

*A Natural Resource Strategy for Finland:*

# *Using natural resources intelligently*



*We are today living in a transitional period, when resources and knowledge need to be combined in new ways to improve controls over natural resource use. This process gives Finland opportunities to gain a competitive advantage, enhance well-being, and bear global responsibility, by pioneering such changes.*

## NATURAL RESOURCES AS AN OPPORTUNITY FOR FINLAND

**As a country that is relatively rich in natural resources and blessed with high levels of know-how, Finland has particular strengths and interests in the context of promoting the sustainable and innovative use of natural resources. If Finland is to continue to thrive, we need a shared vision of our long-term goals and the means to reach them.**

Natural resources meet people's fundamental needs in terms of their physical and economic well-being. Increases in population and consumption mean that natural resource use is also growing, together with the consequent negative environmental impacts. Biodiversity is declining, the functioning of ecosystems is being impaired, and greenhouse gas emissions are rising. Climate change particularly affects the quantities, quality, spatial distribution and usability of many natural resources.

Global competition for raw materials is intensifying. The availability of productive land and fresh water is becoming a major concern. Competition will further increase the growing demand for biomass. Competition for natural resources can change global power relationships and reduce overall levels of security. It is important to be able to create wealth and well-being globally in more sustainable ways. New models are needed for business, policy-making and everyday socio-economic behaviour.

“ **It is important to be able to create wealth and well-being globally in more sustainable ways**

Operating environments are changing rapidly, emphasising the need to reshape production and consumption patterns. We need considerable investments in sustainable production and know-how to support competitiveness, employment and regional development around Finland. At the same time we can export our high-level expertise, take the initiative in international policy-making, and bear our own share of global responsibility.



## NEW OPERATIONAL MODELS NEEDED

**Natural resource use and the related policies are a matter of society's choices. They must be based on our understanding of which resources and operational models can be used to build success in the future. The key issues and their interdependencies must be assessed comprehensively. Without such systemic approaches, the necessary changes cannot be achieved.**

Finland's national economy is exceptionally firmly based on added value obtained from natural resources. In future the demand for such resources will increase. Finland is particularly blessed with plentiful forest resources per capita. Wood is processed to make highly refined export products. Significant reserves of aggregate and peat are also available, primarily for use here in Finland. Finland also has considerable reserves of many minerals, as well as other important abundant natural resources including clean water, undeveloped arable land, and natural products such as berries, mushrooms, fish and game.

Future levels of demand, and the supply and quality of such natural resources will be influenced positively or negatively by factors including population and consumption trends, climate

change and related policies, regulation, developments in international trade, economic conditions, geopolitical power relations, and technological innovations. Water, for instance, will become even more important around the world as many regions where water is in short supply become drier. We may also learn to utilise completely new natural resources, or find new ways to apply known resources. The importance of non-material values based on natural resources and the services derived from them will also increase.

“ **The wealth we can obtain from natural resources obliges us to use them intelligently**

The wealth we can obtain from natural resources obliges us to use them intelligently. Finland's own natural resources can be used to generate employment, new enterprise, well-being and added value. But for this to happen, ecosystems must be cherished to ensure that they will also provide vital services for nature and for people in the future.

