

# Sustainable growth through material efficiency

## Working group proposal for a National material efficiency programme

Publications of the Ministry of Employment  
and the Economy

Concern

8/2014



TYÖ- JA ELINKEINOMINISTERIÖ  
ARBETS- OCH NÄRINGSMINISTERIET  
MINISTRY OF EMPLOYMENT AND THE ECONOMY

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National material efficiency programme – sustainable growth through material efficiency			
<b>Tiivistelmä   Referat   Abstract</b>			
<p>The national material efficiency programme proposes eight measures for the advancement of material efficiency. The programme's objective is to create preconditions for ecologically sustainable growth and employment, to promote competitiveness and balanced operational preconditions for business, to utilise non-renewable natural resources in a sustainable manner, and to promote the production of high value added products based on strong knowledge and skills.</p> <p>The goal of the programme is "sustainable growth through material efficiency", aiming simultaneously at economic growth, the sensible use of natural resources, and disengagement from harmful environmental effects.</p> <p>The programme proposes that a research and innovation programme be compiled in order to increase knowledge, improve the flow of information and create synergy among different players. To improve the operational environment of companies, the programme proposes that the administrative burden be eased by, among other things, clarifying the waste and environmental permit system. This would make it easier to introduce new technologies, to implement reference and experimental facilities rapidly and in an appropriate manner, and to utilise waste and industrial secondary flows in a sustainable way. A proposal for easing and clarifying the procedure for environmental permits is firmly connected with the Government's structural policy programme of 30 August 2013 and the decision on its implementation, made on 29 November, 2013.</p> <p>The programme also proposes support for a fixed-term material review project. The project would be used to encourage companies to clarify the flow of materials and to recognise possibilities for greater efficiency with the help of a model developed by Motiva Oy. The model has been successfully tried in a few companies, resulting in savings in material costs of up to 20 %. Simplified methods need to be made available for small and medium-sized enterprises. In addition, the programme proposes the trial implementation of a material efficiency contract between the administration and companies as a way of spurring material efficiency. There are good experiences of this from the Netherlands. In addition, the programme calls for the strengthening of EU preparations for material and resource efficiency.</p> <p>At the current rate of development, the consumption of natural resources in the world is expected to double between 2000 and 2030. Increasing demand means a rise in the price of natural resources and materials. The adequacy of natural resources is a challenge both for the economy, for fighting climate change, and for the securing of biodiversity and ecosystem services. Promoting material efficiency is one answer to global challenges.</p> <p>Finland differs from many other EU countries in that we have many natural resources, such as minerals and forests, while we also have space and clean water. We also differ with respect to our consumption of materials. We produce paper for more than 100 million people around the world, and the aim is to fulfil a significant portion of our target for renewable energy sustainably with domestic bioenergy. Through the improved utilisation of waste and secondary flows and collaboration between different fields, landfills will eventually become unnecessary. Product planning, in which the impact of the whole life cycle of a product is taken into consideration, also helps consumers make better consumer choices.</p>			
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# Foreword

On 27 December 2012, the Ministry of Employment and the Economy and Ministry of the Environment formed a working group to draft a proposal for Finland's national material efficiency programme and investigate opportunities for the development of measurement and assessment.

The drafting of the national material efficiency programme was based on a Government programme and its theme is one of the Government's top projects. The goal is to, for example, establish the prerequisite conditions for ecologically sustainable growth and employment, to promote competitiveness and balanced operating prerequisites for business, to utilise non-renewable resources in a sustainable manner, and to generate high value added based on strong expertise. The working group was administered by a board, which was comprised of Permanent Secretaries Erkki Virtanen of the Ministry of Employment and the Economy (chair), Hannele Pokka of the Ministry of the Environment and Jaana Husu-Kallio of the Ministry of Agriculture and Forestry.

The working group was comprised of the following members: Matti Pietarinen of the Ministry of Employment and the Economy (chair), Jarmo Muurman, (vice chair), Merja Saarnilehto and Taina Nikula of the Ministry of the Environment, Anne Vehviläinen and Birgitta Vainio-Mattila of the Ministry of Agriculture and Forestry, Outi Honkatukia of the Ministry of Finance, Antti Joensuu, Sixten Sunabacka, Mari Pantsar-Kallio and Erja Fagerlund of the Ministry of Employment and the Economy (Secretary General). Deputy members also participating were Reima Sutinen, Maija Uusisuo, Juho Korteniemi and Aino Kokko of the Ministry of Employment and the Economy. Henrik Österlund of Motiva Oy and Hanna Salmenperä of the Finnish Environment Institute SYKE served as working group secretaries.

The working group term ran from December 2012 to the end of September 2013, after which the term was extended to the end of 2013.

The programme launch seminar was held for a broad stakeholder audience in November 2012.

The board convened three times. The working group held six meetings.

The programme was drafted in four workshops. The first and second workshops were attended by working group members as well as separately invited stakeholder representatives, researchers and other experts working in the field. The drafting of the programme as well as connections between material efficiency and waste were also addressed by a waste sector co-operation group under the Ministry of the Environment.

The working group would like to thank all the experts who participated in drafting the programme.

The working group respectfully submits the programme to the Ministry of Employment and the Economy and Ministry of the Environment.

Helsinki, 31 December 2013.



Matti Pietarinen



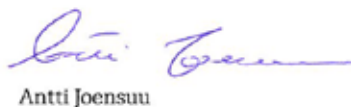
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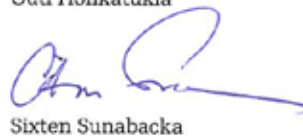
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# Introduction

Material efficiency generally involves the sparing use of natural resources at the actor level, the efficient management of side flows, a reduction in the volume of waste and the recycling of materials in different phases of the lifecycle. The goal is also to reduce harmful impacts to the environment throughout the lifecycle of a product. Material efficiency can be seen in different phases of the value chain, in the production, refining, trade and consumption of raw materials as well as the sustainability of products or an opportunity for reuse, recycling and waste recovery.

The focus in this programme is to promote material efficiency so that there are fewer harmful environmental impacts and the competitiveness of companies is enhanced. The measures to be taken are focused on the development of policy control and tools.

A key function of the programme is the co-ordination of national preparatory actions for EU preparations and financial instruments related to material and resource efficiency. The goal is to influence the development of EU resource efficiency policy instruments where the material economy is concerned. Energy-efficiency already has its own programme. In practice, material and energy-efficiency combine to form resource efficiency for companies, and the two cannot be completely decoupled from one another.

The material efficiency programme forms an entity, particularly with cutting-edge bioeconomy, sustainable mining and cleantech projects. A programme involving consumption habits has already been introduced. The building material efficiency programme was introduced in 2013. The greening of public procurements and promotion of sustainable consumption habits have already been approved in Government decisions-in-principle. This programme will therefore not present actions, which are already specified in these programmes, strategies and decision-in-principle.

# Why do we need a material efficiency programme?

The demand for materials is growing exponentially as the standard of living in developing economies rises. Technological progress will particularly increase the demand for critical minerals many tens of times over in the next two decades. The consumption of natural resources is expected to double in the period 2000-2030. This is a threat to not only the economy, but also the environment. Growing demand has resulted in a sharp increase in the prices of scant natural resources and materials.

