5D49F8F205%7D/30375 (Finnish)

opportunities for, the green economy. The programme aims to promote energy-smart and comfortable living, high-quality food without waste and smooth and environmentally friendly transport. To support the objectives of the programme, 13 trials testing eco-efficient solutions related to mobility, housing and food were launched in 2014–2016.

Decision-in-principle on the promotion of sustainable environmental and energy solutions (cleantech solutions) in public procurement (2013)

Finnish public procurement is a main area for enhancing the circular economy and resource efficiency. The goal of the government decision-in-principle on the promotion of environmental and energy solutions (cleantech solutions) in public procurement is to reduce energy and material consumption and adverse environmental impacts for the entire life cycle of products, services or buildings, as well as to create incentives for the creation and implementation of new cleantech solutions.

Solutions that are defined as cleantech are better and more effective for the duration of their life cycle in terms of their environmental impact than typical alternatives. This often means a reduction in costs over the entire life cycle.

The goal of the decision-in-principle is to promote the creation and implementation of cleantech solutions as first references. First references are new or essentially improved cleantech solutions. Cleantech solutions include, among others, those which improve material and energy efficiency and enhance processes, solutions and services which have less impact on the environment, and measurement and monitoring solutions. The applicability of cleantech solutions is always assessed on a case-specific basis in procurement.

The decision-in-principle requests the public sector to promote cleantech solutions, placing an emphasis on the creation and implementation of first references in all its procurements, but particularly in construction, the energy sector, transport and waste management. In order to achieve the goals laid out in the decision-in-principle and attain as much influence as possible, it is vital that the governmental and municipal sector adhere to its goals.

Motiva Ltd (see Examples of good practice and innovative approaches section) is developing tools and offering a consultancy service for sustainable public procurement. The service focuses on one-time purchases, for example in the areas of energy, waste and water management, transport and logistics. The aim of the service is to provide the public-sector client with the technologically and environmentally most advantageous solution and at the same time facilitate the planning of public procurement.

In all government procurement, the goal is a comprehensive solution, which promotes energy and environmental goals and utilises cleantech solutions in the most economically advantageous way. There are detailed targets for food and catering, vehicles and transports, construction, energy, services and energy related products.

Cleantech Finland[22], a hub of Finnish cleantech expertise and sustainable innovation, contains information on Finnish companies that do business in the sector.

Decision-in-principle on the basis for evaluating catering service procurements in the public sector (2016)[23]

The goal of the government decision-in-principle for catering-service procurement in the public sector is to require them to strive for high quality and overall economic sustainability. Purchasers should demand

[22] http://www.cleantechfinland.com/ (English)

[23] http://mmm.fi/documents/1410837/1880296/periaatep%C3%A4%C3%A4t%C3%B6s+julkisista+ruokahankinnoista_su.pdf/7115f133-a4d9-4e2d-a729-2486f76df2c (Finnish)

foodstuffs that have been produced using environmentally friendly methods that also promote animal welfare and food safety. This relates to the government decision-in-principle on the promotion cleantech solutions in public procurement, as well as to the Programme to Promote Sustainable Consumption and Production (2005). Public sector procurement personnel find guidance supporting the food procurement policy in Motiva's Guide for Responsible Procurement of Food.

Towards sustainable choices – A nationally and globally sustainable Finland (2006) and The Finland we want by 2050 – Society's Commitment to Sustainable Development (2015)[24].

Finland's National Strategy for Sustainable Development from 2006, Towards sustainable choices – A nationally and globally sustainable Finland, includes the national concept of Society's Commitment to Sustainability. It was updated in 2013 by a strategy called The Finland we want by 2050 – Society's Commitment to Sustainable Development. This is one of the tools that Finland uses to reach the United Nations Sustainable Development Goals (SDGs) targets (see also paragraph on Resource efficiency, circular economy and the 2030 Sustainable Development Goals).

Government Report on the implementation of the 2030 Agenda for Sustainable Development (11/2017)[25]

In addition to the above-mentioned strategies, Finland has a national action plan on how to reach the SDG targets with specific focus areas. One of the areas is a carbon-neutral and resource-wise Finland.

Institutional setup and stakeholder engagement

In Finland there is a long tradition of involving different stakeholders in the drafting of laws and strategies. This reflects a wider consensus-seeking culture. Resource efficiency and circular economy are an integral part of the official government policy under the theme of bioeconomy and clean solutions.

The material and resource efficiency policies are mainly addressed by the ministries of Environment, of Employment and the Economy, of Transport and Communications, of Agriculture and Forestry, and of Finance.

In addition, there is a group of governmental organisations such as Sitra – the Finnish Innovation Fund, a public fund reporting directly to Finnish Parliament – implementing material efficiency policy among other topics. Sitra's tasks, which are defined by law, include a strong focus on sustainable development. Sitra has adopted a project-based organisational model that currently focuses on three themes: resource-wise and carbon-neutral society, capacity for renewal and new working life and sustainable economy.

In addition, a number of different funding organisations – such as Business Finland and governmental agencies which administer, for example, the European Regional Development Fund (ERDF) – are promoting material resource efficiency policies. The themes and programmes of these organisations are closely linked to the general resource efficiency agenda.

Motiva Ltd[26], a state-owned company, promotes material and energy efficiency on a national level. Motiva produces expert services in order to promote efficient energy and material use in Finland. The company's services are utilised by public administration, businesses, communities and consumers.

[24] http://www.ym.fi/en-US/The_environment/Sustainable_development (English)
http://www.ym.fi/download/noname/%7B5D1F24EE-27D0-4E07-BAFE-AFCCAF451E8A%7D/97824 (Finnish)
[25] http://julkaisut.valtioneuvosto.fi/handle/10024/79455 (English)
[26] http://vnk.fi/documents/10616/4610410/Toimintasuunnitelma+H_5_2017+280417.pdf (Finnish)

Circular Economy Roadmap[27]

The process of drafting the Roadmap (see also section on Dedicated national strategies or roadmaps for material resource efficiency and a circular economy) was facilitated by Sitra together with several ministries, the private sector and third (voluntary) sector. It was a multi-stakeholder process utilising three workshops, public online inquiry and parliamentary consultations. Following publication of the Roadmap itself, an official action programme based on the Roadmap was published in December 2017.

In line with the Strategic Programme, The Finnish Innovation Fund (Sitra) compiled the world's first roadmap to a circular economy, Leading the cycle – Finnish roadmap to a circular economy 2016-2025[28]**.** It was drafted under the direction of Sitra in cooperation with the Ministry of the Environment, Ministry of Agriculture and Forestry, Ministry of Economic Affairs and Employment, the business sector and other key stakeholders. The process of drafting the roadmap, which was very extensive and involved around 1,000 participants in multiple stakeholder events, came up with 250 ideas for action and 60 initiatives. It took only four months to create.

CIRCWASTE[29]

In CIRCWASTE, a seven-year LIFE IP project (started in 2016) with a total budget of more than EUR 18 million (see also section Resource efficiency and circular economy policy initiatives from subnational to local level), relevant regional stakeholders will form cooperative groups that work to implement the national Waste Management Plan at a regional level. The groups will create roadmaps that set the goals and activities necessary to decrease waste volumes, improve material efficiency and utilise industrial by-products, etc. To support the regional activities, an expert network on circular economy will be formed by the Finnish Environment Institute and Motiva Ltd. CIRCWASTE is made up of 20 partners and 10 funding organisations.

