BELGIAN FEDERAL PUBLIC PLANNING SERVICE SCIENCE POLICY

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Research programme
"Science for a Sustainable Development"
(SSD)

RESEARCH AREAS "CLIMATE" AND "ATMOSPHERE"

Call for proposals 1

June 2005

Closing dates

Expression of interest (obligatory): Friday 8 July 2005

Research proposals: Friday 29 July 2005 at 3:30 p.m.

INFORMATION FILE FOR USE BY PROPOSAL SUBMITTERS

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FOREWORD

- This document contains all potentially useful information for the teams wishing to participate in the call for research proposals for the research areas "**Climate"** and "**Atmosphere" (incl. Antarctica)** of the **"Science for a Sustainable Development" research programme**.

- The Public Planning Service (PPS) Science Policy supervises and coordinates the Programme on both the scientific and administrative level.

- The call is intended for research proposals with a period of **2 or 4 years**, prepared by **interdisciplinary networks of 2 to 5 teams** belonging to at least two separate scientific institutions, including at least one university institution.

- The call is intended for **Belgian university institutions, public scientific institutes, non-profit research centres and specialised consulting offices**. The participation of specialised consulting offices is limited to a maximum of 25% of the total budget requested by the network.

- The project may require a punctual expertise which can be delivered in **subcontracting** form. Such subcontracting may under no circumstances be greater than 25% of the total budget requested by the network and 50% of the budget requested by the network partner which wants to call on subcontracting.

- The submitters have the possibility of proposing a cooperation with a **non-Belgian** university or research institute. This participation will take place on a co-financing basis. Maximum 50% is paid by the PPS Science Policy and this amount is limited to 20% of the overall budget of the submitted proposal.

- The research network must be able to deal with the issue on the national scale. Within this context, a cooperation between partners from **different Communities or Regions** is encouraged.

- The personnel financed in the project must be **recruited under an employment contract**.

- This call offers the possibility of using earth observation data via a cooperation with the Space Research and Applications Service and for supplementary research within the framework of international commitments of the federal government via a cooperation with the Service for International, Interfederal and Interdepartmental Coordination of the PPS Science Policy.

- The expressions of interest and the proposals must be submitted in **English.** The proposals are accompanied by a summary in the coordinator's language. If the submitters deem it useful, a version of the proposal can also be submitted in the coordinator's language.

- The submitters are obliged **to comply with the modalities** provided for in this document. Otherwise the PPS Science Policy will not consider their proposal.

- Interested parties must submit an expression of interest, using the on-line form that must be completed on the PPS Science Policy website (http://www.belspo.be), at the latest by **Friday 8 July 2005. Only those who submit an expression of interest may later submit a complete proposal.** These expressions of interest will be used by the PPS Science Policy **only** in order to **seek foreign**

experts for the evaluation of the research proposals.

- The proposals must be sent **in five copies** to the following address:

PPS SCIENCE POLICY
RESEARCH PROGRAMME "SCIENCE FOR A SUSTAINABLE DEVELOPMENT"
"CLIMATE" AND "ATMOSPHERE"
WETENSCHAPSSTRAAT 8 RUE DE LA SCIENCE
B-1000 BRUSSELS

The proposals must **also be sent in electronic form** to:

SSD_call1@belspo.be

The proposals (paper and electronic versions) must reach the PPS Science Policy at the latest by **Friday 29 July 2005 at 3:30 p.m**.

- Closing dates:

Expressions of interest: Friday 8 July 2005

Research proposals: Friday 29 July 2005 at 3:30 p.m.

1.1 Context

The following elements from the international, European and national context can act as important beacons for maintaining economic growth, appropriate social development and protection of the environment. They offer a frame of reference for the various actions planned within the Programme.

1.1.1 On the international level

- The Amsterdam Treaty which among others emphasises the necessity of integrating the environmental dimension into the definition and implementation of the various policy guidelines of the European Union.

- The Lisbon Strategy, whose objective is to position the European Union as the world's most dynamic and competitive knowledge economy, via balanced economic, social and ecological innovation whereby one proceeds among others on the assumption that the development of a top-quality scientific potential is indispensable for creating a knowledge economy. The European Council (Brussels, March 2005) gives a new impulse to the Lisbon Strategy aimed at growth and employment in a context of sustainable development, whereby the role of knowledge and innovation is reconfirmed.

- The strategy of the European Union for a sustainable development - Göteborg Strategy (internal and external dimension).