An efficient material economy improves economic and business competitiveness, reduces environmental impacts and ensures the sufficiency of natural resources.

Material efficiency in production means the sparing use of natural resources, the effective management of side flows, a reduction in the volume of waste and the recycling of materials in different phases of the product lifecycle.

Products are sustainable and can be reused, recycled or recovered as a waste.

Designing products and services so that less natural resources will be needed during their lifecycle is central to the improvement of material efficiency. The recycling or circular economy has risen to become one of the solutions for the more effective management of natural resource use. This means that the waste from one function could serve as a raw material for another. Wastes are not generated, because by-products are utilised. However, making such a system a reality is hampered by administrative obstacles.

New technology offers immense potential for material efficiency. For example, digital and biotechnology make completely new types of material-saving enterprises possible. The promoting of material efficiency in Finland supports companies, whose goal is to be an industry leader and offer solutions on the global market.

The structure of the economy must be adapted to the de-materialised (intangible) production made possible by new technologies. Economic growth would then be less and less reliant on the use of natural resources. Technological progress has been rapid, particularly in digitalisation of the economy, which has revolutionised many sectors. The recently published Government Report on the Future includes a theme related to scarcity, which addresses the importance of the digital economy and opportunities for using natural resources as a way to diversify our economy. However, taking advantage of such opportunities requires concretisation and research. In the cleantech sector, Finland is already at the forefront of material efficiency development.

Finland's per capita consumption of energy and materials is high compared to most EU member states.

The reasons for this lie in Finland's production structure and conditions. The forest industry and mining sectors are major users of natural resources, while



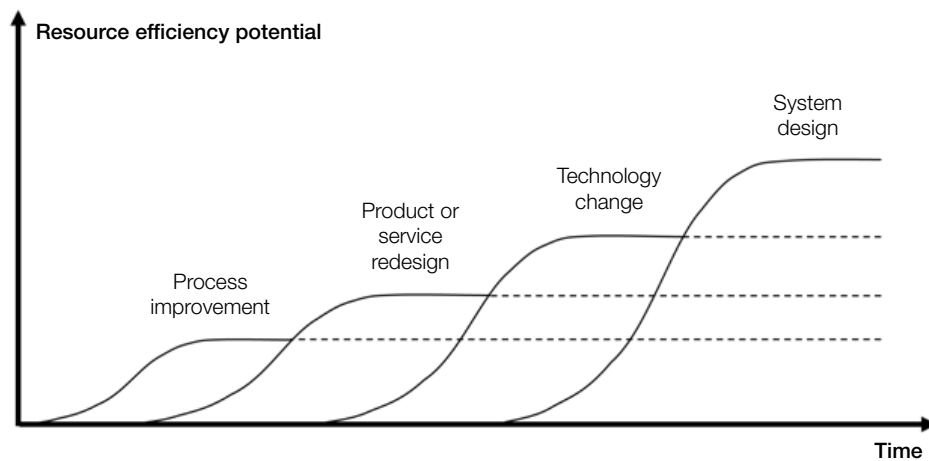
infrastructure construction involves conditions that require a large amount of material. We produce different end products for the global market. An example of this is the Finnish paper industry, which produces paper for approximately 100 million people all over the world.

The Finnish climate is harsh: winter lasts for 100 days in the south and 200 days in the north. Frost, a sparse population and long distances demand a lot of resources for the road system.

Although we have the potential to increase our material efficiency, there are major differences between companies and sectors. Realising this potential requires investment in the above-mentioned factors, i.e. the promotion of product design, recycling, technological development and structural change. The knowledge base must therefore be deepened in many ways.

We also need a common understanding and co-operation between actors in industry, the service sector and public administration.

**Figure 1.** Potential for efficiency improvement at various levels of process improvements, design and innovation.



Source:

European Commission Final Report. Opportunities to business of improving resource efficiency. February 2013. (ref. Brezet. 1998)

Brezet (1998) Sustainable product innovation, 3rd International Conference 'Towards Sustainable Product Design', London, UK

# EU resource efficiency initiatives

Resource efficiency is the flagship initiative of the Europe 2020 growth strategy. A general objective of the growth strategy is to improve the competitiveness of the EU and decouple economic growth from environmental impacts and resource consumption. The EU Raw Materials Initiative also involves materials. The European Union imports a large volume of raw materials and exports finished products. The availability of strategic raw materials and increasing the degree of self-sufficiency are key issues in the EU.

Published in the autumn of 2011, the Commission's first Roadmap to a Resource Efficient Europe defined the actions toward improving resource efficiency as follows: "...reduce inputs, minimise waste, improve management of resource stocks, change consumption patterns, optimise production processes, management and business methods, and improve logistics." A second initiative launched by the Commission is the three-year trial of the Product and Organisation Environmental Footprint (PEF/OEF) environmental performance assessments as part of the Communication "Building the Single Market for Green Products".

According to the recommendations of the high-level, Commission-appointed European Resource Efficiency Platform (EREP) working group, the EU should set ambitious and credible targets for the promotion of resource productivity.

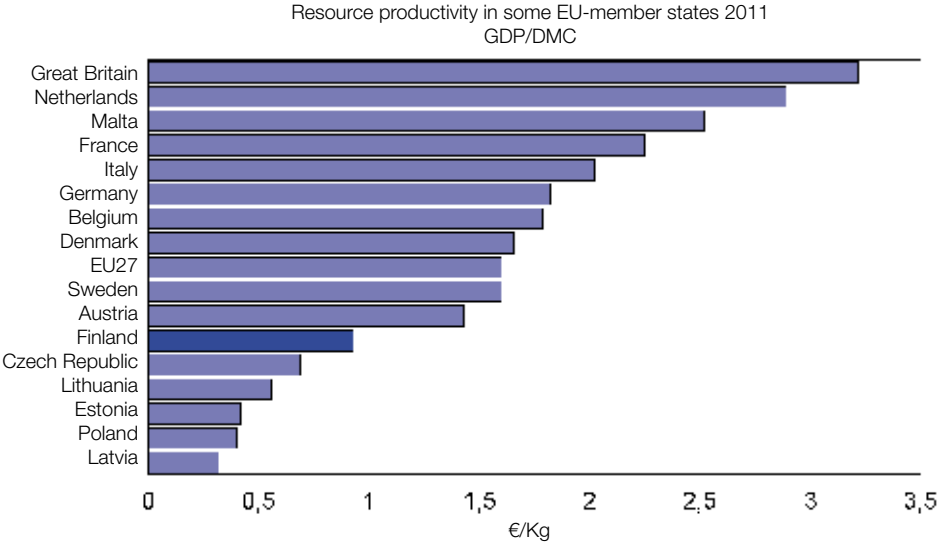
In addition to climate impacts, three key resources should be monitored: materials, water and land use. Follow-up work aims to achieve the targets specified in the recommendations and measure them in the spring of 2014.

It therefore still remain undecided as to whether targets will be set for material efficiency in the EU. The Commission is currently preparing an extensive new resource efficiency policy, in which the use of natural resources, i.e. material efficiency, comprises one part. The Commission is also revising its targets related to the promotion of recycling. Solutions should be adapted to suit local conditions.