Material efficiency in the field of real estate and construction

In 2012, the Ministry of the Environment appointed a working group[30] to highlight the perspective of material efficiency in the field of real estate and construction and create a framework for realising the objectives outlined in the EU Waste Framework Directive (WFD). The group consisted of representatives of the Ministry of Environment, the Finnish Association of Building Owners and Construction Clients (RAKLI); the Helsinki Region Environmental Services Authority HSY (HSY); Motiva; the Centre for Economic Development Model of sustainable green economy for sparsely populated distributed rural regions, Transport and the Environment; the Confederation of Finnish Construction Industries RT (CFCI); the Finnish Real Estate Federation; the Association of Finnish Local and Regional Authorities; the Finnish Association for Nature Conservation (FANC); the Finnish Homeowners' Association; the Finnish Environment Institute (SYKE)' the Ministry of Economic Affairs and Employment; and the Technical Research Centre of Finland (VTT).

The target year for implementing the measures envisaged in the programme is 2020, and progress is being monitored annually. The working group suggested the following measures:

- life-cycle flexibility and material efficiency of new construction should be improved;
- systematic property maintenance, economical renovation and the recycling of construction waste in renovation should be promoted;
- material efficiency expertise of the real estate and construction sector should be improved;
- waste management guidance, reporting and statistics on construction projects should be developed;

[27] https://www.sitra.fi/en/articles/leading-cycle-finnish-road-map-circular-economy-2016-2025/ (English)
[28] https://media.sitra.fi/2017/02/28142644/Selvityksia121.pdf (English)
[29] http://www.materiaalitkiertoon.fi/en-US (English)
[30] http://www.ym.fi/fi-FI/Ymparisto/Jatteet/Rakennusjatteesta_arvokkaaksi_resurssiks%2829942%29 (Finnish)

- regional availability of construction waste management and utilisation services should be ensured;
- the prerequisites for reuse and recycling of construction materials, especially wood, should be improved;
- technology related to the sorting and recycling of construction materials and waste should be promoted.

Model on sustainable green economy for sparsely populated distributed rural regions

More information about the project can be found under the section on Indicators to monitor progress towards a resource-efficient circular economy. The aim of the project was to define and develop indicators to evaluate the initial potential of a local area and its resources. The project was also about the total process for developing and choosing the correct and most suitable indicators for the local area in question. Expertise is required to develop an indicator, to collect data and to monitor progress. Experts are needed in this development process due to a potential risk that stakeholders with specific interests may dominate development processes, not necessarily contributing to the public good by utilising ecosystem services in unsustainable ways in the name of bio- or circular economy.

The indicator development process was complemented at local meetings with residents as indicator development is no longer just a technical issue and cannot be left only to experts. The importance of local participation in sustainability-indicator development has been highlighted in several studies. Workshop meetings were organised in different local villages of Lapland North-East Finland during summer and autumn 2015, where the vision (goal) for the year 2020 was defined in addition to analysis of the current state. These helped in defining the most suitable goals and indicators to be developed.

Forum for Environmental Information

Boundary organisations aiming to increase interaction between stakeholders can create useful platforms for participation, engagement and communication for different actors working with resource efficiency and circular economy. The Forum for Environmental Information (FEI) is a Finnish boundary organisation working in the field of environmental policy and science.

The objective of the FEI is to advance the transfer of timely environmental information to support national policymaking and to establish fruitful communication and discussion among environmental researchers, officials, politicians and other information end users. The FEI's main forms of action are seminars, workshops and smaller discussion groups where different stakeholders can meet and share views. The FEI also publishes policy briefs that summarise and synthesise the most recent environmental research. At FEI events representatives from all stakeholder groups are invited to present their activities and views, and dialogue is strongly encouraged. The principle at all events is to combine forces rather than to divide them by organising several small, concurrent events. In the field of resource efficiency and circular economy, the FEI has organised several seminars and published synthesis papers, for example on circular economy possibilities in food supply chains in a local context, on resource efficiency and key indicators and on water use in a circular economy.

To be able to transfer information efficiently and to increase dialogue it is important that boundary organisations are seen as neutral actors. The FEI is currently funded by two Finnish foundations, Kone Foundation and Maj and Tor Nessling Foundation. Members of the steering committee are the two foundations, the Helsinki and Turku Universities, Ministry of Environment, Finnish Environment Institute and the Association of Finnish Local and Regional Authorities.

Approaches to resource efficiency and circular economy policy evaluation

In recent years, the Finnish government has commissioned several research projects to assess the politics and potential of a circular economy, including Circular economy in Finland – operational environment, policy instruments and modelled impacts by 2030, Bioeconomy and cleantech in Finland – Assessment of

Strategies and development suggestions, Targeted methods for increasing recycling, and Economic Instruments of Circular Economy. The Finnish Prime Minister's Office has commissioned research projects to evaluate the effectiveness of different national strategies, such as the material efficiency programme, the biomass strategy or the cleantech strategy. An example of such a project is the Evaluation and development proposals of the National Material Efficiency Programme[31].

In 2013, the national material efficiency programme proposed eight measures with 40 different projects to promote material efficiency[32]. Only half of the studied projects focused directly on material efficiency. The projects impacted material efficiency either well or very well. It must be noted that the other projects in the programme have also been good projects in their own target areas and many of the evaluated projects had an indirect impact on material efficiency, such as through resource wisdom and the promotion of circular economy.

The implementation of the 2013 Programme was reviewed in 2017[33], evaluating how material efficiency should in future be promoted as part of a circular economy. The results clarified the priorities for national material efficiency work and the measures that best respond to the EU Circular Economy Package and the UN Agenda 2030 Sustainable Development Goals (SDGs). It became apparent that there was a need to renew the Programme to bring its measures up to date. It was stated in the review (by Ramboll Ltd) that the actual quality of the projects was good, but that only half of them had a significant impact on resource efficiency. The rest had small or no impacts.

Monitoring and targets

Targets for resource efficiency and circular economy

The new National Waste Plan presents four targets related to resource efficiency.

- Target 3: Raising the recovery rate of construction and demolition waste to 70 per cent.
- Target 6: Halving food waste and food loss by 2030.
- Target 7: Recycling 60 per cent of the biowaste included in all municipal waste generated.
- Target 10: Recycling 55 per cent of municipal waste.

Indicators to monitor progress towards a resource-efficient circular economy

Statistics

Finland collects economy-wide material flow accounts which describe in units of mass (tonnes) the volume of materials extracted, transferred or transformed from nature. This volume of materials and its ratio to other National Accounts aggregates describes the material dependency of the national economy and the pressures economic activities impose on the environment. The main interest lies in the development of the ratio between GDP and the volume of materials required to generate it. Economy-wide material flow accounts sum the flows of used materials, such as stone, oil and wood. However, due to the summing, the total figures of the material flow accounts do not describe directly the weight and nature of the environmental burden caused by economic transactions.

In 2016, 317 million tonnes of materials were extracted from the soil and vegetation of Finland, which is 34 million tonnes more than in 2015. The growth in the material flow was based on the increased

[31] http://julkaisut.valtioneuvosto.fi/bitstream/handle/10024/80698/64_Kansallisen%20materiaalitehokkuusohjelman%20arviointi.pdf (Finnish)

[32] http://tietokayttoon.fi/hankkeet/hanke-esittely/-/asset_publisher/kansallisen-materiaalitehokkuusohjelman-arviointi-ja-kehitysehdotukset (Finnish)

[33] http://tietokayttoon.fi/documents/10616/3866814/64_Kansallisen+materiaalitehokkuusohjelman+arviointi.pdf/9416e1e8-3afa-417c-ba47-468fb55a0707?version=1.0 (Finnish)

excavation volume in mining and quarrying and growth in unused extraction. The use of domestic direct inputs remained almost at the same level as in 2015. In addition, some 57 million tonnes of products and raw materials were imported to Finland in 2016, which generated an estimated 211 million tonnes of hidden flows for the production countries. All in all, the Finnish total material requirement was 585 million tonnes in 2016, which was 8.5 per cent more than in the previous year.