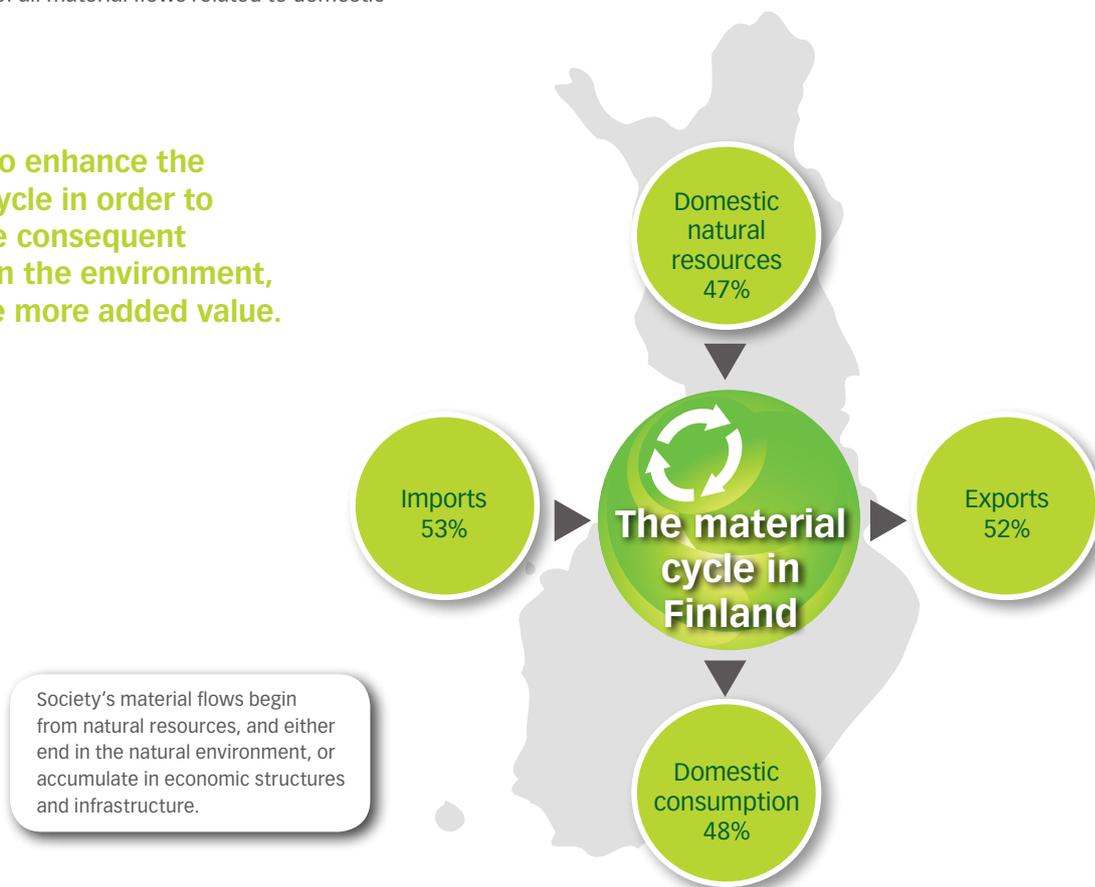
The large-scale refinement of both domestic and imported raw materials is based on a competitive advantage enjoyed by Finland. High levels of know-how are a major national asset. Finland is a leading manufacturer of the equipment designed for the use and refinement of natural resources, for instance. Through exports of expertise and technologies Finland also influences natural resource use in other parts of the world. But this know-how must be enhanced to meet future requirements. Other factors behind Finland's success may include sustainable production processes, high levels of security, the lack of pollution, and the good reputation enjoyed by Finland and Finnish companies. The efficiency of resource use will be a major factor in future competition. Finland can be an attractive destination for investments targeting sustainable natural resource use and resource-efficiency.

Finland's national economy is strongly linked to global material cycles. About half of all material flows related to domestic

production are used for manufacturing products for export. The other half are linked to meeting the demand from domestic consumers (Fig. 1). The most significant imported natural resources are the metals, minerals, chemicals and fuels needed in the pulp and paper, metallurgical and chemical industries. Some of these imports are critical with regard to the refinement of other raw materials and the use of high technology. Plenty of information and resources also flow between rural areas and larger settlements. Future solutions will require extensive collaboration both within Finland and internationally.

Finland needs to enhance the material cycle within the national economy in order to reduce the consequent burdens on the environment, and create more added value. There is also a need to reduce dependency on imported natural resources, enhance the security of supply, and ensure that critical raw materials remain available also from international markets.

“ We need to enhance the material cycle in order to reduce the consequent burdens on the environment, and create more added value.



**Figure 1.** Material flows in Finland 2005. The material cycle includes flows of both materials and energy. (Source: ENVIMAT 2009, Finnish Environment Institute)

## VISION AND STRATEGIC GOALS

### A vision for 2030:

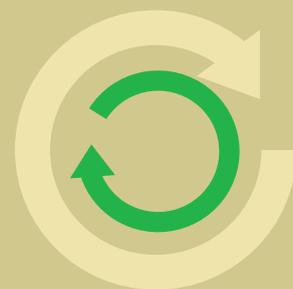
*By using natural resources intelligently, Finland thrives and leads the way.*

The concept of using resources intelligently relates to innovativeness, sustainability and responsibility, which will all be vital for future success. Natural resources can be utilised as a source of well-being and a basis for sustainable economic activities that also safeguard the environment and its biodiversity. Leading the way relates to taking an exploratory and pioneering role in international policy-making and business contexts.