The European Commission Environment Directorate-General has compared EU member states in resource productivity. In this comparison, Finland placed among member states with the lowest material efficiency. As Finland has a wealth of natural resources, the export of material-intensive goods and national conditions, such as a cold climate and sparse population, partly explain Finland's placement. Although the indicator has its faults, it does open the door for discussing the intelligent promotion of material efficiency and ways to develop Finland's competitiveness.

A discussion on possible targets and their measurement as well as impact assessments will be topical in EU resource efficiency policy as early as the spring of 2014.

**Figure 2.** Resource productivity GDP/DMC in some EU member states 2011. The indicator provides a narrow view of the use of natural resources. It shows the the quantity of materials used for consumption, but does not take the scarcity of materials, the percentage of renewable resources or environmental impacts, or impacts on water resources into consideration.



Source: Statistics Finland, Leo Koltola

Material efficiency is also included in the EU Horizon 2020 research programme and LIFE financial instrument. Resource efficiency is also included in structural fund focal points. According to policies already issued by the Government’s working group on public administration and regional development, using structural funds Finland will indeed realise energy and material efficiency as well as the promotion of renewable energy.

# Measurement and assessment of material efficiency

At the company level, material efficiency is the creation of competitive products and services with diminishing material inputs, so that any adverse impacts decrease during their lifecycle. Actions promoting material efficiency are used to effect changes to physical material flows. The benefits of such changes are expressed by indicators, which describe economy, natural resource sufficiency or environmental impacts.

At the national economy level, various statistical indicators can be used to spark discussion on developmental trends.

Material consumption can be measured and assessed at different levels, such as products and services, locations and sectors, cities, national economy or the European internal market. There are currently only a limited number of tools available for use in measurement and assessment. Challenges to development are posed by the availability of statistical data (e.g. Total Material Requirement (TMR)) and precision of the indicators used (Direct material consumption (DMC) and Raw Material Consumption (RMC)). On the other hand, more detailed indicators and assessment methods designed for the measurement of different natural resources as well as different economic levels and actors have been investigated.

Measured conventionally, the value added of production does not include all production stemming from intangible capital - intangible capital investments are dealt with as intermediate product inputs and costs. For example, in the EC's FP7 INNODRIVE project, value added is examined using an alternative auditing method. The GDP would actually be higher if R&D investments were considered intellectual capital. Indeed, in Finland intangible investments have been examined in connection with the programme in question.<sup>1</sup>

There were 19 more detailed resource efficiency indicators in a consultation organised by the EC. The statistical practices used in different countries are not always comparable.

Natural resources and material uses that are crucial to Finland should be monitored on a resource- and material-specific basis as well as involving various applications, in order to ensure a precise, transparent audit. Key areas include forest stock, minerals, municipal waste, construction, transportation, utilisation of industrial side flows, and food wastage. Natural resources are used as both a source of energy and a material.

Indicators that might be suitable for the measurement of material efficiency have been investigated and assessed both nationally and at the EU level. In the Roadmap

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<sup>1</sup> [www.innodrive.org](http://www.innodrive.org)

to a Resource Efficient Europe, the Commission proposed resource productivity as a preliminary primary indicator, which is used to measure the GDP in relation to the Direct material consumption (DMC).

The objective of the indicator would be to achieve growth with a relatively small amount of resources.

In addition to this, individual natural resource indicators, such as biomass, metals, minerals and water, were also presented. There are also indicators for waste, innovations and gross nutrient balance (nitrogen, phosphorous).

The DMC indicator would be misleading as a target indicator. It favours replacing the use of domestic natural resources with semi-finished imports, i.e. the "outsourcing" of natural resource use and basic industry, even though material efficiency would suffer at the global level. The weaknesses of the DMC indicator are emphasised in the impacts of the mining boom currently underway in Finland. Furthermore, the consumption brought about by exporting is focused on domestic consumption.

When different materials are measured according to their weight, the difference between renewable and non-renewable resources as well as the differences between widely available and scarce materials are concealed. The impact of different environmental hazards is not so simple. Various actors may get the wrong idea about what the objective of material efficiency in Europe or Finland is. The direct material consumption (DMC) of various materials does not correlate with the total environmental impact, which was also found in the Finnish Environment Institute ENVIMAT study.

Due to the problems with these DMC indicators, other possible indicators describing total resource consumption trends have also been investigated in Finland and at the EU level. These include raw material consumption or Total Material Requirement (TMR). Table 1 shows the projected trends of DMC and RMC until 2030. A conventional GDP calculation method was used in the assessment.

**Table 1.** Finnish material use and efficiency trends with various indicators 2008–2030 (MATPOT 2012). The trend for Finnish resource productivity (material productivity) has been estimated using two different calculation methods: direct material consumption (DMC) and raw material consumption (RMC). The use of natural resources by the mining industry is based on the presumptive growth in production in mining projects known at the time the calculation is made.

	2008	2030	change (%)
Population (1,000 persons)	5 313	5 850	10
Gross Domestic product (GDP) (BEUR in 2008 prices)	186	251	35
Direct Material Consumption (DMC) (MEUR)	208	331	59
Raw Material Consumption (RMC) (MEUR)	209	239	14
Direct Material Consumption per capita (tonnes/person)	39	57	45
Raw material Consumption per capita (tonnes/person)	39	41	4
Material productivity (GDP/DMC), €/t	894	758	-15
Raw material productivity (GDP/RMC), €/t	889	1 051	18

Source: Finnish Environment Centre and Thule Institute; MATPOT study 2013

Raw Material Consumption, i.e. RMC is a better indicator than DMC, because it also 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 using the DMC indicator. In Finland, the differences between DMC and RMC indicators are quite significant. As with DMC, RMC also fails to take into account water use and the unused extraction of natural resources (i.e. the formation of gangue or hidden import flows).

EU policy often uses, for example, new technological advances as benchmarks, which actors are encouraged to achieve. The material efficiency of producers operating in the same field could increase transparency, encourage them to learn from other actors and, in turn, lead to a more efficient use of resources. At the same time, there may be a wide variety of products within a field, thus making interpretation more difficult. The development of functional indicators is time-consuming and demanding.

According to the high-level European Resource Efficiency Platform, EU product policy has to be made more comprehensive.

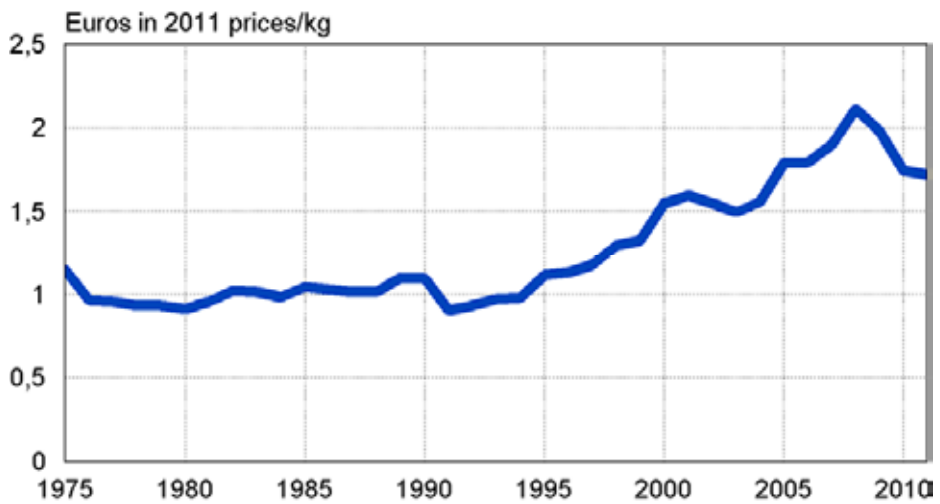
This includes, for example, recyclability requirements, guarantees, sustainability and eco-design requirements. On the other hand, information on issues related to the material economy should be increased in company reporting and accounting.

