

Background Material for the Government Research Policy Bill
Formas's Research Strategy for
2009–2012



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Formas's Research Strategy for 2009–2012



Foreword

Formas (the Swedish Research Council for Environment, Agricultural Sciences and Spatial Planning) has revised its previous research strategy. The new strategy covers the period 2009–2012 and the goal is to strengthen Swedish research within the areas that fall under Formas’s responsibility. The strategy is Formas’s contribution to the 2008 Government Research Policy Bill.

Formas’s activities are primarily concerned with gathering knowledge about natural resources and their sustainable utilization and finding new ways to achieve sustainable construction and urban and rural development.

The Government research bill “Research for a better life” (2005) identified three priority areas, one of which was Sustainable Development. This part called for allocation of additional funds to Formas totalling SEK 180 million up to 2008. These funds were mainly to be used for research on climate, biodiversity and sustainable development. Funds were also earmarked for spending on strong research environments, qualifying positions and postgraduate programmes in the Council’s various areas of responsibility.

It is clear from the present strategy that many previous priorities and urgent research areas will be the same during the coming period. At the same time there are a number of new areas whose importance has grown and where society’s need for more knowledge has become increasingly urgent. Formas would like to emphasize the importance of research in support of environmental technology development aimed at finding environmentally preferable substitutes for society’s materials, services and processes. Formas also points out that opportunities are largely lacking today for researcher-initiated research in entire value chains, including upgrading of the raw materials from forestry and agriculture.

Finally, Formas remains committed to the further internationalization of Swedish research and to maintaining Sweden’s position as a leading research nation.

Stockholm, January 2008

Rolf Annerberg
Director General



Rolf Annerberg
Director General Formas



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Message to the Government

- The Swedish state's spending on civilian research has decreased as a proportion of GDP. Formas has to turn down many excellent research applications today. At least one percent of Sweden's GDP ought to go to civilian research. This assessment is shared by the Government's Globalization Council.
- Sustainable development requires well educated people and knowledge based on research. A carefully balanced mix of basic research and need-driven research of the highest scientific quality is needed.
- Swedish research should be further internationalized in order to enhance the quality of the research, contribute to the solution of large-scale sustainability problems and use resources more efficiently. Formas intends to create and strengthen internationally leading research groups.
- National cooperation with public authorities, foundations and industry in research funding continues to be important for Formas. This permits strategic prioritizations.
- Completely researcher-initiated research regarding industrial upgrading of the primary products of forestry and agriculture is hardly possible today. Formas can assume this responsibility, provided additional funds can be made available.
- The fact that the proportion of female researchers decreases as their careers advance is a loss to research and society. The universities and research councils must together work actively to promote an even gender distribution in researcher recruitment and careers. Attention must also be given to the importance of ethnic origin and diversity.
- It is vital that the research be put to good use. Many researchers today have little dialogue with the surrounding society. A dialogue is important to ensure practical application of the results, to determine the direction of the research and to obtain support for the research. Formas intends to be an active force for change.
- Formas prioritizes the following areas: climate and energy, management of natural resources and the environment, urban and rural development, environmental technology and new materials, and quality of life for humans and animals. Formas intends to be a leading source of funding for research in these areas.



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Sustainable development – a challenge that requires research

The world's population faces the common challenge of achieving sustainable development, so that the planet's nonrenewable resources and environment are not consumed or irrevocably degraded to the detriment of future generations. The world's socioeconomic and technical systems must be changed so that a sustainable utilization of natural resources and the environment is possible. Such development requires well educated people and knowledge obtained from research.



Scientific progress in Formas's research areas

The description of scientific progress in Formas's research areas is based on:

- Evaluations of research (construction, architecture, organic production, Skogforsk, JTI and other targeted research programmes)
- Overviews of research areas ("national programmes" for climate, food, environmental toxicology)
- Research strategies (fish and fisheries, rural development, social environmental research, environmental technology)
- Knowledge overviews (research on biodiversity, urban research, sustainable reindeer husbandry)
- Calls for applications for excellence grants ("Formel-Exc", "Linnaeus", Nordic grants in climate and food and SLU's excellence grant, where Formas was in charge of the selection process)

Scientific excellence

Scientific excellence means that a researcher or research group has a leading international position in terms of *peer review* publication, participation as a *keynote speaker* at important conferences, an ability to attract prestigious research funds, involvement in research communication and an ability to sustainably recruit PhD students and postdocs.