The 2013 National Material Efficiency Programme recognised that monitoring material efficiency is challenging and must therefore be further developed. The Programme does not set specific indicators to be followed. Thus, although compiled, indicators based on material flow accounting, such as DMC and raw material consumption (RMC) are not currently used for monitoring policy implementation in Finland. However, the Programme states that RMC is a better indicator because it takes the indirect consumption of materials into account, thus measuring the global impacts of resource use and the impacts of domestic consumption more effectively than DMC. However, as with DMC, RMC fails to take into account water use and the unused extraction of natural resources (hidden import flows).

Finnish material use and efficiency trends for 2008–2030[34] have been calculated with various indicators in a pre-study for the National Material Efficiency Programme by the Finnish Environment Institute and Thule Institute. The trend for Finnish resource productivity (material productivity) has been estimated using DMC and RMC.

The National Waste Plan requires the elaboration of a monitoring programme for the assessment of its implementation and impact. The waste prevention indicators used are:

- generation of municipal waste (tonnes/year);
- construction waste sent to landfill/volume of the construction business (tonnes/EUR);
- amount of municipal waste/consumption of households (kg/EUR);
- municipal waste volume development relative to GDP development;
- electronic and electrical equipment reuse volume (tonnes/year).

Findicator (Findikaattori)[35] is a service provided by the Prime Minister's Office and Statistics Finland that includes approximately 100 indicators for social progress. Each indicator provides information in the form of statistical graphics, tables and analyses. It collects up-to-date information, including indicators related to environment and natural resources, such as total consumption of natural resources (Indicator 88). The total consumption of natural resources is expressed as total material requirement (TMR) calculated by using the economy-wide material flow accounts. It is the sum of domestic and foreign direct inputs and hidden flows. Direct inputs represent the actual volume of material entering the Finnish economy and, together with domestic hidden flows, the material volume behind the burden on the domestic environment. The total material requirement of our economy is obtained by adding to this the hidden flows of imports, i.e. the global ecological environmental burden of our economy.

The Key indicators of green growth, resource and material efficiency project (ViReAvain) has proposed indicators on national, regional and company levels. In total, 19 indicators have been proposed. The project has been supervised by the Ministry of Environment, the Ministry of Economic Affairs and Employment and the Ministry of Agriculture and Forestry.

Key indicators are categorised under three themes which describe the core questions of green growth:

- low-carbon and resource-efficient society: sustainable energy economy and material efficiency;
- ecosystem services: sustainable use of natural services and environmental quality;
- economic opportunities and policy instruments: economic opportunities based on a low-carbon and resource-efficient society, and measures and policy instruments that promote them.

[34] http://www.stat.fi/til/kanma/index_en.html (English)
[35] https://findikaattori.fi/en/88 (English)

Key indicators recommended in the ViReAvain project to measure the progress of green growth and material and resource efficiency have been categorised grouped under three themes that describe various goals, and further categorised into nine goals and 19 key indicators. One of the three key indicators to measure the resource efficiency goal is RMC, which can be calculated on the national, regional (county/municipal) or sectoral/company level. However, it is not calculated on a regular basis, though various research projects have done calculations and time series on the development of the indicator. The calculations are mainly based on the Finnish environmentally extended input-output model (ENVIMAT).

The Prime Minister's Office is monitoring progress towards the SDG targets with such indicators as greenhouse gas emissions, forest stock, the share of renewable energy in final consumption, funding for resource efficiency and carbon-neutral research, and RMC.

Examples of local-level indicators

Fifteen local-level indicators are currently being developed and tested in Finnish Lapland. The aim of this project, the Model of sustainable green economy for sparsely populated distributed rural regions, was to create indicators for measuring the implementation potential and effectiveness of the green economy transition process at the local level in Lapland. These indicators work as part of a decentralised and competitive green economy approach. Green economy indicators showed that fossil energy demand needed to be cut as soon as possible by producing self-sufficient green energy, bringing economic growth and creating possibilities for cascading work towards the production of more high-added-value products. Local raw materials for energy production are obtained from the existing production side streams of forestry (woodchips, tree stumps, twigs etc.) and agriculture (manure) and are the source of most of the renewable resources and biomass for potential energy production. Further indicator development needs include connecting energy system indicators with food system and ecotourism indicators as a network of symbiotic indicators for circular economy thinking.

Examples of indicators[36] that relate to the circular economy include utilisation of side-stream volumes, sustainable utilisation of the total raw material base and renewable energy production potential.

Member cities and municipalities in the FISU Network intend to make all activities in their region carbon neutral and waste free while bringing their use of natural resources within the Earth's carrying capacity by 2050 at the latest. Four indicators[37] are used on a regular basis to evaluate the region's steps towards resource wisdom:
1) carbon footprint;
2) ecological footprint;
3) material loss; and
4) the perceived well-being of city residents.

The FISU Network service centre provides expert assistance to municipalities in calculating these indicators.

Resource efficiency, circular economy and the 2030 Sustainable Development Goals

Carbon neutrality, the wise use of resources and the circular economy are at the heart of Finnish national efforts to follow a sustainable path. Finland is committed to implementing the global 2030 Agenda as a whole, while focusing on a few issues that are critical for Finland. To become carbon neutral and resource wise by 2030, Finland is investing strongly in the bioeconomy, the circular economy and clean solutions,

[36] http://jukuri.luke.fi/handle/10024/541451 (Finnish)
[37] http://www.fisunetwork.fi/fi-FI (Finnish)

producing and exporting climate-friendly products, services and innovations, and building low-emission sectors and business models.

The following strategies are examples of national initiatives targeting the SDGs, partially through resource efficiency and circular economy.

Towards sustainable choices - A nationally and globally sustainable Finland (2006) and The Finland we want by 2050 – Society's Commitment to Sustainable Development (2015)[38]

Finland's national strategy for sustainable development from 2006, Towards sustainable choices – A nationally and globally sustainable Finland, includes a national concept of Society's Commitment to Sustainability. Updated in 2013 with the strategy The Finland we want by 2050 – Society's Commitment to Sustainable Development, it represents one of the tools that Finland uses to reach the SDG targets.

Through the Commitment, the government and administration, in collaboration with various actors and stakeholders, pledge to promote sustainable development in all their work and operations. The Commitment includes eight objectives that aim to make the vision on sustainable Finland 2050 a reality. One of the objectives is a resource-wise economy. Specific commitments aim at improving resource efficiency, as well as creating business models that boost the productivity of natural resources.

Commitments are a promising way of boosting voluntary initiatives and efforts to make concrete improvements in resource efficiency. To gain more impact there is a need for efficient coordination, peer support, clustering of similar commitments in order to catalyse benchmarking, and incentives that motivate ambitious change.