The Product and Organisation Environmental Footprint (PEF/OEF) method is one alternative approach for assessing and presenting the environmental impacts of organisations and products. At present, there are very many ways of presenting information on a given product's environmental properties. In addition, labelling systems, such as the energy-efficiency rating of appliances, are obligatory for certain products. The information made available to the consumer on the impact of their choices is important, and there are many different environmental labels in use throughout the EU.

The PEF/OEF method is based on a simplified lifecycle assessment, including key environmental impacts. It is being tried as a three-year pilot project in the EU with volunteer companies. Finland has always highly valued the cost-effectiveness and genuine controllability of developing methods.

Another indicator investigated in Finland was the export kilo price, which illustrates structural change in the economy in relation to natural resources used by the economy (excl. water).

**Diagram 3.** Export kilo price trend in Finland, i.e. value of goods and services exports, with fixed prices in relation to the export volume.



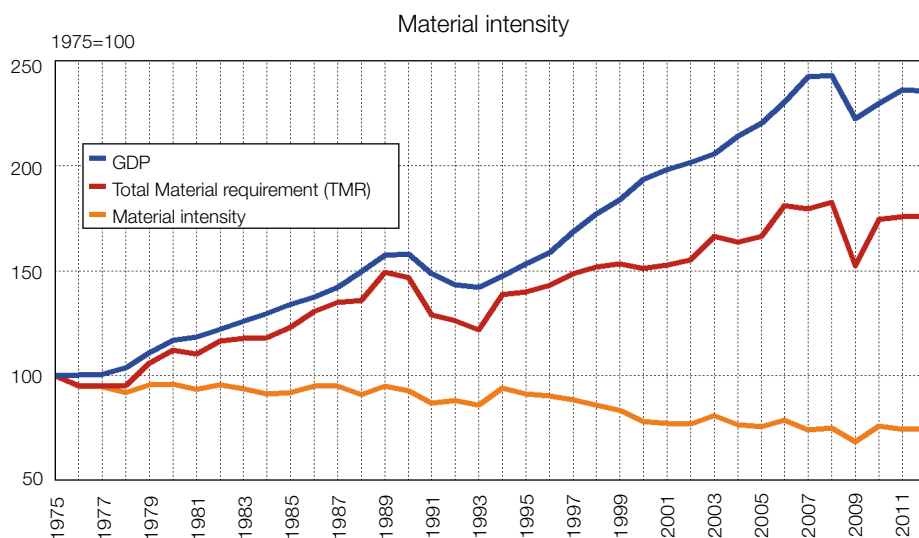
Source: Statistics Finland, Leo Koltola

# Development and possibilities of material efficiency

The material intensity of a national economy, as calculated from the Total Material Requirement (TMR), has declined steadily over the past 30 years (Figure 4). The use of materials has become more efficient, partly due to the structural changes brought about by the mobile phone industry. The use of natural resources is affected by economic fluctuations, even though, in relative terms, fewer natural resources have been used in relation to the value of production. If only Direct Material Consumption (DMC) is used in this calculation, the material intensity has been cut in half since 1975.

**Figure 4.** GDP, total use of natural resources.

The use of natural resources is measured in material tonnes. Total use also includes natural resources that have been extracted from the earth in either raw material form or contained in products, hidden flows abroad related to extracted natural resources imported to Finland and the extraction of unused natural resources in Finland. Water use is not included in the diagram below.



Source: Statistics Finland, Environmental accounting key figures

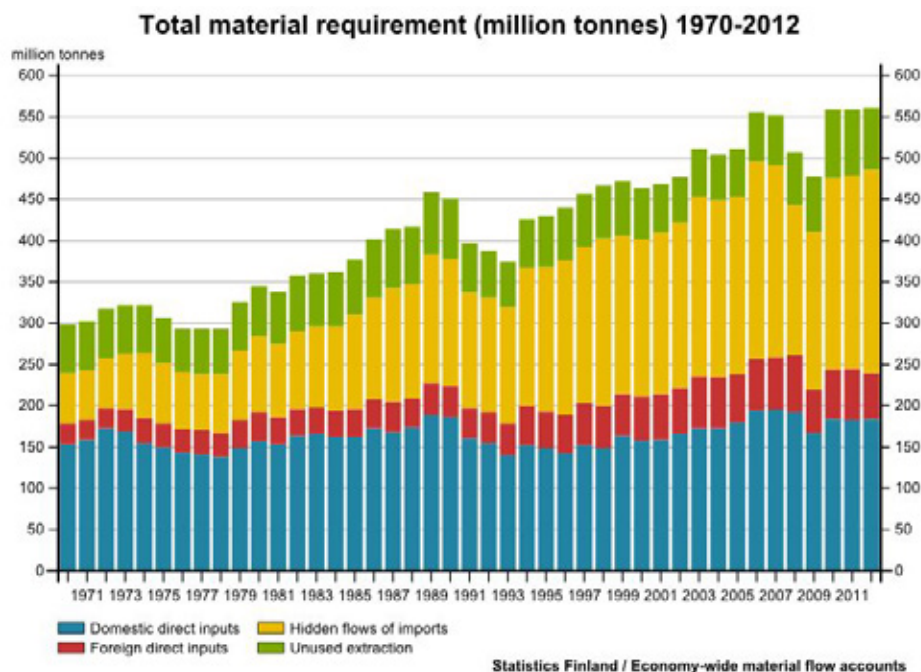
The use of natural resources can therefore be described as a whole, including the estimated hidden flows of imports, which are natural resources contained in imported goods in their country of manufacture. Diagram 5 shows that these hidden flows seem to have increased rapidly, already far exceeding the direct use of natural resources domestically.

It indicates an increase in consumption and diversification of the production structure. In industry, the percentage of domestic raw materials has declined.



Measured in terms of volume, half of the raw materials used in the Finnish economy come from imports and slightly less than half go to exports. The largest material categories for imports are metal concentrates and fossil fuels.

**Figure 5.** Total Material Requirement (TMR) of Finnish natural resources, including hidden flows



The overall trend of material intensity depends, on one hand, on the production structure, and on the other, it depends on the development of company and production plant material efficiency. Consumption habits also affect, for example, food wastage.

Over the past two decades, the production structure has moved dramatically toward the use of fewer resources and, in particular, domestic resources. The forestry industry's share of production has seen a significant decline. The domestic consumption of timber has not decreased, despite decreases in the capacity of the paper industry and sawmill industry production. Higher consumption levels is the result of the increased use of pulpwood and wood used for energy. Services' share of production has also grown dramatically. This change in the production structure has been exceptionally rapid and extensive, both in Finland's economic history and by international standards.