There is wide variation in excellence between subareas, research groups and individual researchers. This is natural, but it can also be a problem if there is a lack of leading research competence in areas of nationally strategic importance.

Research area	Disciplines with one or more excellent research groups*
Environment and nature	Biogeochemistry including greenhouse gases, ecology, microbiology, environmental toxicology, interdisciplinary environmental research
Agricultural sciences, animals and food	Animal health, physiology (plants and animals), genomics (plants and animals), food, mycology, virology
Spatial planning and building research	Demographics, property development, fire – physics – management – design – materials in construction, indoor environment, environmental economics, environmental psychology, persistent organic pollutants, urban research

* Criteria – see page 13.

The table shows disciplines with one or more identified excellent research groups in Formas's three research areas.

Several relatively large disciplines, which Formas judges to be of strategic importance for the country, have been found to be fragmented or have weak international presence and prestige. This is especially true of architecture, organic production and rural development.

Trends in research

Researchers and funding agencies have shown increasing interest in several research areas since 2001:

- Research on climate issues, resource utilization, environmental effects and biodiversity
- Research on management of ecosystems, which has become more holistic and increasingly includes social science aspects
- Studies of large-scale phenomena over both societal and ecological gradients
- Research on cities – their sustainability, environmental impact, attractiveness and governance
- Research on the functions of genes
- Research on the quality of life of humans and animals, which includes both physical and psychosocial health

There are at the same time urgent areas where research has declined, deteriorated or has not yet taken off to a sufficient extent. There are also areas where, despite relatively great efforts, the research has not yet been able to answer urgent social questions.

1. Important research areas that have declined or deteriorated	2. Important research areas that have not taken off to a sufficient extent	3. Important research areas where urgent questions have not been answered
Architecture Applied subjects in the area of forestry and agriculture (at universities) Actions in an ageing built environment Urban water management	Rural development Social environmental research Urban development Synergy effects of pollutants	Moisture in buildings* Indoor environment and health Baltic Sea environment*

** There is insufficient understanding of the mechanisms of the "implementation deficit", i.e. why no significant improvement occurs in the situation despite the fact that problems and necessary measures have been identified.*

Trends in funding

Formas's funding forms have changed in several ways since 2001:

- Cooperation with other funding agencies has taken off, both nationally and internationally in the framework of ERA-Net.
- Strong research environments have been funded via our own call for proposals ("Formel-Exc"), with the Swedish Research Council ("Linnaeus support") and within the framework of the Nordic Council (Nordic Centres of Excellence).
- Formas has developed processes for identification and announcement of strategic initiatives, within the framework of the third of the research funds that have been used for targeted, need-driven research.
- Interdisciplinary research has been given greater priority and the work forms have been developed. Such research now has its own call for proposals, budget and selection process with special assessment criteria.



Vision for Formas

Formas belongs to the stratum of internationally leading sources of funding of research for sustainable development – research which is of both the highest scientific quality and socially relevant. Formas funds the best researchers and is an attractive cooperation partner, both nationally and internationally. Formas funds both basic research and need-driven research. The research and the research results are well known in the outside world and are leading to change.



Strategic considerations for Formas

Role and responsibility – research of the highest quality and relevance

Goal for 2012

Formas will belong to the stratum of leading and well reputed European sources of funding for high-quality basic research and need-driven research for sustainable development.

Means of achieving this

Research funded by Formas will promote sustainable development and growth. The ecological dimension will continue to be in focus, but research aimed at the economic and social dimensions of sustainability is also required. This means that research is needed in all scientific areas, as well as interdisciplinary research.

Formas will continue to invite applications for research funds both in an open call for proposals and in strategic initiatives. The relative proportions between these approaches will be constantly evaluated. Only research of the highest scientific quality and social relevance will be funded. The results of the research will be published in international scientific journals with *peer review*.

In order to find the best project proposals, incoming applications will continue to be reviewed by prominent Swedish and international researchers (*peers*). Individuals from companies, public authorities and organizations will participate in assessment of the relevance of the applications.

Formas will evaluate the effects of the research support more systematically than before. The evaluations will preferably be performed by international experts, particularly with regard to scientific quality. Publication and citation analysis will be used to an increasing extent. Formas will work to ensure that the results of the evaluations are made known and put to use.