### This vision is to be realised through four key strategic goals:

1. Finland has a thriving bioeconomy generating high added value.
2. Finland utilises and recycles material flows effectively.
3. Regional resources generate both national added value and local well-being.
4. Finland takes initiatives and leads the way on natural resource issues.

Achieving these goals through the steps proposed in this strategy will increase well-being and enhance Finland's competitiveness and security of supply. The implementation of the strategy will enable the decoupling of economic growth from negative environmental impacts. The burden imposed on the environment will diminish. These key issues must be considered when assessing whether the strategy's goals have been reached.



The Natural Resource Strategy for Finland examines natural resources and their use from a wider perspective extending across all sectors of society. Implementing the strategy will help to realise many more goals in areas linked to natural resource use, including targets in climate and energy policies, efforts to safeguard biodiversity, and the reshaping of Finland's forest sector.

## LEADING THE STRATEGY

**To achieve change, the public sector, businesses and civil society must work together towards a shared vision. A new model of leadership will be necessary for this purpose.**

The strategy's vision and goals can only be achieved with the help of a dynamic leadership model, where goal-setting, implementation, evaluation and development work are all seen as parts of a single continuous process (Fig. 2). This approach can be illustrated as follows:

A vision must initially be defined for the direction in which the desired changes should lead in the long term, so that this can be expressed in the strategy's vision and goals. Subsequently the key areas where structures need to be changed simultaneously to reach the desired goals should be identified – together with the first steps that need to be taken in each of these areas. (Fig 3.)



Figure 2. The strategy's systemic and dynamic leadership model.

The strategy's long-term vision and goals define the direction for the overall step-by-step process. Since the operating environment features many uncertainties, it is important to plan progress flexibly, and with repeated evaluations of the situation. The strategy is characterised by the need to recognise barriers, conduct experiments, and learn continuously.

The commitment of actors is strengthened through democratic and participatory procedures and the widely-based preparation of strategic work, as well as equitable dialogues involving various administrative bodies, policy-makers, businesses, research and training organisations, civil society and the media.

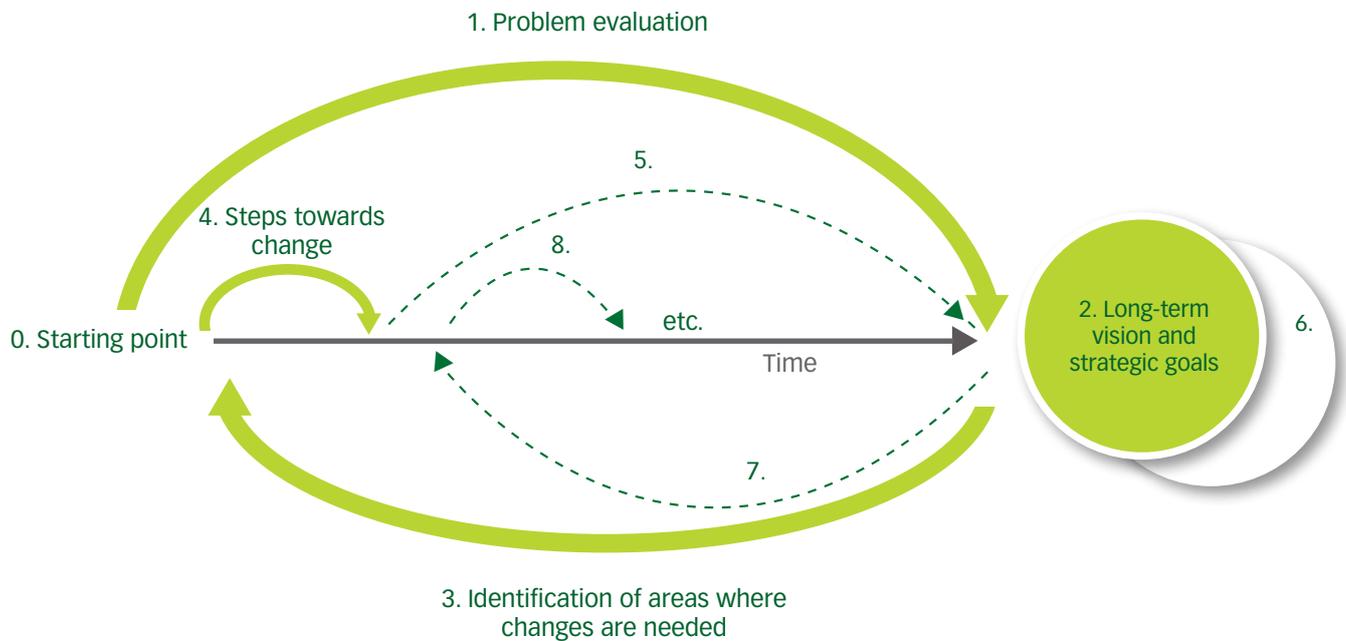
Change will only be possible if a new leadership model is devised for the implementation of the strategy. The following first steps will be necessary in this context:

1. The basic starting points for the natural resource strategy must be included in the interim review of the government programme, with decisions made on the first steps to be implemented.
2. A preparatory process must be initiated, aiming to set up a permanent high-level body to oversee the implementation of the strategy and the coordination of natural resource policies. This body will serve under the Prime Minister (e.g.

“ **The strategy is enhanced by recognising barriers, conducting experiments, and learning continuously** ”

as an economic and natural resource council). This process will be realised jointly by the Prime Minister's Office and the present Economic Council, Natural Resources Council and Sustainable Development Committee.

3. This body will then lead systemic and gradual change. It will prepare the agenda for an action plan for the implementation of the strategy. Additionally, a set of thematic programmes will also be needed to realise the strategy's key goals. For each programme, groups will be set up to implement steps towards change.
4. Extensive public debate and publicity campaigns will be needed already in the initial stages of the strategic work. The media and non-governmental organisations will play a key role in initiating these processes. Plenty of information will be provided from the outset to encourage journalists and citizens to find out more about related issues.



**Figure 3.** Implementation of the strategy through selected steps leading towards long-term goals.

## AREAS FOR CHANGE

**To reach the strategy's goals, mutually supporting changes will need to be made in many sectors of society.**

The main areas where changes will be needed are outlined below.

### ***I The bioeconomy***

Added value and well-being are primarily generated through efficient, vigorous, adaptable and innovative private enterprise. Businesses develop and provide the products and services valued by their customers. A bioeconomy for the new generation can provide a wide range of business opportunities, applying innovations based on the conversion of different kinds of biomass into various fibres and chemical compounds, and on innovations based on biological processes.

Biomass production can be increased sustainably, providing biofuels that can then be used to generate energy instead of



imported fossil fuels. The bioeconomy should however be seen as providing a wide range of opportunities to utilise natural resources by applying and reproducing biological processes in sustainable ways. Applications are possible throughout society, in areas including the production of energy, materials, foodstuffs, and also health services.

National reserves of wood, water, and other plentiful renewable natural resources are a major asset for Finland in the context of building up the bioeconomy. High quality materials and equipment made out of mineral resources will also be needed in the bioeconomy, but biotechnologies can also be utilised in the mineral economy.

Bio-business and its products gain added value from the safety, purity and responsible management of the environment from which their raw materials are obtained. The bioeconomy also encompasses the development of services, know-how and business activities based on the non-material values associated with natural resources. Natural resources and processes must be cherished for the production of such added value to be sustainable.

### ***II The material cycle***

Building up an efficient material cycle requires an approach that encompasses the whole system of material flows throughout society. Products, services and energy have to be produced in resource-efficient ways, with environmental impacts mini-

mised. The resources to be utilised by society should be kept within the economic system for long periods, so as to maximise added value and minimise the quantities of valuable materials that permanently leave the economic system. Wastes, for instance, should in this sense be seen as raw materials that happen to be in the wrong place.

The product planning phase is critical for material use throughout product life cycles, for products' overall sustainability, and with regard to opportunities for recycling. At the level of communities, tools useful for this type of far-sighted planning include spatial planning processes. A shift towards the production of service and know-how concepts can support a sustainable material cycle.