In the years to come, this structure will continue to change in the same direction (MATPOT 2012, Table 1), thus having a retarding effect on growth in the use of natural resources

However, use seems to be increasing, for example, because mining operations are expected to see explosive growth in the next couple decades.

The production process material efficiency of large Finnish companies operating on the international market is of a very high standard. According to a VTT study, the material efficiency of pulp and paper production is actually close to the theoretical optimal level. Products are being further developed. The opportunities of the forest industry are related to market changes, which are also a challenge.

Demea, the German Agency for Material Efficiency, has estimated that the percentage of material costs for production companies in the German SME sector account for, on average, 43-45% of the production costs. The estimated savings potential here is 20%. In Finland, the material audit method developed by Motiva Oy has been successfully tested in a few companies, which have achieved as much as 20% savings on material costs.

According to a 2012 Federation of Finnish Technology Industries study, a key developmental opportunity for the promotion of material efficiency is product design. There are also developmental opportunities to be found in the choice of raw materials and materials and their procurement as well as in the optimisation of production. Material efficiency is already important to company operations, and it will become even more so with customer demands. Untapped potential can be particularly be found in SMEs.

In the construction sector, which is Finland's largest single consumer of natural resources, the possibility of using various recycled materials as well as renewable and recyclable materials instead of non-renewable materials has increased with greater access to information.

Approximately 100 million tonnes of soil is used in geoengineering each year. Recoverable wastes, industrial side flows and reusable surplus soil would be, in this respect, only available in limited quantities. Of these, the productisation and use of ash and certain other mineral wastes, such as foundry sand, are promoted in a material efficiency project for recyclable materials. In this context, it has been determined that improving the practical applicability of the geoengineering legislation with regard to environmental permits is exceptionally important. The use of domestic biomass to achieve the target set for renewable sources of energy will increase the quantity of wood ash in the future.

The recycling and reuse of materials are key areas in material efficiency. In Finland, there are some highly advanced collection systems, such as paper collection. The bottle deposit system recycles beverage containers. There are plenty of opportunities for development in the field of recycling and reuse. In Finland, turnover in recycling and reuse operations amounted to EUR 861 million for 2011, and waste collection and transport approximately EUR 1 billion.

Many predict considerable growth in the field throughout Europe in the near future.

# Management of material efficiency in Finland

Material efficiency requirements can be found in, for example, environmental protection and waste legislation. The separate collection obligation and recycling targets set for certain types of waste are stipulated in waste legislation. The recovery of waste ending up in landfills is promoted by means of a waste tax.

An effort is made to promote the optimisation of material use through advice and volunteer actions. Motiva's Material Efficiency Unit offers advice for the promotion of material efficiency in public procurements, provides information on the use of recycled materials in infrastructure construction, and offers companies tools to improve material efficiency (e.g. the material audit model).

Various projects have been launched to reduce food wastage. Ways to promote sustainable food choices are currently being investigated.

The goal of SITRA's Toward Resource Wisdom project is to find effective ways to conserve natural resources, raw materials and energy through experimentation and pilot projects.

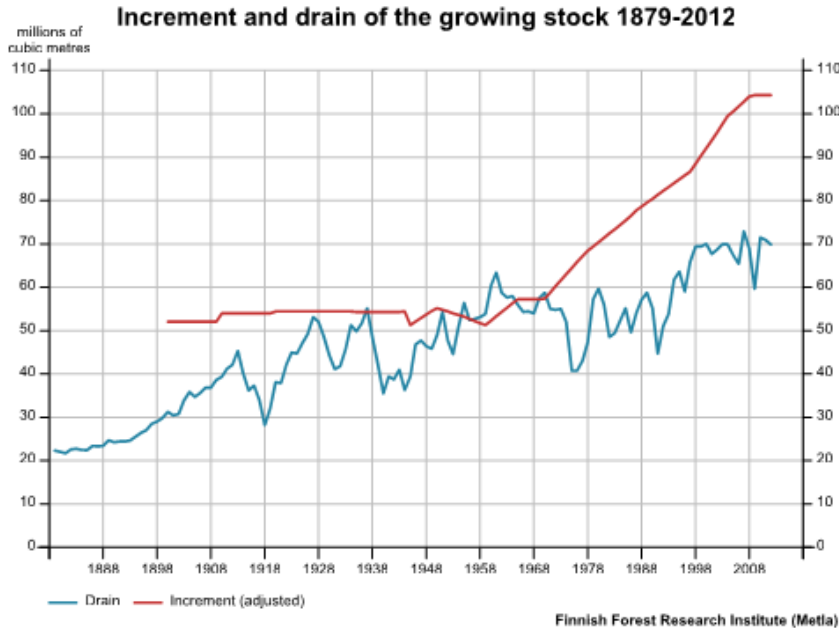
SITRA and Motiva have launched a trial project for the promotion of industrial symbioses. The Strategic Programme for the Forest Sector adopted a model for the promotion of partnerships for large corporations and SMEs.

With regard to residential construction, a construction material efficiency working group worked alongside the material efficiency working group. The construction working group issued its procedural recommendations on 24 October 2013.

With regard to infrastructure construction, a fixed-term project on the promotion of recycled materials is currently underway.

With regard to the management of natural resources, forests have been a key source of employment, with forests having been regulated since 1886. The use of forest resources is based on sustainable forest management, which ensures biodiversity, the proper function of ecosystems and the sustainable use of forest resources. The growth of forest outstrips the forest stock lost (Figure 6).

**Figure 6.** Growth of forest and forest stock lost in Finland 1879-2011



Source: Metla

The transition of the production structure toward intangible fields, diversification of the structure and an increase in the degree of production value added surely play a key role in improving material efficiency. The requirements for a change in the production structure are influenced by economic policy. Choices made in economic policy are therefore key to the steering of material efficiency.

### **Examples of material efficiency steering in certain member states**

In most EU member states, where attention is given to material efficiency, it is done as part of a larger whole. The matter is described and steered in different countries as either part of a green economy or broader resource efficiency. Many countries have at least some related activity in various administrative fields.

In the Netherlands, one focal point of the green growth strategy involves raw materials and production chains. Companies, citizens and organisations as well as authorities outside the central government were invited to come up with ideas for the "Green Deals" project, which has a decentralised administrative structure. Some of the projects are related to administration and some to companies, but universities of technology have also been granted resources for the extensive basic research programme. Sustainable innovations include streamlined regulatory functions. The Green Deals programme is currently being evaluated.

Following an earlier raw material programme, Germany approved a resource efficiency programme (2012), whose goal is to decouple economic growth from the use of resources, i.e. when the economy is growing, the use of resources should be decreased.

The programme includes key targets for the various areas of resource use: the availability of sustainable raw materials, resource-efficient production and design, resource-efficient consumption and closed circuits. It also includes an extensive, 12-year university research programme. The Federal Government supports SMEs in the development of innovations and resource efficiency. The voluntary material efficiency audits of companies have also been supported since 2005.