- The various commitments which Belgium has made within the framework of different international Conventions and Agreements[1], the recommendations formulated by various international organisations[2], as well as the entirety of European directives and strategic plans which Belgium must satisfy in the areas involved.

- The efforts which have been made for some time now with regard to the creation of a European Research Area (6th Framework Programme, 7th Framework Programme), in particular the strengthening of cooperation at the level of research projects and programmes (networks of excellence, ERA-NET).

- The positioning of international institutions such as the European Commission regarding basic research as an essential link within the innovation process. Combining basic research - targeted research - multidisciplinary approaches makes developments possible which take all of the necessary parameters into consideration for the creation of new services, new technologies and new products.

- The initiatives of the OECD and other international organisations concerning the dissemination of scientific information and data, proceeding on the assumption that information and data exchange forms the basis for the development of cooperations and delivers an added value to individual actions. The participation of states implies that they offer support to both the production (thus to research) and the organisation of information.

1 Agenda 21, the Implementation Plan of the WSSD (World Summit on Sustainable Development), the Framework Convention on Climate Change (UNFCCC) and the Kyoto Protocol, the Vienna Convention and the Montreal Protocol, the Convention on Long-Range Transboundary Air Pollution (LRTAP), the Convention on Biological Diversity (CBD), the Antarctic Treaty and the Madrid Protocol, the declarations of the interministerial North Sea Conferences, the OSPAR Convention for the Protection of the Marine Environment of the North-East Atlantic Ocean, the Aarhus Convention, the Millennium Declaration of the UN, the Doha Declaration of the World Trade Organisation (WTO), the Frankfurt Charter, the Helsinki Agreement on Health and Environment...

2 International Labour Organization (ILO), World Health Organisation (WHO), Organisation for Economic Cooperation and Development (OECD)...

1.1.2 On the national level

- The priorities of the government coalition agreement of 10 July 2003, in particular those mentioned in the following chapters:

  - The chapter "Environment, mobility and sustainable development", in which the following problems are cited: environment, mobility, consumer protection and food safety and, more specifically, the implementation of the Kyoto Protocol, research on and development of renewable energy sources, a renewed multidisciplinary approach to the mobility problem, active support of global biodiversity, progress on the sustainable development policy, the development of an integrated product policy, the protection of the North Sea...

  - The chapter "Two hundred thousand new jobs" aimed at the introduction of new measures to keep older citizens working, improve the quality of work and prevent work-related accidents and occupational illnesses...

  - The chapter "Oxygen for knowledge and enterprise", in particular the efforts with regard to new incentives for research and development, further liberalisation of the energy markets, better protection of consumers (encouraging responsible consumption, discouraging excessive debt loads, etc.).

  - The chapter "A more equitable world", which postulates that Belgium wishes to introduce an active policy concerning fair world trade and will strive for a more humane globalisation.

- The Belgian position with regard to the European spring summit (Brussels, 25 and 26 March 2004) which among others confirmed that:

  - *"The revision of the Sustainable Development Strategy of the European Union by the end of this year will be an occasion to give a new impulse to priority environmental themes such as sustainable transport, climate, energy, natural resources, public health and biodiversity..."*

  - *"The European Union must continue to play a pioneering role on the international level with regard to environmental protection and must make the necessary efforts in order to strengthen international "governance" in the environmental area, to implement the Millennium Declaration and the objectives established in Johannesburg, to work on a common framework in order to assure the follow-up of the most important UN conferences and to strive for implementation of the Kyoto Protocol."*

  - *"Belgium is a proponent of the Commission's Environmental Technologies Action Plan, an ideal instrument for integrating the three pillars of sustainable development."*

- The conclusions of the Council of Ministers of Ostend (20-21 March 2004) concerning the topic "Quality of Life" which dealt with the following levers: social security and social exclusion, the elderly and pensions, the environment and Kyoto, traffic safety and mobility, large city policy, health and the working environment, nuclear and extended families, social economy and administrative simplification.

- The various policy plans and policy strategies which are being implemented or being prepared on the national and federal level, such as the National environment and health plan (NEHAP), the National climate plan, the National ozone plan, the Federal Sustainable Development Plan, the National mobility plan, the national biodiversity strategy...

- The various (sectoral and trans-sectoral) policy plans and policy strategies elaborated at the level of the Regions and the Communities.

- The decision of the Council of Ministers of 6 February 2004 to proceed in 2007 with the setting up of a Belgian summer base in Antarctica.

- The Government's commitment with regard to achieving the 3%- objective concerning research and development, one of the pillars of the Lisbon Strategy.