Government Report on the implementation of the 2030 Agenda for Sustainable Development (11/2017)

In addition to the above-mentioned strategies, Finland has a national action plan[39] on how to reach SDG targets with specific focus areas. One of the areas is a carbon-neutral and resource-wise Finland. To achieve this by 2030, Finland must take determined and ambitious steps to increase energy, resource and material efficiency, sustainably increase the share of energy from renewable sources, produce and export climate-friendly products, services and innovations, and build low-emission sectors and business models. The key actions, while not exclusively related to resource efficiency, are:

1) launch implementation of the energy and climate strategy;
2) prepare and implement a plan for medium-term climate policy;
3) create sustainable bioeconomy and cleantech solutions;
4) follow the Circular Economy Roadmap alongside implementing organisations;
5) accelerate public procurement in central and local government;
6) support sustainable innovations;
7) enforce the Transport Code to enable more sustainable and flexible transport;
8) prepare and implement a national programme for sustainable urban development;
9) promote carbon-neutrality and wise use of resources globally.

To accelerate the transition to a circular economy, Finland has prepared the national Circular Economy Roadmap. Businesses, government, research organisations and local authorities are together seeking growth, export possibilities and environmental benefits from circular economy solutions. The Roadmap involves measures the government should take in creating an encouraging business environment for circular economy investment, including streamlined regulation and creating new incentives and direct R&D financing. Most importantly, the Roadmap directs public procurement, which represents almost 20 per cent of GDP, to help new circular economy solutions and business models enter the market.

[38] http://www.ym.fi/en-US/The_environment/Sustainable_development (English) and http://www.ym.fi/download/noname/%7B5D1F24EE-27D0-4E07-BAFE-AFCCAF451E8A%7D/97824 (English)
[39] http://julkaisut.valtioneuvosto.fi/handle/10024/79455 (English)

Examples of innovative approaches and good practice

Examples of good practice and innovative approaches

Below, some of the best practices, on both organisational and national levels, are listed.

Finnish Innovation Fund – Sitra[40]

Sitra is an independent public foundation operating directly under the supervision of the Finnish parliament. Sitra's decision-making processes are tied to parliamentary systems. Its administration includes a supervisory board, board and president. Administration and accounts are audited by accountants appointed by parliament.

Sitra is a future-oriented organisation that promotes Finland's competitiveness and the well-being of the Finnish people. It anticipates societal change, tries out new operating models and accelerates business activities aimed at creating sustainable well-being. The Finnish circular economy roadmap, Leading the cycle – Finnish Roadmap to a Circular Economy 2016–2025, was drafted under the direction of Sitra in cooperation with several ministries, the business sector and other key stakeholders. In 2017 Sitra organised the World Circular Economy Forum 2017 in Helsinki. In conjunction with the 2018 World Economic Forum in Davos, Switzerland, Sitra received The Award for Circular Economy in the Public Sector for playing a key role in accelerating the circular economy and leading the development of the ground-breaking *Finnish Roadmap to a Circular Economy 2016–2025*, which incorporated circular economy education across 1,500 elementary schools and 50 high schools.

Sitra has an important role in bringing all circular economy players together to work towards common goals, steering the implementation of the Finnish Roadmap, and tackling education and consumer behaviour as a new focus area. Sitra provides funds for surveys, forward-thinking activities, experiments, and shared strategy processes that promote well-being and are ecologically and socially sustainable. Project funding must be related to Sitra's themes or key (focus) areas. Material resource efficiency is especially represented under the theme of a Resource-Wise and Carbon-Neutral Society, which aims to create the conditions necessary for the advancement of the theme itself as well as encouraging businesses that promote it. The Circular Economy focus area was defined in 2016 as a two-year project, but recently got an extension to 2019.

One of the recent activities of Sitra that targets resource efficiency is *impact investing*, which helps promote well-being in a resource-wise way. It is a means of channelling private equity to projects whose aim is to achieve positive, measurable social or environmental benefits.

All of Sitra's operating activities are funded by the return on its endowment capital, valued in its 2015 Annual Report at EUR 771 million, and corporate investment. According to Sitra's Annual Reports 2014 and 2016, the total cost of the Resource-Wise and Carbon-Neutral Society project was EUR 1.9 million in 2014, EUR 3.3 million in 2015 and EUR 2.3 million in 2016.

World Circular Economy Forum[41]

Sitra, together with 12 international and national partners, hosted the first World Circular Economy Forum (WCEF) in June 2017 at the Finlandia Hall, Helsinki. The forum brought together 1,600 key decision makers, top experts, entrepreneurs and financiers from more than 90 countries to share their circular economy

[40] http://www.sitra.fi/en (English)
https://markets.ft.com/data/announce/detail?dockey=600-201801221729BIZWIRE_USPRX____BW5047-1 (English)
https://www.sitra.fi/en/topics/impact-investing/ (English)
[41] http://www.wcef2017.com/ (English)

solutions and find common visions for the global transition to a circular economy. The Forum played a major role in stimulating public interest in the circular economy and the challenges and possibilities it offers.

The world is in serious need of solutions to create sustainable growth and jobs. The WCEF 2017 presented the world's best circular economy solutions in which business and the environment go hand in hand. The Forum also highlighted how the circular economy plays an important role in achieving the SDGs. At the WCEF 2017, Finland shared its own inspirational story on how to turn the vision of the circular economy into reality and deliver concrete benefits across all sectors of business and society. As a result, Finnish society is much more aware of the concept of the circular economy and many new activities have since been launched. Regional councils are preparing regional circular economy roadmaps, different grassroots movements are popping up and companies are talking about new business models. A growing trend around circular economy has become visible.

Back-to-back with the Forum, UN Environment held its 20th International Resource Panel meeting in Helsinki. The UN was represented by high-level representatives, as key speakers in the forum included, amongst others, Achim Steiner, Administrator of the United Nations Development Programme, Janez Potocnik, Co-chair of UN Environment's International Resources Panel and Ibrahim Thiaw, Deputy Executive Director of UN Environment and Assistant Secretary-General of the United Nations. Ministers from Nordic countries, the Russian Federation and Japan also attended and contributed.

Prior to the WCEF in 2017, no global forum on circular economy existed, with most activity taking place at the EU or national levels. After the successful first event, the WCEF established itself as a global platform for discussion on the issue of circular economy and sustainable use of resources.

The Forum serves as an important instrument for setting up networks and strengthening stakeholder partnerships at a global level. Bringing stakeholders together in discussions on how the circular economy can help to reach the SDGs is at the core of the platform. The main organisers were Sitra, the Nordic Council of Ministers and the Finnish ministries of the Environment and Economic Affairs and Employment. Co-organisers included UN Environment, the European Commission, the World Resources Forum, the World Business Council for Sustainable Development, the EEA, the International Institute for Sustainable Development and the Koli Forum Association.

In 2018 the WCEF was co-hosted by the Ministry of the Environment of Japan and Sitra in Yokohama, Japan; in 2019, it will be held again in Helsinki.

Motiva[42]

Motiva Ltd, a state-owned company, promotes material and energy efficiency on a national level. Motiva provides expert services to promote efficient energy and material use in Finland. The company's services are utilised by public administration, businesses, communities and consumers. The Material Efficiency Centre**,** established at Motiva in spring 2008, aims to be a well-known and independent national coordinator, information source and networker in the field of material efficiency. The Centre initiates and coordinates interactive networks of material-efficiency professionals and acts as a data and knowledge centre. Motiva promotes material efficiency by emphasising the importance of pro-activity and early adaptation. The best results in material efficiency are achieved by early intervention in planning and by promoting ecodesign. In an optimal situation, the whole value chain benefits from life-cycle considerations in product development.