Sustainable production patterns, innovative technologies and high levels of know-how all improve resource efficiency. The accumulation and utilisation of expertise related to material cycles can open up new business opportunities based on resource

“ **The product planning phase is critical for material use throughout product life cycles** ”

scarcity both in Finland and internationally. From the perspective of global resource efficiency, it is prudent to manufacture goods where resources can be used effectively.

### ***III Regional resources***

Many natural resources are geographically fixed. They may be used either locally, regionally, nationally or internationally. The interrelationships between these different levels in the context of resource use are an important starting point for sustainable processes. Natural resources in rural areas are both a considerable asset for society, and an important basis for industrial activities. Assets associated with larger settlements include economic resources, universities and polytechnics, and concentrations of private enterprise. Future success will be based on our awareness of the interlinkages between different areas, and the ways these different resources can be combined.

National resource production often has pronounced impacts on regional and local employment, public well-being, and the permanence of settlement patterns. Regional production models reduce the need to transport natural resources, while also increasing the security of supply, and ensuring local well-being. Local natural products and the non-material values associated with natural resources (e.g. landscape and recreational amenity values) also create many opportunities for business and increased well-being. Demand is rising for services based on aspects of the environment such as beauty, purity, silence, and health impacts.

#### **IV International cooperation**

Natural resources are used as part of the global economy, and natural resource issues are not constrained by national borders or organisational boundaries. Material flows must therefore be examined and controlled across such boundaries. Climate and energy issues are today largely defined through international environmental policy forums. A sustainable and effective global natural resource policy will support climate policy, but would also be needed and set up regardless of climate issues. Natural resources also have inherent linkages with stability and security.

Active international involvement and campaigning will provide more global partnerships for Finland, and create business opportunities and competitive advantages. International co-operation can help to lessen the disadvantageous fragmentation of controls, and ensure that international rules support the sustainable utilisation of natural resources in Finland.

By taking initiatives, Finland can highlight the need for a global natural resource policy and shared responsibility, while also influencing the handling of natural resource issues in international organisations including the EU, UN, and WTO.

#### **V Administration and regulation**

International competition is getting tougher also with regard to the exploitation of opportunities provided by natural resources. For Finland to be a favourable and attractive operating environment for firms able to use natural resources successfully and sustainably, our innovation system, physical infrastructure, economic policies, legislation and administration must provide the necessary conditions. To support change and improvements in resource efficiency, we need legislation and controls that provide incentives and break down barriers, as well as active influence over EU decisions.

Society's choices must be based on sufficient information and the careful inspection of material flows. The planning and steering of natural resource use is today highly sectorised in the spheres of administration, legislation and research. The use and conservation of natural resources should instead be examined as a single entity, and planned over a sufficiently long time-frame. This will require service models that enable the producers and users of information to meet each other. Increasing competition for productive land, mineral reserves and the various usages of different kinds of biomass will also create international demand for such planning expertise.

#### **VI Expertise and communications**

The need to understand the forces of change that affect natural resources and their interlinkages is increasing, together with the need for foresight. Expertise, innovations and enterprise related to natural resources are spread out across several sectors. To develop the bioeconomy and the material cycle, Fin-

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land's learning and innovation system must produce world class natural resource expertise across such boundaries. Experts' mobility and collaboration is needed internationally, among different sectors, and between business life, research and the administration.

Many of the costs incurred due to the environmental impacts of natural resource use end up being paid by other countries or future generations. Global linkages are often overlooked, and harmful impacts unrecognised. The importance of hidden flows and logistics in impacts is not yet sufficiently understood, for instance. From the perspective of the implementation of the strategy, it is important to identify chains of material flows, their impacts on the environment and society, and the real costs they entail.

It is vital that consumers should get enough information and incentives to support resource efficient choices. Environmental education must be intensified to make children and young people more aware of the significance of natural resources.



## FIRST STEPS TOWARDS CHANGE

The following first steps towards change must be initiated rapidly through various kinds of development projects, as the first phase of efforts to reach the strategy's goals.

In identifying these steps, proposals have also been made concerning the actors who could implement the necessary changes. **It is proposed that the authorities or organisations listed first should bring the various actors together to plan development projects and define who will participate in the necessary work.** Other actors than those listed here will also need to take part in the implementation of the strategy. (See back page for key to abbreviations.)