- The position of the PPS Science Policy within the Belgian research landscape, which offers possibilities for:

  - the analysis of trans-sectoral or horizontal themes which correspond to the competences of different federal departments;

  - the analysis of problems managed on different levels of authority (federal, Regions, Communities).

1.2 Objectives of the Programme and ways of implementation

1.2.1 Strategic and operational objectives

From a **strategic** perspective, the objectives of the Programme are:

- to preserve and develop the scientific potential in various strategically important areas, with the objective of reducing scientific uncertainties and anticipating future needs for knowledge;

- to offer the authorities of the country the scientific support which is necessary for the preparation, implementation and follow-up of a supranational, federal, regional or local policy in and between these areas;

- to offer the Belgian research potential in the areas involved the possibility of integrating themselves into the various research initiatives on the European and international levels, in particular within the European Research Area.

From an **operational** perspective, the proposed Programme will contribute to develop scientific knowledge and instruments (databases, models, concepts, indicators, etc.) aiming to:

- the analysis of processes: understanding, monitoring, evaluating and forecasting processes and their mutual interactions which are at the basis of the functioning of both anthropogenic and natural systems;

- the study of impacts: evaluating the effects on the environmental, social and economic levels of changes/evolutions in the processes and in their mutual interactions;

- the development, follow-up and evaluation of (existing and/or future) policy measures, on the basis of criteria such as efficiency, feasibility, acceptability... Among other things, the research will study policy measures which are focused on prevention, adaptation, remediation, management...

1.2.2 A diversified way of implementation

In order to be able to fulfil these objectives, the Programme provides a diversified approach which:

- devotes attention to **sectoral**, **trans-sectoral** and **integrated** approaches to the concerned issues;

- encourages **interdisciplinary** research, in order to be able to offer support to decision-making processes on the basis of an integration of different dimensions, perspectives, etc. of the concerned issues and to promote dialogue and information exchange between scientists, decision-makers and other involved actors;

- offers space for **oriented basic research** (projects of 2 or 4 years) and **targeted research actions** (projects of 2 years):

  - **oriented basic research** will anticipate needs, in particular on the level of policy, by playing a future-oriented role and/or an alarm-sounding role and eliminating specific uncertainties, in order to offer a scientific basis for decision-making. Oriented basic research also contributes to (inter)national research efforts.

  - the **targeted actions** aim to formulate, within relatively short periods, answers to specific policy issues on the (inter)national level. This can involve a complementary applied research, exercises integrating scientific results, harmonisation proposals, standardisation of data and information...

- offers possibilities for the **internationalisation of Belgian research**, via:

  - the opening up of this Programme to foreign researchers;

  - the initiatives aimed at cooperation and synergies between national thematic research programmes, such as ERA-NET (European Research Area –Networks). The Federal Science Policy is currently involved in a number of ERA-NET projects[3]. This implies in the future the possibility of the development and implementation of joint transnational activities such as joint calls, clustering of projects, etc.;

  - support for the participation of Belgian researchers in international and supranational research programmes and networks, such as those of the European Science Foundation, the European Union, the International Energy Agency, the United Nations, the International Council for Science, etc.

- promotes **cooperation between research projects** which are financed within the different research areas of the Programme and/or within the framework of other initiatives of the PPS Science Policy and which are mutually complementary or demonstrate points in common (**clustering**). The intention of this is to ensure a greater coherency in research and to give the research an added value in the specific fields.

1.3 Research priorities

The priority research areas of the present Programme are linked to the national and international context described above. The entirety of the priority research areas was chosen because of the necessity to deal with the complex, global, interrelated problems which lie at the basis of a sustainable development policy. This choice responds to the strategic needs, on different levels of authority, for policy-supporting research and to the challenge to maintain and develop a national scientific expertise in complex and strategically important areas.

3 ERA-NET TRANSPORT (transport research), MARINERA (marine sciences), BIODIVERSA (biodiversity research), AMPERA (Accidental Marine Pollution), EUROPOLAR ERA-NET (polar research), SKEP (Science based knowledge for environmental policy), CIRCLE (Climate Impact Research Coordination for a Larger Europe). (http://www.cordis.lu/coordination/era-net.htm)

The **priority research areas** are the following:

- **Energy**
- **Transport and mobility**
- **Agri-food**
- **Health and environment**
- **Climate (including Antarctica)**
- **Biodiversity (including Antarctica and the North Sea)**
- **Atmosphere and terrestrial and marine ecosystems (including Antarctica and the North Sea).**

Within these priority research areas, the Programme encourages the submission of proposals on questions concerning **standardisation**.