In Sweden, material efficiency-related themes are included in, for example, work being done by the Commission on the Future of Sweden, which is chaired by the Prime Minister and sectoral programmes.

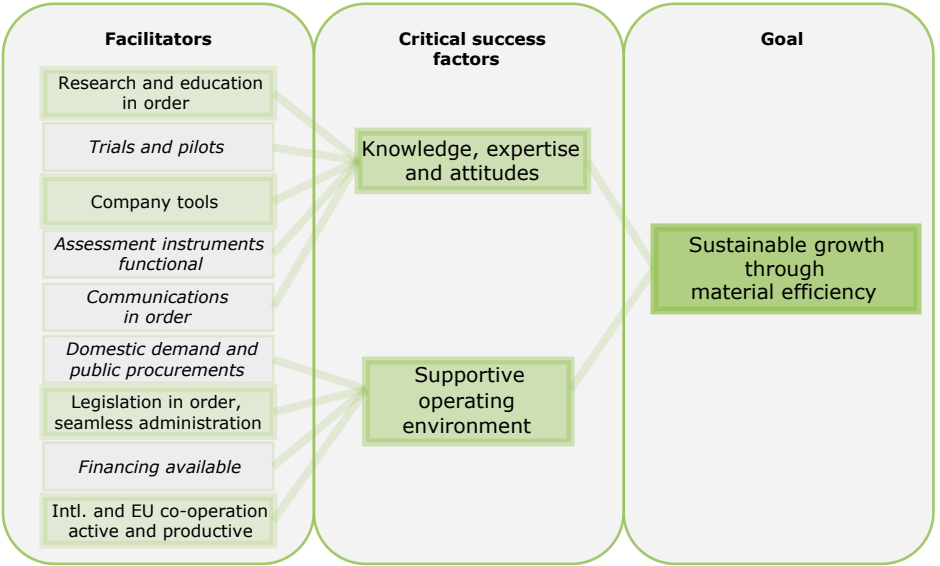
# Goal and proposed measures

The stated objective of the programme is: "sustainable growth through material efficiency", which aims to simultaneously achieve economic growth, the wise use of natural resources and disengagement from harmful environmental effects.

The working group found that there are two critical success factors for achieving the goal: knowledge, expertise and attitudes, and a supportive operating environment (Figure 7).

Where these are concerned, four political areas were found to play a crucial role. The working group proposed measures for these four areas. The programme includes eight measures for promoting material efficiency.

**Figure 7.** Critical material efficiency success factors and their facilitators



# Actions

The working group proposes the following actions be taken:

## Research and education

### 1. Launch a joint research programme for the promotion of material efficiency

*Programme sponsors: Ministry of Employment and the Economy (TEM) (Tekes, VTT), Ministry of Education and Culture (OKM) (Academy of Finland), Ministry of Agriculture and Forestry (MMM) (RKTL, MTT, Metla), Ministry of the Environment (SYKE)*

In Finland, research, education and innovation enjoy a generally high standard. A sustainable material and recycling economy is a theme gaining traction. A joint, multidisciplinary research programme, also representing education in the field, is being launched to find new solutions and ensure competitiveness. The programme will be comprised of, for example:

- development and pilot projects for innovations and operating models promoting material efficiency and closed circuits, the development and implementation of technologies using less material and alternative resources, a needs survey of voluntary standardisation
- material wisdom and productivity assessment methods, the assessment and measurement of environmental footprint methods, social impacts
- more comprehensive research, assessment and development of resource efficiency potential and bottlenecks, including the recycling economy, industrial ecology, cleantech, future digital economy and design as well as the utilisation of other intangible value added opportunities.

Today, research is conducted separately, with numerous material efficiency test projects underway in various parts of Finland. A joint research programme promotes co-operation between research institutes, companies and customers in the development and dissemination of new business models as well as forecasting and impact assessment.

A research entity requires a long-term, multidisciplinary engagement in the given subject, which is why funding for the research area should be ensured, for example, by a future strategic research funding source. The Research Consortium for

Natural Resources and the Environment (LYNET<sup>2</sup>) and the Government Resolution on Comprehensive Reform of State Research Institutes and Research Funding provide an opportunity to strengthen material efficiency research, also through the normal performance management of Ministries.

In addition, the research theme should be integrated in the development of the LIFE financing project consortium mentioned below as well as the promotion of material efficiency in the Horizon 2020 framework programme.

## Company tools for developing material efficiency

### **2. To realise a national operating model to accelerate industrial symbioses as a three-year project**

*The project funders are the Ministry of Employment, the Economy and the Ministry of the Environment, and other actors (e.g. SITRA)*

In industrial symbiosis, materials, energy, water and side flows are utilised in co-operation with companies in a way that generate value added for all involved parties. Industrial symbioses often transcend conventional sectoral boundaries and differ from established value chains. Symbioses offer the opportunity to take advantage of other actors' side flows, new operating concepts and even intellectual rights at the regional level or otherwise in a restricted operating network. Joint development in industrial symbioses offers a new way of ideating, developing and testing product and service innovations as well as developing new expertise and enterprise. The goal of this action is to develop a national industrial symbiosis model based on a trial currently being conducted by SITRA and Motiva Oy, gaining experience with the need for and use of digital marketplaces and databases for surplus materials.

An operating model developed based on the experiences gained in a pre-project currently underway would create the conditions for regional, national and possibly even international companies to network during a three-year period, which would accelerate the growth and internationalisation of companies.

### **3. Develop an operating model for strengthening resource-wise regional co-operation**

*Funded by SITRA, the Ministry of Employment and the Economy, Ministry of the Environment and possibly other actors*

The impact of regional actors on the development of material efficiency is significant. Companies, municipal decision-makers, households and authorities are needed for greater co-operation in developing a comprehensive regional resource economy.

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2 In the beginning of 2015, LYNET will be comprised of the Natural Resources Institute Finland, Finnish Food Safety Authority (Evira), Finnish Environment Centre, Spatial data Research and Development Centre, Finnish Meteorological Institute, Geological Survey of Finland and Moniteknologinen tutkimuskeskus (VTT and MIKES).



An effort is being made to create an operating model, which can be used to promote resource efficiency comprehensively in the region, taking into account resource flows, their impacts and interrelationships as well as the impact of actions taken on business and well-being. The goal is to identify solutions, which support different goals simultaneously. The operating model utilises experiences with test projects related to SITRA's "Resource wisdom" theme as well as the Finnish Environment Institute's Carbon Neutral Municipalities (HINKU) project.

The realisation of effective measures often requires investments and new business concepts as well as changes in the ways companies, administration and citizens do things and behave.

#### **4. Launch a five-year subsidised material audit project**

*To be carried out by Motiva Oy and funded by the Ministry of Employment and the Economy*

The material audit is a tool, which supports companies in determining the material flows of the facilities and identifying possibilities for improving efficiency. A material audit is conducted with a consultant chosen by the company. The audit will provide the company with concrete procedural recommendations on how to improve material efficiency in production. The measures taken will provide the company with cost savings in the procurement of raw materials, waste management fees, energy and labour. The tool has been developed and tested successfully. The project also includes the development of an audit checklist for SMEs. The checklist lowers the threshold for gaining familiarity with the possibilities of material efficiency. In addition, the project for the development and implementation of tools for improving resource efficiency may consist of a suitable combination of streamlined tools, such as regionally available consultation or development of the Ecostart Environmental Management System, which has already been tested at Centres for Economic Development, Transport and the Environment (ELY Centres) or an equivalent system. Material efficiency can then be integrated into the management systems of companies.