Motiva's key services include material efficiency audit tools for companies and help for environmental technology procurement. The audits are supposed to help companies clarify the flows of materials and to recognise possibilities for greater efficiency with the help of a model developed by Motiva. The procedure

[42] http://www.motiva.fi/en/ (English)

was developed collaboratively by Motiva, the target companies and audit consultants. This development work was carried out in connection with the first pilot audits made in five medium-sized companies, which identified a significant number of concrete measures for improvement. The companies started carrying out the measures as soon as the results of the audits were clarified. The savings potential of the measures was EUR 0.3–1 million per company, of which 20–50 per cent is realised during the first year of implementation. A systematic analysis of the material flows of the process will bring together the savings measures related to various activities and material flows, as well as enabling the discovery of wholly new savings targets. The Finnish government is offering economic incentives for material audits of companies.

Motiva coordinates the FISS[43]. At the moment, 15 regional facilitators in different parts of Finland help companies and other organisations to create partnerships and new business opportunities through more efficient use of raw materials, technology, services and energy. The FISS is based on collecting resource information, matchmaking and active facilitation.

Motiva also acts as a focal point for sustainable and innovative public procurement[44], giving advice and consultancy services to public procurers around sustainable and clean-tech procurements, and covering all stages of the procurement process. The objective of the service is to provide product-group-specific procurement guidance and advice according to the knowledge base and ambition level of the procuring entity.

The Finnish Funding Agency for Innovation – Tekes (from January 2018 a part of Business Finland)

Tekes is the most important publicly funded expert organisation for financing research, development and innovation in Finland, and works with the country's top innovative companies and research units. Every year, Tekes finances some 1,500 business R&D projects, and almost 600 public research projects at universities, research institutes and universities of applied sciences. Research, development and innovation funding is targeted at projects that in the long-term provide the greatest benefit for the economy and society. Tekes does not derive any financial profit from its activities, nor claim any intellectual property rights.

Tekes has had several funding programmes aimed at better material resource efficiency:

- *BEAM – Business with impact 2015–2019*[45]
  The joint programme of Tekes and Ministry for Foreign Affairs of Finland. Its aim is sustainable growth for Finland and the developing world.
- *Smart & Green Growth – clean transition to the bioeconomy*
- The vision of Smart & Green Growth is to create internationally attractive R&D environments and business ecosystems in the Finnish bioeconomy and clean solution sectors.
- *Mobility as a Servic*[46] – in cooperation with Ministry of Transport and Communications and other partners.

Tekes will receive additional investment of EUR 70 million from the Finnish government to boost companies' product development, renewal, high-level research and research effectiveness for 2018 and 2019. The funding will be directed at joint projects of companies, research institutes and central government to boost growth. A fair share of the additional funds will go to strengthen circular economy innovations and ecosystems in the Smart & Green Growth programme package.

[43] http://www.industrialsymbiosis.fi/ (English)
[44] http://www.motivanhankintapalvelu.fi/in_english (English)
[45] https://www.businessfinland.fi/en/for-finnish-customers/services/programs/business-with-impact-beam/
[46] https://www.liikennevirasto.fi/web/en/transport-system/maas

Change in consumption patterns and consumer behaviour[47]

Under the **Programme to Promote Sustainable Consumption and Production** (see section Policies which include elements of material resource efficiency), several tools and pilot projects have been developed to promote sustainable consumption in everyday life. A few examples follow.

- The *Peloton Club* is a centre for energy-smart start-ups. The idea is to help start-ups create solutions for the world's biggest challenges, such as energy and resource scarcity.
- The *Ekokoti – ecological solutions to everyday life* project provided tools (auditing, application and a trainer) for households to estimate their environmental impact and make choosing sustainable services and products easier.
- The *Save the Food* project undertook a pilot scheme to establish the feasibility of sharing left-over food and groceries between the inhabitants of a housing cooperative. In addition, an internet portal was created providing information on where to buy sustainable grocery bags.
- *Sustainable Everyday Life* – Sitra's resource-wise citizen focus area promotes the change towards a more sustainable life in two ways: by inspiring Finns to make sustainable choices in their everyday life and by helping companies develop competitive sustainable products and services.
- *Experimental Finland* (see below).

Experimental Finland[48]

The Prime Minister's Office houses a service with a responsibility to provide information and tools for those engaged in experimenting, to create related networks, and to improve awareness of the experimental culture among various sectors and potential participants across Finland. The service brings together Finland's best people and best stories, sharing messages of related success stories and stumbling blocks. The service also supports experiments that promote the government's strategic objectives by removing existing obstacles and improving the chances of success.

The Experimental Finland (Kokeileva Suomi) platform organised a call for pilot projects on the circular economy: small-scale pilots on how we live, eat and move about. The pilot experiments will contribute to the work on a National Circular Economy Roadmap. Examples of the expected pilots include extending the useful life of products, joint use of goods and other resources, and reuse of goods and materials.

Finnish efforts to develop an experimental culture have already attracted international interest, for example in the World Government Summit in Dubai. What is unique about the Finnish model is that a change of culture is a political goal in its own right and that grassroots experiments are promoted together with policy measure experiments.

The project was launched shortly after the new government took office in 2015. The first steps, a workshop and meetings, took place during the summer 2015, and a first version of the web pages was published in autumn 2015. Early in 2016, the first employees started work on the project.

The call for Pilot projects on the circular economy: small-scale pilots on how we live, eat and move about, was set up to test as least three things.

1. Whether it is possible for an upper-level public sector actor, such as the Prime Minister's Office, to finance societally relevant experimentation in a flexible way.
2. What such an actor can learn from close interaction with small-scale experiments taking place at the grassroots level. Can it yield new types of understandings about challenges faced by the

[47] http://www.syke.fi/hankkeet/ekokoti (Finnish)
http://www.saasyoda.fi/ (Finnish)
https://www.sitra.fi/en/topics/sustainable-everyday-life/ (English)
http://kokeilevasuomi.fi/ (Finnish)
[48] http://kokeilevasuomi.fi/contact-us (English)

pioneers? Can this way of working help promote a strategically relevant field such as circular economy in a new way?

3. How a platform such as Kokeilunpaikka.fi can facilitate the financing and support processes of various types of experiments.

As a result of the call, 21 small-scale experiments were kick started and received finance of EUR 2,000–5,000 per experiment in autumn 2017[49]. Many interesting grassroots solutions were tested, including the use of less aesthetic bananas in ice cream production, the sharing services of municipally owned cars, and the use of stylist services to support change towards more sustainable fashion. The call provided an interesting opportunity, particularly for small start-ups and municipal-level actors. For those conducting the experiments, key benefits of the process were the encouragement to take action and interact with stakeholders and customers, reciprocal learning among those experimenting, gaining access to local and even national media, and cultural change that emphasised happy trial and error rather than meticulous planning and strict implementation.

Sustainable and Innovative Public Procurement

In Finland, there is a national focus on public procurement in the fields of clean technology, resource efficiency, the bio- and circular economies. The value of public procurement in Finland is more than EUR 30 billion annually (16–17 per cent of GDP). The authorities in charge of sustainable and innovative public procurement policies include Ministries of the Environment, of Economic Affairs and Employment and of Finance. A government decision-in-principle on the promotion of sustainable environmental and energy solutions (cleantech solutions) in public procurement was published on 13 June 2013 (see also the section on Policies which include elements of material resource efficiency), which states that in all government procurements, the goal is a comprehensive solution that promotes energy and environmental goals and utilises cleantech solutions in the most economically advantageous way. Although there is no explicit reference to the circular economy in the document, specific attention is paid to sectors such as food and catering, vehicles and transport, construction, energy, services and energy-related products.