Different forms of support for research

Goal for 2012

Formas will contribute to both cutting-edge and broad initiatives. Formas will enable new PhD recipients to go into research. Interdisciplinary research will be given greater emphasis, along with research with a genus perspective. Formas will contribute to strengthening important but currently fragmented and weak areas. Formas will also develop forms for supporting scientific syntheses and knowledge overviews.

Means of achieving this

Support to cutting-edge research will take the form of support to particularly excellent research groups. Formas is already supporting several such projects within the framework of “Formel-Exc” and “Linnaeus support”. Additional Linnaeus-related calls for proposals are being considered during the period up to 2012.

A large proportion of the research support will continue to be given to PhD students. However, Formas intends to increase the proportion that goes to postdoctoral positions, for example research assistantships. Formas believes that increased international recruitment is urgent.

Topics in sustainable development are often multifaceted. Formas will therefore continue to issue special calls for proposals of an interdisciplinary nature. Methods for issuing calls for proposals, assessment of applications and support to prominent research groups will be refined.

Evaluations have shown that several important research areas, such as architecture and rural development, are weak and fragmented among many institutions of higher learning. They lack critical mass and are in need of new recruitment to the ranks of researchers. Formas will support the work of the institutions of higher learning to promote the positive development of such research areas.

Formas is responsible for promoting research with a genus perspective. The problematization of genus is of crucial importance for how the research questions are formulated, analyzed, interpreted and finally communicated. Formas will work actively to increase the proportion of applications and projects that include the genus perspective.

Users of research results, as well as researchers, can benefit greatly from syntheses. This need is only met to a small extent today. Funding opportunities are lacking. Formas intends to work to change this.



National cooperation

Goal for 2012

Formas will be an attractive cooperation partner for other leading research funding bodies. Cooperation with the Swedish Research Council, VINNOVA (the Swedish Governmental Agency for Innovation Systems) and the Swedish Energy Agency will be intensified. Funding of research in entire value chains will be facilitated.

Means of achieving this

Cooperation is necessary for strategic prioritization and resource-efficient funding of research. Formas's cooperation with the other research councils, VINNOVA and other funding bodies, such as the research foundations, will be further developed and deepened.

Formas and the Swedish Research Council are already cooperating in the climate area. Cooperation in other areas as well will be facilitated by the Swedish Research Council's plans for prioritized basic research programmes.

Formas and VINNOVA should develop cooperation on funding of research and innovation. The research strategy for environmental technology is an important platform. Coherent research on value chains (primary production – consumption) in the forestry and food sectors should be facilitated. Today Formas's responsibility ends at the threshold to industry. There VINNOVA's responsibility takes over, although usually in the form of large "top-down" controlled programmes. Formas should be able to fund researcher-initiated research in entire value chains, including upgrading of the raw materials from forestry and agriculture.

Formas and the Swedish Energy Agency should be able to issue joint calls for proposals for energy-related research in the agriculture, forestry and construction areas. The strong link between energy and climate research is an important factor here. Formas's collaboration with other research-funding state authorities such as the National Rail Administration, the Swedish EPA and the National Road Administration should concern strategies, calls for proposals and evaluations. Other government agencies – such as the National Board of Housing, Building and Planning, the Swedish Board of Agriculture, the National Food Administration and the Swedish Forest Agency – are important beneficiaries of Formas-funded research, so a dialogue with these agencies is important.

Formas will continue to co-fund research together with industry in the forestry and agriculture sector, for example via Skogforsk and the Swedish Institute of Agricultural and Environmental Engineering (JTI). Other institutes also work in the same areas as Formas, such as the Swedish Environmental Research Institute (IVL) and the Swedish Technical



Research Institute (SP), for which there are good opportunities for co-funded research. Cooperation should continue with the Swedish Farmers' Foundation for Agricultural Research (SLF), with joint calls for proposals. Formas, SLF and the Swedish Energy Agency should cooperate with regard to bio-energy questions in agriculture.

In the construction and housing sector, Formas's cooperation with the Construction Sector Innovation Centre (BIC) will play an important role. Joint calls for proposals will be carried out, including within the framework of the European network ERABUILD, which has links to the European Construction Technology Platform (ECTP).

The link to the European technology platforms will be developed in Formas's other areas as well. National implementation will be intensified in the forestry, food and construction sectors. This is an important arena for initiation of research. The state and industry should develop effective forms of collaboration here.