Public aid may be granted to cover the consulting costs of material audits, in compliance with applicable EU regulations. The amount of aid to be granted is determined in the state spending limits and budget process.

#### **5. Trial the material efficiency contract method as a means of accelerating material wisdom**

*The initiative was launched by the Ministry of Employment and the Economy and other key Ministries*

Companies and company groups will be offered the opportunity to participate in the development of voluntary material efficiency contracts to promote material wisdom

in various fields. The Ministry of Employment and the Economy will determine the content and form of the contracts with interested parties.

The objective of a material efficiency contract might be, for example, a company's commitment to developing a specific aspect of environmental and material efficiency, such as increasing the transparency of production chains, product design, reducing the volume of waste, production information, or increasing recycling and reuse. It is appropriate to monitor the environmental impacts of a product or service throughout its lifecycle. The commitment could also include measures in the field of resource wisdom that support strategic objectives that extend beyond a company's own sector, such as reducing climate impacts.

## Legislation and seamless administration

### **6. Launching a project for easing and clarifying the procedure for environmental permits.**

*The project is being implemented by the Ministry of the Environment together with key authorities in connection with the Government's structural policy programme*

Clarifying environmental permit procedures can promote and accelerate the implementation, productisation and commercialisation of new material- and environmentally-efficient technologies and business concepts as well as the utilisation of recycled materials. These include industrial symbioses and facilities using recycled materials and closed circuits. In an industrial symbiosis, operations can grow from a single business into a conglomerate, which offers energy, consumer and investment products, related services and waste processing. The challenges facing environmental permits are expediency, suitability for new operating models and the transition from trial use to production. The number of compulsory environmental permits in Finland is high by international standards, with short renewal intervals. Permit processing times are long. Consideration could be given to the adoption of a registration and notification procedure for standardised functions.

Environmental permit procedures should be flexible and user-friendly for implementation by companies and cleantech.

The proposal and measures regarding streamlining and clarification of environmental permit procedures are directly linked to the Government Structural Policy Programme of 30 August 2013 and the decision for its implementation on 29 November 2013.

## International and EU influence

### **7. Anticipate international material efficiency policy and influence the drafting of EU material efficiency policy**

*Implemented by the Ministry of the Environment together with other key Ministries*

The Commission is preparing ambitious targets for the decoupling of resource use and environmental impacts. Preparations also involve the selection of material efficiency indicators and the related Organisation and Product Environmental Footprint information model.

Measurement methods and the actions based on them can have a major impact on the Finnish economy. This is especially due to the fact that material use in Finland differs from other EU member states. This is why the proper preparation of rationales and influence itself are so important. In addition, product specifications, waste legislation and construction regulations require constant influence. The "think small first" principle in EU legislation, i.e. the application of regulations to small enterprises must always be taken into account, such as when drafting legislation on consumer information obligations.

### **8. EU LIFE programme funding will be confirmed for Finnish material efficiency projects**

*Implemented by the Ministry of the Environment*

LIFE is the EU's environmental financial instrument, which supports nature conservation and environmental projects for the development of environmental policy and legislation. LIFE projects represent some of the largest national environmental protection projects. The LIFE funding programme is steered by the LIFE Regulation.

The LIFE Regulation is currently being amended. The next funding period will be 2014-2020.

LIFE funding will be increased considerably and an entirely new project form – jointly funded integrated projects – will be added alongside conventional projects. Jointly funded integrated projects cover a broad area and aim to implement environmental and climate policy plans or strategies. Finland is working to make resource efficiency and its attendant material efficiency a single area for funding.

Actors will jointly form a national "integrated project consortium", which is used to conduct trials promoting resource efficiency in Finland. Formation of the consortium is in its early phases, with the intention to invite suitable companies, municipalities/cities and research institutes, while also taking the needs of other funding agencies (Tekes, Sitra, TEM, MMM ) into consideration. Funding is being sought for from the LIFE financing instrument to cover 60% of the total project costs. The project is also linked to the research programme proposal.

# Oversight

The Permanent Secretaries of the Ministry of Employment and the Economy, Ministry of the Environment and Ministry of Agriculture and Forestry report on the progress of the programme each year. The first report will be published at the end of 2014.

## Appendix

### Other participants in the drafting of the programme

The programme was drafted in four workshops. The first and second workshops were attended by working group members as well as separately invited stakeholder representatives, researchers and other experts working in the field. The third and fourth workshops were held for members of the working group. The workshop themes were: 1) the current state of material efficiency and future prospects; 2) the programme vision, mission and critical success factors; 3) programme goal, critical success factors, facilitators and bottlenecks; and 4) programme procedural recommendations.

The working group would like to thank all the experts who participated in drafting the programme.