### 1. Bio-expertise and business activities

Expertise on the reserves and characteristics of various types of biomaterials should be developed, in order to create environmentally sustainable business activities that produce added value. New sources of organic raw materials should be identified,

and related applications developed. Cost-effective biomaterial production and processing technologies should be devised to enable the manufacture of products with high added value. The environmental impacts of such activities should be identified, and prevented as necessary. Risks and barriers hindering commercial activities should be identified and eliminated. Opportunities for businesses in the SME sector should also be examined. (MEE, MAF, MEd, Tekes, VTT, forest industry and other firms, MTK, SHOKs, research institutes.)

“ **Local biorefinery activities should be created as regional networks**

### 2. Biorefineries

The establishment of biorefineries that process organic materials to produce energy and new raw materials should be promoted. Technologies and business models should be developed to promote the utilisation of diverse local biomaterials through regional networks. Models for the development of logistics chains for biomaterial procurement and new purification techniques should be created and tested. (Tekes, MEE, MAF, VTT, forest industry and other firms, MTK, research institutes.)

### 3. Enhancing controls over the material cycle

Calculation methods and measures should be developed to express the use of natural resources and material flows, giving due consideration to hidden flows and the whole logistics chain. Their effectiveness should then be tested in practice. Material cycles should be evaluated in various sectors and at different administrative levels, with systems then devised to

“ **Business opportunities created by the need to restore and close material cycles should be promoted**

support efficient material flows. A national resource efficiency programme should be prepared. (Natural resource strategy coordinating body, Motiva, firms, SYKE, GTK.)

### 4. Product-centred resource efficiency

A national network of expertise on product-centred environmental management should be set up to bring together Finnish expertise in this field. Support should be provided for the integration of design for the environment (DfE) into corporate management systems. The incorporation of the EU's environmental integrated product policy (IPP) into practical steering mechanisms should be promoted both in the EU and at national level. Resource efficiency thinking should be integrated into public sector purchasing policies. Product labelling systems based on material flows and life cycle analyses should be created and adopted for application in evaluating both material and energy solutions. (MoE, MEE, EK, Motiva.)

### 5. Restoring and closing cycles

The utilisation of side streams in production systems as raw materials and sources of energy should be promoted. Data banks should be set up to support material cycles. New concepts enabling wastes to be used for their material and energy content should be demonstrated. Technologies should be developed to utilise valuable materials including those stored in landfills. Measures to close local cycles of materials such as sludge and ash, or restore such materials to wider nutrient cycles, should be promoted. Business opportunities created by the need to restore and close material cycles should be promoted. (MoE, MEE, Tekes, SYKE, GTK, MTK.)

## 6. Businesses' resource efficiency

The resource efficiency of businesses should be increased with the help of advice, qualitative improvements in services, subsidies, or taxation incentives. More economic incentives should be provided to encourage firms to join energy efficiency agreements. Tools and methods should be developed to increase resource efficiency. Technologies and life cycle



planning to enhance energy and material efficiency should be promoted in the construction sector. Developers' expertise on material and energy efficiency should also be increased. (MEE, YM, EK, Motiva, Confederation of Finnish Construction Industries, firms.)

## 7. Services based on non-material natural resources

Steps should be taken to promote services based on non-material natural resources and related expertise, innovations, product development, marketing and business activities. Market-based mechanisms that take into account controls and ownership rights over natural resources should be developed. A knowledge base and business models should be developed to support trade related to natural values, recreational amenity values and related rights, and promote the maintenance of ecosystem services. Conditions for nature tourism should be enhanced. Research and demonstration projects should be initiated to realise the services provided by ecosystems and measure their value. (MAF, MEE, MoE, MTK, SYKE.)

## 8. Dispersed production models

Business models for the dispersed production and distribution of energy, materials and foodstuffs should be developed. Local biorefinery activities should be created as regional networks. Concepts should be devised at national level to reduce the risks faced by entrepreneurs in the field of dispersed production. (MAF, MEE, MoE, Sitra, MTK, regional councils.)