Formas's good contacts and cooperation with the science academies – KVA (the Royal Academy of Sciences), IVA (the Swedish Academy of Engineering Sciences) and KSLA (the Royal Academy of Agriculture and Forestry) – will continue to be of great importance. The cooperation concerns the planning and implementation of seminars and conferences plus various projects, for example knowledge reviews and "foresights".

International cooperation

Goal for 2012

Researchers in Formas's areas will participate at the forefront of international research via scientific publication, conferences and project participation.

Means of achieving this

Within the EU's framework programmes, priority will be given to those areas where Formas has principal responsibility as the competent Swedish authority. Formas will continue to be active in the ERA-NET programmes of importance for Sweden, and try to get support from the EU for the most interesting ones (ERA-NET+ or Article 169 projects). Formas will continue to support activities within the European Science Foundation (ESF) and also contribute to Swedish activities in the European Research Council (ERC) and the European Institute of Technology (EIT).

The Nordic countries will continue to be an important arena. Coordination should be improved during the period up to 2012 in order to provide overview and better quality in the selection procedure and the research. Formas will contribute

to creating and maintaining strong Nordic research environments. The role of Nordic cooperation as a springboard to broader European cooperation is important.

Outside of Europe, Formas will also cooperate with the USA, China and Japan. Formas intends to broaden its commitment to research in and about developing countries. Cooperation with Sida/SAREC (the Department for Research Cooperation within the Swedish International Development Agency) should be consolidated and broadened in cooperation with other funding agencies as well.

Formas will continue to contribute financially to international conferences in Sweden, the participation of Swedish researchers at conferences abroad, postdoctoral stays by new Swedish PhD recipients in other countries and stays by visiting researchers at Swedish universities.



Research communication

Goal for 2012

There will be a developed dialogue between researchers in Formas's areas and the surrounding society. Formas-funded research and its results will be readily accessible and well known in the surrounding world.

Means of achieving this

Research-based knowledge is crucial for sustainable development, but the knowledge must be known outside the research community. In collaboration with universities and other relevant actors, Formas will ensure that research-based knowledge is readily accessible and of practical benefit.

Many researchers have an undeveloped dialogue today with the surrounding society, despite the fact that such a dialogue is crucial for exploitation of the results of the research and for confidence in and support for research. Formas intends to work for a change by promoting the merits of research communication and by arranging meetings between researchers and different interest groups.

Formas gives support to teaching researchers. This enables the research to be integrated in the instruction, which is very beneficial for quality of the education. Formas is the only research funding agency today to fund information projects via a special call for proposals. Formas will continue doing this and will also advertise the call for proposals better.

The website and the magazine continue to be important in providing information on Formas's research. All projects will be searchable on the website. Formas intends to increase its efforts to compile knowledge reviews and become involved in new media and international research communication. Together with others, Formas will continue to contribute to web portals for information on research as well as to "expertsvar.nu", a researcher contact tool for the media.

Gender equality and ethnic diversity

Goal for 2012

Formas's secretariat and selection organization will be gender-equal. The proportion of women and men applying to Formas for funds will be roughly equal. The selection process will treat women and men equally. Formas will work for ethnic diversity in its own activities and in the research world.

Means of achieving this

The different perspectives offered by people of different genders and ethnic backgrounds enrich the research.

It is therefore a problem that the proportion of female researchers decreases so sharply as their careers advance. It should be possible to improve the situation by means of joint measures by institutions of higher learning and research councils. In this way the percentage of women among applicants for Formas projects can increase from 35 percent today to around 50 percent in 2012. Formas's personnel and selection organization will continue to have an even gender distribution. The selection process for research applications will not discriminate against either sex.

More attention should be given to the importance of ethnic background in research. The ethnic diversity of society should be reflected at the secretariat, in the selection organization and among the researchers.

Need of research infrastructure in Formas's areas

Goal for 2012

Implementation of good research ideas will not be hampered by a lack of suitable infrastructure.

Means of achieving this

Today's research requires access to advanced, large-scale, expensive equipment, sometimes so costly that several countries



have to collaborate on investment and operation. Large-scale infrastructure is needed in Formas's areas, mainly in the food, environmental and materials sciences. The Swedish Research Council's Committee for Research Infrastructures (KFI), on which Formas is represented, works to meet the infrastructure needs of Swedish research. Projects in KFI's long-range plan that are of interest to Formas are LIFEWATCH (biodiversity), ICOS (Integrated Carbon Observation System), EMSO (European Multidisciplinary Seafloor Observatory) and DISC (Database InfraStructure Committee). An urgent question for this research is how all the data collected by researchers and by various authorities can be coordinated and made available to research in a cost-effective manner.