Under the Action Plan for a Circular Economy, the Ministries of the Environment, of Economic Affairs and Employment and of Agriculture and Forestry established an extensive network-based Competence Centre for Sustainable and Innovative Public Procurement (KEINO)[50] in March 2018. KEINO offers a wide variety of services free of charge to its customers and stakeholders from municipalities to cities and counties, as well as the governmental procurement units. The Competence Centre will establish buyer groups to facilitate peer learning and knowledge transfer as well as mutual goal settings and even buying strategies in the fields of health care and social services, construction and energy, transport and logistics and the bio- and circular economies.

Act on Transport Services (2017)

A long-term aim pursued in transport policy is a change that would turn mobility into a service (MaaS)[51] along the lines of the communications service sector. Finland is a pioneer in mobility-as-a-service thinking. Mobility will to a greater extent become a service in which physical mobility and digital services merge into a high-quality door-to-door service that meets users' needs. Such a service should not only be cost-effective for consumers, but also more resource efficient.

[49] http://kokeilevasuomi.fi/en/frontpage (English) and http://kokeilevasuomi.fi/en/article/-/asset_publisher/10616/kiertotalouden-kokeiluhaku-avautuu-pienkokeiluja-asumisesta-ruuasta-ja-liikkumisesta (English)

[50] http://www.ym.fi/en-US/The_environment/Circular_economy (English) and http://www.procurementcompetence.fi/ (English)

[51] https://www.lvm.fi/mobility-as-a-service (English)

The Act on Transport Services is addressing mobility as a service and will bring together legislation on transport markets and create preconditions for digitalisation and new business models in transport. Most parts of the Act will enter into force on 1 July 2018. Its key aim is provision of customer-oriented transport services. The Act will significantly enhance the implementation of new technologies, digitalisation and new business concepts, will enable seamless, multimodal travel chains, and will promote fairness of competition in the passenger transport market and competitiveness of the service providers of both passenger and goods transport.

The new mobility services enabled by the Act may accelerate a shift from private car ownership to a shared use of cars, especially in cities. This might contribute to greater resource efficiency, as well as to emissions reduction[52].

Packaging recycling[53]

Finland has been rather successful in its **recycling of packaging**: more than half of all packaging is now recycled. This is especially thanks to high recycling rates of cartons, glass and metal packaging. Producer responsibility of packaging was renewed in 2014 and a network of bring sites for different household **plastic packaging waste** was established in 2016. Rinki Ltd is a producer responsibility organisation (PRO) for packaging. In addition to PRO bring sites, post-consumer plastic packaging waste is also been collected by municipalities from selected housing cooperatives in different regions in Finland. In the Helsinki region, for example, collection of plastic packaging waste is cheaper than the collection of mixed municipal solid waste.

An area in which Finland has a proven track record is collection and **recycling of drinks packaging**. The success can be partly credited to the drinks packaging tax, currently paid on packaging for alcoholic beverages, beer and soft drinks. Packaging of bottled water and certain other drinks is also subject to the tax. This form of taxation aims to further encourage the reuse of drinks packaging, prevent litter and reduce the volume of such materials ending up in landfill .

The taxation level currently amounts to EUR 0.51 per litre. This tax does not apply to packaging covered by approved returnable deposit systems that involve the collection of packaging for refilling or material recycling.

Finland's returnable deposit system is defined in special legislation on the taxation of the manufacture of certain types of drinks packaging (1037/2004), as well as statutes in the Waste Act and a related decree on collection systems for returnable drinks packaging (180/2005).

Finland's deposit-based system for beverage packaging enables the efficient collection of packaging for recycling. The deposits encourage consumers to return empty beverage packaging for recycling, preventing it from ending up in the environment or in mixed waste. The deposit is a good incentive for recycling, as is the convenient location of reverse vending machines.

Habits and attitudes also have an effect: in Finland, returning bottles is learned in childhood and is considered important. Therefore, the recycling rates of beverage packaging are among the best in the world – 96 per cent for aluminium cans, 92 per cent for polyethylene terephthalate (PET) bottles and 88 per cent for glass bottles.

[52] https://www.finlex.fi/fi/laki/alkup/2017/20170320 (Finnish)

[53] https://rinkiin.fi/for-households/ (English)

Textile recycling[54]
Research on textile recycling is gaining momentum in Finland. Currently there are several ongoing national and international research and implementation projects on textile recycling and logistics, including new materials, such as Telaketju and Trash2Cash.

Green deal on plastic carrier bags[55]
The Ministry of the Environment has concluded the first Green Deal agreement with the Federation of Finnish Commerce, the Plastic Carrier Bag Agreement, to implement the EU Directive by a voluntary agreement instead of a legal instrument.

The Agreement, in force until the end of 2025, aims to ensure that Finland reaches the reduction targets for consumption of plastic carrier bags in the EU Directive on Packaging and Packaging Waste. The aim is that by the end of 2025 no more than 40 bags are used per person per year. The reduction target concerns all plastic carrier bags from retail outlets, excluding very lightweight bags provided for loose food such as fruit and vegetables and those required for reasons of hygiene.

Tax credit for domestic help or household expenses[56]
The tax credit for domestic help or household expenses, worth EUR 2,400 per person per year, can be applied for by any private person who has previously paid a wage to somebody providing housekeeping, nursing services at home, or home/holiday home maintenance and basic renovation work. It is intended to support legal employment and improve the living conditions of citizens. Renovation work represents a large share of the applied tax credits, therefore the scheme can be seen as a means to boost energy efficiency, as well as a means to extend the lifetime of Finnish building stock.

Seeking synergies with other policy areas

The effects of different policy instruments in Finland, especially taxation, are under investigation with a view to making concrete suggestions for implementing the most promising instruments. The production of biogas from waste, for example, is one of the areas for which synergies between different policies can be found, with the production of biogas from waste promoting the goals of waste policy. Biogas production from wastes is supported through three different policies:

- feed-in tariffs for new biogas plants generating more than 100 kilo-volt-ampere (kVA) of power and supplying electricity to the grid;
- investment support for other plants producing energy but not supplying electricity to the grid – the plants must reduce the use of fossil fuels;
- farm support for those that plan to invest in a biogas plant to meet their own energy needs.

The Ministry of the Environment has a funding programme to promote nutrient recycling (RAKI), which includes measures to increase nutrient recycling and step up action to protect the Baltic Sea and other waterways. An experimental programme funding product development and innovation related to renewable energy and nutrient recycling has been conducted, including demonstration and reference projects. Venture funding is provided to farms, small and medium-sized enterprises (SMEs) and processing plants. Industrial symbioses and innovation related to new uses are promoted. The implementation of the programme requires administrative and legislative measures, as well as specific projects aimed at promoting new technologies and methods. Other important factors are communication and advisory services.

[54] https://telaketju.com (Finnish)
https://www.trash2cashproject.eu/trash-2-cash-about-page/ (English)
[55] http://www.ym.fi/en-US/The_environment/Waste/Green_Deal_agreements (English)
[56] https://www.vero.fi/henkiloasiakkaat/verokortti-ja-veroilmoitus/tulot-ja-vahennykset/kotitalousvahennys/ (Finnish)

The second phase of the programme, RAKI 2 (2016–2019), is currently under way[57]. Initially, in 2012 the government allocated EUR 3 million for implementation of the programme. Since then, 69 projects have been granted support totalling approximately EUR 13 million.

The Ministry of the Environment has concluded the first Green Deal agreement with the Federation of Finnish Commerce, the Plastic Carrier Bag Agreement, to implement the EU Directive through a voluntary agreement instead of a legal instrument. The Agreement gives a strong signal to industry that innovation for replacement of traditional plastic bags is needed (see also Examples of good practice and innovative approaches).