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		Toimielimen asettamispäivä   Organets tillsättningsdatum   Date of appointment	
Julkaisun nimi   Titel   Title Kestävää kasvua materiaalitehokkuudella – Työryhmän esitys Kansalliseksi materiaalitehokkuusohjelmaksi			
Tiivistelmä   Referat   Abstract Kansallinen materiaalitehokkuusohjelma esittää kahdeksaa toimenpidettä materiaalitehokkuuden edistämiseksi. Ohjelmalla pyritään luomaan edellytyksiä ekologisesti kestäväälle kasvulle ja työpaikoille, edistämään elinkeinoelämän kilpailukykyä ja tasapuolisia toimintaedellytyksiä sekä uusiutuvien ja uusiutumattomien luonnonvarojen kestävään hyödyntämiseen ja vahvaan osaamiseen perustuvan korkean arvonlisän tuotantoon. Ohjelmassa asetettu tavoite on: "kestävää kasvua materiaalitehokkuudella", jolla pyritään samanaikaisesti talouskasvuun, luonnonvarojen viisaaseen käyttöön ja irtikytkentään haitallisista ympäristövaikutuksista. Ohjelma esittää tutkimus ja innovaatio-ohjelman kokoamista tiedon lisäämiseksi, tiedonkulun parantamiseksi ja synergian luomiseksi eri toimijoiden kesken. Yritysten toimintaympäristön parantamiseksi ohjelmassa esitetään hallinnollisen taakan keventämistä muun muassa ympäristölupajärjestelmän selkeyttämisellä. Tämä helpottaa uusien teknologioiden käyttöönottoa, referenssi- ja koelaitosten asianmukaista ja ripeää toteutusta sekä jätteiden ja teollisuuden sivuvirtojen kestävää hyödyntämistä. Ympäristölupamenettelyjen keventämistä ja selkeyttämistä koskevalla ehdotuksella on kiinteä yhteys hallituksen 30.8.2013 tekemän rakennepoliittisen ohjelman ja sen toimeenpanosta 29.11.13 tehtyyn päätökseen. Ohjelma esittää myös tukea määräaikaiselle materiaalikatselmushankkeelle. Sillä kannustetaan yrityksiä materiaalivirtojen selvittämiseen ja tehostamismahdollisuuksien tunnistamiseen Motiva Oyn kehittämän mallin avulla. Mallia on kokeiltu onnistuneesti muutamissa yrityksissä, joissa on saatu säästöjä jopa 20 % materiaalikustannuksista. Pk-yritysten käyttöön on saatava kevennettyjä menetelmiä. Lisäksi ohjelma esittää hallinnon ja yritysten välisen materiaalitehokkuussopimuksen kokeilua materiaalitehokkuuden vauhdittajaksi. Tästä on hyviä kokemuksia Alankomaissa. Lisäksi ohjelma esittää materiaali- ja resurssitehokkuuden EU valmistelun vahvistamista. Luonnonvarojen kulutuksen on arvioitu nykyisellä kehityssuunnalla kaksinkertaistuvan maailmassa vuodesta 2000 vuoteen 2030 mennessä. Lisääntyvää kysyntä merkitsee luonnonvarojen ja materiaalien hintojen nousua. Luonnon resurssien riittävyys on haaste niin taloudelle, ilmastomuutoksen torjunnalle kuin biodiversiteetin ja ekosysteempipalveluiden turvaamiselle. Materiaalitehokkuuden edistäminen on yksi vastaus maailmanlaajuisiin haasteisiin. Suomi poikkeaa monista EU-maista, koska meillä on useita luonnonvaroja, kuten mineraaleja ja metsää, mutta myös tilaa ja puhdasta vettä. Poikkeamme myös energian ja materiaalikulutukseltamme. Tuotamme paperia yli 100 miljoonalle ihmiselle ympäri maailmaa ja uusiutuvan energian tavoitteestamme on tarkoitus täyttää merkittävä osa kestävästi kotimaisella bioenergialla. Jätteiden ja sivuvirtojen paremmalla hyödyntämisellä ja eri toimialojen yhteistyöllä kaatopaikat tulevat lähes tarpeettomiksi. Tuotesuunnittelu, jossa otetaan huomioon tuotteiden koko elinkaaren vaikutukset auttaa myös kuluttajia tekemään parempia kulutusvalintoja.			
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Nationella programmet för materialeffektivitet – hållbar tillväxt genom materialeffektivitet			
Tiivistelmä   Referat   Abstract			
<p>I det nationella programmet för materialeffektivitet föreslås åtta åtgärder för främjande av materialeffektiviteten. Programmet syftar till att skapa förutsättningar för en ekologiskt hållbar tillväxt och arbetstillfällen, att främja näringslivets konkurrenskraft och lika verksamhetsbetingelser samt att skapa högt mervärde som baserar sig på hållbart utnyttjande av förnybara och icke förnybara naturresurser och högklassigt kunskande.</p> <p>Det mål som ställs i programmet är: "hållbar tillväxt genom materialeffektivitet", vilket syftar samtidigt till ekonomisk tillväxt, förnuftig användning av naturresurserna och eliminering av skadliga miljöeffekter.</p> <p>I programmet föreslås att det ska sammanställas ett forsknings- och innovationsprogram för att öka kunskapen, förbättra informationsflödet och skapa synergier mellan olika aktörer. I syfte att förbättra företagens verksamhetsbetingelser föreslår programmet minskning av den administrativa bördan genom bl.a. klarläggning av avfalls- och miljötillståndssystemet. Detta underlättar införandet av ny teknik, ett adekvat och snabbt uppförande av referens- och provanläggningar samt ett hållbart utnyttjande av avfall och industriella sidoströmmar. Förslaget om förenkling och klarläggning av förfarandena för miljötillstånd har ett nära samband med regeringens beslut av den 29 november 2013 om genomförandet av det strukturpolitiska programmet av den 30 augusti 2013.</p> <p>Programmet föreslår också stöd för ett tidsbundet materialkartläggningsprojekt. Dess syfte är att uppmuntra företagen att utreda materialflöden och identifiera möjligheter att effektivisera dem med hjälp av en modell som har utvecklats av Motiva Oy. Modellen har testats med framgång vid några företag som har kunnat åstadkomma besparingar på hela 20 procent av materialkostnaderna. Förenklade förfaranden måste ställas till små och medelstora företags förfogande. För att sätta fart på främjandet av materialeffektiviteten föreslår programmet dessutom ett försök med materialeffektivitetsavtal mellan förvaltningen och företagen. Man har gjort goda erfarenheter av detta i Nederländerna. Programmet föreslår dessutom stärkning av EU-beredningen när det gäller material- och resurseffektivitet</p> <p>Det har beräknats att förbrukningen av naturresurser i världen fördubblas från år 2000 och fram till år 2030 om utvecklingen fortsätter sådan den är i dag. Resursernas tillräcklighet är en utmaning med tanke på såväl ekonomin, bekämpningen av klimatförändring som trygghandet av biodiversiteten och ekosystemtjänsterna. Främjande av materialeffektiviteten är ett av svaren på de globala utmaningarna.</p> <p>Finland skiljer sig från många EU-länder i och med att vi har rikliga naturresurser, såsom mineraler och skog, men också gott om plats och rent vatten. Vi skiljer oss från andra länder också när det gäller energi- och materialförbrukningen. Vi producerar papper för drygt 100 miljoner människor runt om i världen, och en stor del av vårt mål för användning av förnybar energi ska uppnås med hjälp av hållbar inhemsk bioenergi. I och med att avfall och industriella sidoströmmar utnyttjas bättre och att olika sektorer samarbetar blir soptipparna onödiga. Sådan produktplanering som beaktar effekterna under produkternas hela livscykel hjälper också konsumenter att göra bättre konsumtionsval.</p>			
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# Sustainable growth through material efficiency – Working group proposal for a National material efficiency programme

In December 2012, the Ministry of Employment and the Economy and Ministry of the Environment formed a working group to draft a proposal for Finland's national material efficiency programme and investigate opportunities for the development of measurement and assessment.

The stated objective of the programme is: "sustainable growth through material efficiency", which aims to simultaneously achieve economic growth, the wise use of natural resources and disengagement from harmful environmental effects. The operating environment and knowledge, expertise and attitudes of companies are key to success. The measures to be taken are focused on the development of policy control and tools.

Establishing a research and innovation programme to increase the knowledge base and create synergy between different actors is necessary to making wiser choices. To improve the operational environment of companies, the programme supports clarifying and streamlining the environmental permit system. The programme also includes the development and testing of practical tools for companies.

The European Commission is currently preparing a comprehensive resource efficiency policy. Taking features specific to Finland, such as the availability of renewable natural resources and minerals, long distances and climate, into consideration is vital, because future EU actions and material efficiency measurement methods may have a significant impact on the Finnish economy.

The working group also examined the indicators developed to measure and assess material efficiency as well as their suitability. The programme calls for strengthening of Finland's EU preparations.

In product design, companies must take into consideration impacts for the entire product lifecycle. The high degree of production value added and move toward intangible production can be seen at the national economy level. Economic policy choices are key to the management of material efficiency.

The Permanent Secretaries of the Ministry of Employment and the Economy, Ministry of the Environment and Ministry of Agriculture and Forestry report on the progress of the programme. The first report will be published at the end of 2014.

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