Central research themes for the future

Formas has identified five themes that are urgent for sustainable development, each of which spans Formas's three areas of responsibility: "Environment and nature", "Agricultural sciences, animals and food" and "Spatial planning". They will have top priority in 2009 – 2012. They will require efforts in all scientific areas and contain the three dimensions of sustainability: ecological, economic and social. The genus perspective is of general relevance.

Climate and energy

Further research is needed to counteract the greenhouse effect and to mitigate its consequences. Urgent research concerns the exchange of greenhouse gases between the biosphere/society and the atmosphere, effects on man, nature and society, the need for adaptation in the various sectors of society, and suitable policy instruments. Society's energy use is crucial for how the climate changes. Collaboration with the Swedish Energy Agency is therefore urgent.

Natural resources and environment

The survival of mankind and other organisms is dependent on our finding a way to prevent the depletion of nonrenewable resources and environmental degradation. Research is needed to enable society to achieve sustainable use of natural resources and ecosystems, to replace nonrenewable resources with renewable ones, and to stop environmental degradation. Research is also important for preserving biodiversity.

Environmental technology and new materials

The aim of development of environmental technology is to find environmentally preferable substitutes for society's materials, services and processes. Formas's and VINNOVA's research strategy points to different possibilities. Advances in biotechnology are making it possible to find substances in nature with unique properties that can lead to environmentally friendly applications. Research on the genetic modification of animals, plants and microorganisms can play an important role. Materials science, with nanotechnology and



light advanced materials, is a dynamic area with great practical potential. Research in the entire field should generally shed light on both opportunities and risks.

Urban and rural development

Most inhabitants of Sweden today live in three metropolitan regions. Large parts of the rest of the country have declining population bases for services and industry. Research is needed to show how cities can contribute to a better environment, be attractive and interact in a positive way with the surrounding countryside.

The old land-based industries (agriculture and forestry) are still dominant in rural areas, but the perspective is now broadening to include other forms of livelihood as well. Research is urgently needed on how rural industry, services and housing can be developed sustainably.

Quality of life for people and animals

Prerequisites for a high quality of life include meaning, security, social contact and health. There are many threats, but at the same time great opportunities for a higher quality of life. Formas's research responsibility mainly applies to the importance of the environment. Research is needed on the impact of the environment's physical properties and the occurrence of chemical substances, but also on the interaction between humans, animals and microorganisms. Important issues related to the quality of life of both people and animals concern the effects of climate and pollution, the design of the living environment, food handling, and the importance of diet.





Formas's resource needs

The research councils, VINNOVA, SUHF and the science academies have jointly proposed that the state's spending on civilian research should amount to at least one percent of GDP. The Government's Globalization Council has made the same assessment. Formas's research covers some of Sweden's most economically important sectors (construction, forestry, food), but also many of the necessities of life (clean air, clean water, arable land, biodiversity, aesthetic values, etc). Formas believes that a gradual increase in spending is needed, reaching SEK 600 per annum in 2012, for a reasonable funding of the best and most urgent research. The following breakdown should be regarded as indicative and may change when it becomes clear what resources are available.

Breakdown of funding:

- SEK 250 million per year under Formas's open call for proposals to fund the applications with the highest scientific quality and relevance – around 25-30 percent. So far (2001 – 2007) the grants have only sufficed to fund about 15 percent of the applications received.
- SEK 100 million per year in increased support to strong research environments – the goal should be that by 2012 there are at least 2-3 groups for each of the five central themes Formas has identified and at least 4-5 within each of Formas's three research areas.
- SEK 50 million per year in increased support to post-doctoral positions for young researchers.
- SEK 100 million per year for new strategic initiatives in urgent areas.
- SEK 50 million per year for special measures where it is urgent to promote the internationalization of the research.
- SEK 50 million per year to researcher-initiated research within industrial upgrading of the raw materials from agriculture and forestry.

Formas, the Swedish Research Council for Environment, Agricultural Sciences and Spatial Planning, is a governmental research-funding agency. Formas encourages and supports scientifically significant research related to sustainable development.



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