## 9. Interaction between rural areas and growth centres

Awareness of the national importance of rural areas' natural resources should be increased. New expertise and potential for innovation should be created by promoting interaction between rural areas and growth centres. Trials should be initiated to promote networking between rural areas and growth centres in the context of business activities based on natural resources. (Sitra, Rural Policy Committee, MTK.)

## 10. Regional strategies

Complementary regional natural resource strategies and mechanisms for their implementation should be developed to support local strengths and implement the national natural resource strategy. Stakeholders and citizens should be widely encouraged to take part in this work. Resource efficiency perspectives should be incorporated into the funding criteria for regional development financing programmes. (Regional councils, ELYs and other regional actors, Ministry of Finance.)

## 11. Exports of expertise on environmental and natural resource issues

Businesses based on natural resources whose activities are oriented towards exports and internationalisation should be promoted as part of Finland's Cleantech-brand (a trade mark for environmental technologies and expertise). Exports of social innovations that promote the sustainable use of natural

“ **A national strategy for minerals and aggregates should be created, focusing on their long-term utilisation**

resources and administrative, organisational and communications expertise should be supported. To promote exports and internationalisation, the availability of risk financing should be ensured, and opportunities for collaboration with international corporations and organisations including financial institutions should be exploited. Conditions for businesses basing their activities on natural resources should also be enhanced as part of Finland's trade and development policies. (EK, MEE, MFA, Finpro, firms, environment and natural resource research consortium.)



## 12. International measures and rules

The development and adoption of international sustainability criteria, standards, and calculation and monitoring methods that assess natural resource use comprehensively should be promoted. Common international rules should be developed. Market-based mechanisms and international steering policies designed to integrate all of the costs related to natural resource use in prices should also be promoted. Trade policies and other tools should be shaped to help ensure that strategic and critical natural resources remain available on international markets. (MoE, MFA, MAF, business sector.)

“ **Multidisciplinary networks for forecasting natural resource issues should be developed**

## 13. International natural resource policies

Finland should take initiatives and work responsibly towards the creation of international natural resource policies that promote global sustainability, justice, security, and a level playing field for business. Natural resource diplomacy should become an integral part of foreign policy, especially in the contexts of trade and development issues and wider security policy. Natural resource issues should be integrated into Finland's national EU strategy. (MFA, MoE, MAF, MEE, Prime Minister's Office, business sector, research institutes.)

## 14. Strategies for specific natural resources

A national strategy for minerals and aggregates should be created, focusing on their long-term utilisation. The goals of the natural resource strategy should also be considered during the preparation of Finland's national peatland strategy, and in the creation and revision of sectoral strategies guiding the use of various other natural resources. In the preparation of such sectoral strategies widespread participation and active public discussion should be encouraged. (Natural resource strategy coordinating body, MEE, MAF and MoE.)

## 15. Administrative work-sharing, co-operation and regulations

The responsibilities of different administrative sectors with regard to natural resource issues should be assessed, leading to the enhancement of collaboration and work-sharing between the ministries responsible for natural resource use and other authorities, so as to support the natural resource strategy. Legislative and administrative procedural barriers hindering the development of the bioeconomy and the material cycle should be examined. The goals of the natural resource strategy should be duly considered whenever new legislation is drafted. The

need to improve land use planning with respect to the use of natural resources should also be assessed. Natural resource use should be planned with a longer-term timeframe at both national and regional level. (Natural resource strategy coordinating body, MoE, MEE, MAF, Ministry of Justice.)

## 16. Natural resource accounting and economic incentives

Models for evaluating material flows and environmental impacts within the national economy should be developed together with natural resource accounting methods as part of national accounting systems. Their adoption should be tested at various administrative levels and in the commercial sector. Everyday consumer behaviour should be steered with the help of economic incentives and revised taxation policies designed and implemented to support this strategy's goals. (Ministry of Finance, SYKE, Thule Institute, Statistics Finland and other research institutes.)

## 17. Forecasting and integrated expertise

Multidisciplinary networks for forecasting natural resource issues should be developed. International expertise and information supporting the natural resource strategy should be sought more effectively, and co-operation models should be developed to exploit such knowledge. Research and training should be organised to build up expertise on the wider aspects of natural resource issues: networks and coordination should be developed, with structural changes made across institutional and learning boundaries. Networks of expertise, including centres of expertise and strategic centres for science, technology and information (SHOKs) should be encouraged to focus on the natural resource strategy and support its goals. (MEd, Sitra, Prime Minister's Office, Finpro, SHOKs, research institutes.)