The Nordic Swan Ecolabel works to reduce the environmental impact of production and consumption of goods – and to make it easy for consumers and professional buyers to choose the most environmentally friendly goods and services. Nordic Swan Ecolabel includes 60 different product groups and more than 200 different product types. The Swan criteria promote good-quality products with requirements on durability, warranties and the availability of replacement parts. The use of secondary raw materials as input for products and packaging can be noted. Separability or the possibility of separating materials are already included in the criteria for some product groups and are expected to gain greater attention in the future. Recyclability is, in addition to separability, helped or hindered by the material content. One important aspect in Nordic Swan criteria is the presence of hazardous chemicals, which may hinder recycling. Such chemicals are limited by ecolabel requirements.

Resource efficiency and circular economy policy initiatives from subnational to local level

Local platforms

In Finland there are two initiatives that aim to create solutions that have economic and social benefits as well as environmental advantages. Both Carbon Neutral Municipalities (CANEMU) and Finnish Sustainable Communities (FISU) bring municipalities, businesses, citizens and experts together to create and implement solutions to reduce greenhouse gas emissions. FISU also focuses on improving communities' resource efficiency.

Both networks lean on the coordinating role of the Finnish Environment Institute (SYKE). The Institute provides expert assistance to municipalities, coordinates initiatives and communicates results. Specialist in energy and material-efficiency Motiva is also a key player in the FISU network.

Finnish Sustainable Communities (FISU)[58]

This is a network for forerunner municipalities aiming at carbon neutrality, zero waste and globally sustainable consumption by 2050. In a FISU municipality, authorities, companies and other local actors build a common vision and a roadmap to achieve their targets. Partners identify new possibilities for cooperation and ways of working. The aim is to strengthen the local economy, create jobs and promote sustainable well-being. The municipalities of Forssa, Ii, Jyväskylä, Kuopio, Lahti, Lappeenranta, Turku and Vaasa currently belong to the FISU network. The network is coordinated by the Finnish Environment Institute (SYKE) and Motiva. FISU is steered by an advisory committee comprising representatives from Sitra, Motiva, the Finnish Environment Institute, the Finnish Funding Agency for Innovation Tekes, the Association of Finnish Local and Regional Authorities, the ministries of the Environment, of Employment and the Economy, of Transport and Communications, and of Agriculture and Forestry, and the FISU municipalities.

[57] http://www.ym.fi/en-US/Nature/The_Baltic_Sea_and_marine_protection/Programmes_and_strategies/Programme_to_promote_the_recycling_of_nutrients_and_to_improve_the_status_of_the_Archipelago_Sea (English)

[58] http://www.fisunetwork.fi/fi-FI (Finnish)
http://www.fisunetwork.fi/fi-FI/Tiekartat_ja_tyokalut (Finnish)

In the 2013–2015 joint project Towards Resource Wisdom, Sitra and the city of Jyväskylä developed an operating model through which cities and municipalities can promote the wise use of natural resources and create the preconditions for sustainable well-being and success. The operating model was piloted in Forssa, Lappeenranta and Turku in spring 2015, by drawing up a resource-wisdom roadmap for each city. The four newest FISU municipalities (Ii, Kuopio, Lahti, Vaasa) are currently also developing their resource-wisdom roadmaps.

Many cities have expressed an interest in joining FISU, which is always searching for new members. Becoming a member requires that the region adopts the resource-wise operating model and commits to setting zero-waste and zero-carbon targets for 2050 or sooner.

While network members compete to see who will reach the targets fastest, they also share information on best practice. This way, the best ideas are spread and also have a positive impact outside the regions in which they were created.

The FISU network currently operates only in Finland, but the plan is to extend it beyond the country's borders at some stage as climate change and dwindling natural resources are topical themes all over the world. The FISU network's operating model attracted a lot of interest in 2014 at the World Resources Forum in Peru and at the European Resources Forum in Berlin. International cooperation already takes place between large cities through, for instance, the C40 Cities Climate Leadership Group. The FISU network also offers a cooperation platform for smaller cities, and by extending it into an international network FISU could help revitalise regions and stimulate sustainable development activities anywhere in the world.

Helsinki Metropolitan Smart & Clean[59]

The Helsinki Metropolitan Smart & Clean Foundation was established in 2016 with the aim of making the Helsinki metropolitan area the world's best testing area for smart and clean solutions. The Smart & Clean initiative, based on cooperation between cities, businesses, research organisations, the state and citizens, is unique. New solutions and ecosystems are built cooperatively to mitigate climate change, promote a circular economy and create new business in the Helsinki region. Smart & Clean operates in five areas: smart mobility, the circular economy, a net positive sustainable built environments, clean energy and solutions for resource-wise citizens.

The first Smart & Clean projects focus on new solutions to improve the quality of life of citizens through better air quality, new natural quality-management solutions for urban stormwater, as well as creating new concepts for urban retrofits. The world's first comprehensive city-wide air quality system will be built in Helsinki and the data will be open and available to everyone. It can be used to inform citizens about local air quality and how it changes. The more comprehensive data can be used to further develop air quality improvement measures.

In building work, prefabricated elements can be used to shorten renovation time, reduce costs and make properties smarter and more energy efficient. The aim is to create fast, repeatable and integrated renovation solutions that take buildings' life cycles into account better than previously. At the same time, this creates new purchasing and funding models and improved opportunities for smart energy solutions, as well as smarter housing and buildings.

Stormwater management is one of the most essential questions related to climate change resilience in urban infrastructure. Pollutant emissions to water are being reduced by, for example, cleaning microplastics and nutrients from the water. A greener urban environment creates better quality of life while also supporting the circular economy. Business ecosystems supported by research organisations

[59] https://smartclean.fi/en/ (English)

offer cities integrated solutions. Information generated in the process is shared on an open digital platform.

The Finnish Industrial Symbiosis System (FISS)[60]

During 2013, Motiva and Sitra undertook a pilot project on how the British National Industrial Symbiosis Programme (NISP) model could be applied to Finland. The project, which was funded by Sitra, the Ministry of Employment and Economy and the Ministry of the Environment, aimed to test NISP working methods and to discover what would be the most effective way of promoting industrial symbiosis at the national level in Finland. The project assessed the possibility of implementing a programme and proposed a plan for its preparation.

The working methods of the NISP were tested by arranging three workshops bringing together companies and other organisations in different cities: Helsinki, Jyväskylä and Rauma. In these workshops, 548 resources and 640 potential synergies were identified. After the workshops Motiva input the resource data to the SYNERGie database and worked on facilitating these synergies with about 40 companies. This experience showed that the NISP methodology, based on facilitated industrial symbiosis, is functional and that it provides a great opportunity for companies to develop new cross-sectoral business cooperation and to work in a more resource-efficient and sustainable way.

FISS was launched in September 2014. Motiva is the national coordinator, with regional partners supporting businesses in their respective areas. FISS is based on the collection of resource information, matchmaking and active facilitation. FISS also runs a Synergie-database (not publicly available) to identify possible synergies and to collect information on the impact of industrial symbiosis on the environment and economy.

At present around 623 companies from different sectors and 4,734 resources are involved all over the country.
The objectives of the system are:

- cost savings for participating companies;
- creating new business and new jobs;
- encouraging new investments;
- increasing the use of recycled and reused materials;
- saving virgin materials and water.