## 18. Training for decision-makers

A training programme should be launched for key decision-makers within society, covering natural resource issues comprehensively on the basis of the national strategy. (Natural resource strategy coordinating body.)



## THE PREPARATION OF THE STRATEGY

For Finland to succeed in the future by using natural resources intelligently, wide-ranging and fundamental changes will have to be made. By bringing various actors together in the process of shaping the national strategy, the Finnish Innovation Fund Sitra has aimed to help identify and enable the necessary changes.

The Natural Resource Strategy for Finland has been created through wide-ranging collaboration involving politicians, administrators, business representatives, researchers, organisations and the media. To support the strategic acquisition of information an extensive network of experts was set up, to assist the strategy group through seminars and information transferred via the internet. All interested parties were given the chance to participate in the creation of the natural resource strategy through an open web-based tool that compiled respondents' suggestions on which issues the work on the strategy should address, and how. The outcomes of thematic events arranged as part of the LUODIN communications campaign, which was organised jointly by various sectors, were also utilised.

As part of its role as an independent fund acting under the supervision of the Finnish Parliament, Sitra, the Finnish Innovation Fund, assumed responsibility for the planning and coordination of the strategy work, as well as related reporting. Responsibility for implementing and developing the strategy lies with political decision-makers, everyone who has participated in the work of preparing the strategy, and other actors throughout society. The strategy was submitted to the Prime Minister in April 2009. The strategy group, which operated from October 2008 to February 2009, included the following members:

**Sirkka Hautojärvi** (Chairperson)

**Tarja Cronberg**, Finnish National Commission on Sustainable Development FNCSD (Minister of Labor)

**Elina Grundström**, Vihreä Lanka

**Ensio Hakkarainen**, Confederation of Finnish Construction Industries RT

**Marko Hakovirta**, Metso Corporation

**Michael Hornborg**, Central Union of Agricultural Producers and Forest Owners (MTK)

**Jussi Kahlos**, Finnish Forest Association

**Ilkka Kananen**, National Emergency Supply Agency

**Lea Kauppi**, Finnish Environment Institute

**Ilmo Kolehmainen**, Metsähallitus (State Forest Enterprise)

**Juha Kuisma**, Finnish Museum of Agriculture

**Tellervo Kylä-Harakka-Ruonala**, Confederation of Finnish Industries EK

**Esko Lotvonen**, Regional Council of Lapland

**Marjo Matikainen-Kallström**, Parliament of Finland

**Pekka Nurmi**, Geological Survey of Finland

**Piia Nurmi**, Turku School of Economics, Finland Futures Research Centre, Centre for Responsible Business

**Annika Nyberg Frankenhaeuser**, Finland's National Public Service Broadcasting Company

**Hannele Pokka**, Ministry of Environment

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**Markku Stenborg**, Ministry of Finance

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**Petteri Taalas**, Finnish Meteorological Institute

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**Hannu Vornamo**, Chemical Industry Federation of Finland

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**Eero Yrjö-Koskinen**, Finnish Association for Nature Conservation

**Henrik Österlund**, Motiva

Sitra's natural resource team included: **Eeva Hellström** (Project Director) **Tapio Anttila**, **Eero Mikkola** (Finnish Forest Research Institute, Metla), **Jaana Roos** (Academy of Finland), **Johanna Soininen** and **Jonna Stenman**.

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**SITRA**

Sitra, the Finnish Innovation Fund

KEY to abbreviations used on pages 8-10:

EK – Confederation of Finnish Industries  
ELYs – regional economic, transport and environment centres  
GTK – Geological Survey of Finland  
MAF – Ministry of Agriculture and Forestry  
MEd – Ministry of Education  
MEE – Ministry of Employment and the Economy  
MFA – Ministry for Foreign Affairs  
MoE – Ministry of the Environment  
MTK – Central Union of Agricultural Producers and Forest Owners  
SHOKs – Strategic centres for science, technology and information  
Sitra – Finnish Innovation Fund  
SYKE – Finnish Environment Institute  
Tekes – Finnish Funding Agency for Development and Innovation  
VTT – Technical Research Centre of Finland

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