Regional Circular Economy Roadmaps

Circular Economy Roadmap of Southwest Finland[61]

In 2017 the Circular Economy Roadmap of Southwest Finland grew from the need to gather information on all the strengths, needs and know-how of the region in the light of a future circular economy based society. The Roadmap is focused on three categories – a sustainable food system, technical loops and transport and logistics – and creates and presents the steps towards a diverse and circular-economy-based Southwest Finland. It also functions as a basis for all the needed development projects and is executed as a genuine collaboration. It was drawn up at the Regional Council of Southwest Finland under the leadership of the Valonia Service Centre for Sustainable Development and Energy of Southwest Finland.

Circular Economy Roadmap of Päijät-Häme Region in Finland[62]

The Päijät-Häme Circular Economy Roadmap describes regional goals and actions to achieve the vision of a successful resource-efficient region by 2030. It is divided into five themes: closed loops of technical streams to create added value; sustainable food systems as part of a bio-circular economy; towards energy

[60] http://www.industrialsymbiosis.fi/ (English)
[61] http://www.lounaistieto.fi/kiertotalous/in-english+/ (English)
[62] http://www.kohtikiertotaloutta.fi/english/ (English)

self-sufficiency through sustainable transport and energy solutions; a shared economy for generating new consumption models and business opportunities; and piloting and demonstrating innovative circular economy solutions.

Circular Economy Roadmaps in other regions

Roadmaps have been compiled in connection with CIRCWASTE (see below) in four regions and in 10 forerunner cities. The target of the roadmaps is to implement the national waste management plan and further enhance activities surrounding the circular economy at regional level, taking local factors and strengths into account. The roadmaps focus on decreasing the amounts of municipal solid waste, improving material efficiency, preventing waste, setting and piloting opportunities to achieve regional recycling targets for municipal waste, utilising mineral waste and industrial by-products in earth works, recovering construction waste, reducing and recovering hazardous waste, and enhancing activities for a circular economy.

Examples of Finnish research projects related to the circular economy with a regional impact

CIRCWASTE[63] is a seven-year project, started in 2016, with a total budget of more than EUR 18 million, funded in large part by the EU LIFE programme. The project promotes the efficient use of material flows, waste prevention and new waste and resource management concepts. All actions contribute to implementing the national waste management plan and directing Finland towards a circular economy. CIRCWASTE is made up of 20 partners and 10 funding organisations, coordinated by the Finnish Environment Institute.

The CIRCWASTE project operates in five geographical areas: Southwest Finland, Satakunta, Central Finland, and the North and South Karelia regions. Demonstrations take place in these areas. Relevant regional stakeholder groups create roadmaps that set the goals and activities needed to decrease waste, improve material efficiency and utilise industrial by-products, etc.

In order to support the regional activities, an expert network on the circular economy is being formed by the Finnish Environment Institute and Motiva Ltd. The network will provide expert services and spread information on successful solutions. The target groups are businesses, municipalities, administration and citizens. In practice, the network will offer material audits and tools for assessing environmental impacts and cost effects, including life-cycle assessment and input-output models, and develop indicators for a circular economy. A help desk will be established to provide information regarding, for example, material-efficient procurement, hazardous substances, industrial symbiosis, and finding funding for new initiatives. A database of 100 good practices for a circular economy will be published. The expert network will give particular support to the regional cooperation groups and a set of chosen forerunner municipalities.

The CIRCWASTE project puts into practice demonstrations and pilot plants and carries out studies and trials related to resource efficiency solutions. Each of these actions brings concrete results such as decreasing the amount of waste or material used, setting up new equipment or intelligent management systems and creating new practices and strategies. The 19 cases focus on municipal waste, industrial waste and by-products, construction waste, soils and contaminated lands, the food system, etc. Specific themes are, for example, reusing of plastics, material efficiency in hospitals, biogas production, nutrient recycling, surplus food, digital systems. Some activities include counselling, education and facilitating the creation of industrial symbiosis.

In addition, relevant regional stakeholder groups catalyse new actions and R&D projects as well as activate and support local people in reducing waste and creating economic value.

[63] http://www.materiaalitkiertoon.fi/en-US (English)

CIRCWASTE also offers municipalities the possibility of becoming a forerunner in material efficiency, recycling and circular economy. Ten forerunner municipalities have been chosen. The Circular Economy Network run by the Finnish Environment Institute and Motiva Ltd offers selected municipalities services, counselling and support.

BIOREGIO[64] is a five-year Interreg Europe funded project that started in 2017. The project boosts the bio-based circular economy through the transfer of expertise about best available technologies and cooperation models. The project will improve regional development policies and programmes related to the circular economy of biological streams.

Other resources

Examples of policies which go beyond "material resources"

The government has launched several projects to speed up the transition to a circular economy. One of the key projects is the improvement of nutrient recycling, with the aim of having 50 per cent of the manure and sewage under advanced treatment. This project includes pilot plants for wastewater sludge treatment to salvage phosphorus. Key government projects for a circular economy also include developing waste regulation and solutions to promote recycling, including new solutions for soil recycling and remediation of contaminated soil.

Society's Commitment to Sustainable Development

The Society's Commitment to Sustainable Development is a long-term, shared objective for the future of Finland. The idea is simple – concrete actions, measurable results. More than 600 commitments have already been made. With these commitments, operators pledge themselves to promoting sustainable development in their work and operations. Everyone is welcome to join in – from companies and communities to private individuals and public administration. The commitment benefits the operators in many ways. Companies, for example, can use it as an effective tool for planning and performing their sustainable development work. Many of the commitments contribute to circular economy targets. A fine example is a Green Deal agreement of the Ministry of the Environment and the Federation of Finnish Commerce on measures to reduce the consumption of plastic carrier bags.

The way forward

Reflections on future directions of policies on resource efficiency and circular economy

Finland can provide good examples of forerunner circular business models, as well as policy programmes targeting a circular economy and resource efficiency. However, the mainstream economy remains linear. Nevertheless, since implementation of the National Material Efficiency Programme, the concepts of low-carbon circular economy, green growth and resource efficiency, as well as goals and policy measures, have become more prominent in society and the media.

There are different proposals on how to facilitate the implementation of resource efficiency in Finland and in general they include economic instruments such as taxes. Some examples of the proposals include lowering labour taxation and increasing the taxation of material resources or lower value-added tax on services. However, there is a need for more coordinated action at the European level to treat the market equally.

There are several strategies in Finland that target resource efficiency, raw materials policies or circular economy to some extent or another. This clearly shows the direction of Finnish policy. A challenge remains, however, in how to make them more interconnected. Implementation of the goals defined in the

[64] https://www.interregeurope.eu/bioregio/ (English)

strategies should ideally be done in a more coherent way. Moreover, views on sustainability differ slightly from strategy to strategy.

Short-term challenges

Finland has a real opportunity to create sustainable well-being and a successful carbon-neutral circular economy over the next five to 10 years. It maximises the conservation of materials and their value in circulation for as long as possible which, in turn, keeps the volume of emissions to a minimum. Rather than offering products, the foundation for earnings in a circular economy will be services and intelligence-based digital solutions. A proposition of how to make the transition to a circular economy is outlined in the Roadmap, though it also highlights the short-term challenges that will hinder the transition. These can be summarised as follows:

- the complexity and rebound effect of promoting systemic change, in which the savings obtained from improving the resource efficiency of individual parts can eventually lead to more production and material consumption;
- economic challenges because circular economy business may be unprofitable in the short term;
- imperfect markets, including a lack of the necessary products and infrastructure, competition, knowledge and/or incentives;
- imperfect regulation due to inadequate legislation and/or implementation;
- social factors including insufficient knowledge and skills related to the circular economy;
- as a result of the above, inadequate waste sorting, the difficulty in obtaining suitable financing, and a lack of harmonised procedures in different areas.

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