The goal of the research actions is to support both specific decision-making for sector-related problems and decision-making relating to trans-sectoral problems. The Programme promotes **interactions between the priority research areas**, in order to be able to respond to common and complex problems such as air pollution (tropospheric ozone, aerosols...), environment-health relations, the impacts of genetically modified organisms (GMO´s), the life cycle of products and services, renewable forms of energy, the challenge of globalisation, the integrated management of coasts and basins...

The research must take account of the (complexity of the) interactions between the priority research areas. This forms an essential guideline throughout the programme (the calls for proposals, the selection and management of projects, the valorisation of research results).

For this are planned:
- the integration of interactions and common themes in the appropriate calls;
- joint calls between the priority research areas;
- the "clustering" of projects which cover different aspects of common and complex problems.

In order to better translate/operationalise the concept of sustainable development, in and between the priority areas, **transversal and generic research** is necessary. Accordingly, the Programme includes a "Transversal research" part, in order to deal with the following questions:
- the change of unsustainable production and consumption patterns;
- the role of spatial and temporal dimensions of sustainable development;
- the search for and analysis of instruments to support a sustainable development policy, in particular instruments aimed at a better equilibrium between the social, economic and environment-related pillars of sustainable development.

The priority research areas and their mutual interactions are described in **Annex I** to this document. Each research area is developed in detail in the corresponding call.

1.4 Continuity with SPSD I, SPSD II, the “Workers' healthcare” and “Standardisation” programmes

The research programme “Science for a Sustainable Development” is the continuation of the first and second Scientific Support Plan for a Sustainable Development Policy (SPSD I (1996-2001) and SPSD II (2000-2005)).

Compared to SPSD I and II, the Programme integrates new themes, namely "Health and Environment" and "Standardisation". These themes build upon the preceding programmes “Workers' healthcare” and “Standardisation and Technical Regulation”, which both formed part of the Scientific Support Plan in order to integrate the concepts of quality and safety of production environments, processes and goods into a context of sustainable development (1998-2003).

On the one hand, all submitters of research proposals **must take account of the research activities which were conducted in the previous programmes** (see www.belspo.be/fedra).

On the other hand, a **research proposal that is a continuation of a project** financed within the framework of the aforementioned programmes must **clearly describe the relationship and the added value** of this proposal with respect to the preceding project. The PPS Science Policy will provide to the experts who are in charge of the scientific evaluation of the proposals (see point 4.2) the relevant English-language material (final and/or interim scientific reports, findings of evaluations, etc.).

These elements will be taken into consideration when evaluating the research proposals.

1.5 Complementarities with other research actions

The research will be performed taking into account:

- the other (preceding and/or current) research actions of the PPS Science Policy:
  - the research programmes Information Society, Belgian Coordinated Collections of Micro-organisms (BCCM), Social cohesion, Agora, Earth Observation Research Programme (STEREO), Interuniversity Attraction Poles (IUAP), Technological Attraction Poles (TAP), Action in support of the federal authority's strategic priorities, Society and future, etc.;
  - the research within the federal scientific institutions.

- other research actions carried out on the federal, regional or community levels.

Depending on the priority research areas of the Programme, the calls for proposals will establish more direct relations with certain of these research actions (see e.g. point 3.5.1).

1.6 Indicative calendar of future calls for proposals

Taking into account the resources made available during the period 2005-2009, various calls for proposals will be launched with regard to the different research areas of the Programme, in conformity with the following indicative timetable:

	2005	2006	2007	2008
Energy		call 2		call 4
Transport		call 2		call 4
Agri-food		call 2		call 4
Health and environment		call 2		call 4
Climate (incl. **Antarctica**)	call 1			call 4
Biodiversity (incl. **Antarctica** - **North Sea**)		call 2	call 3	
Atmosphere, terrestrial and marine ecosystems (incl. **Antarctica** - **North Sea**):				
Atmosphere	call 1		call 3	
Terrestrial ecosystems		call 2	call 3	
Marine ecosystems		call 2		call 5
Transversal research		call 2		call 4

Calls:

- **Call 1**: publication planned mid-2005; projects of 2 or 4 years
- **Call 2**: publication planned end 2005 - beginning 2006; projects of 2 or 4 years
- **Call 3**: publication planned beginning 2007; projects of 2 years
- **Call 4**: publication planned end 2007 - beginning 2008; projects of 2 years
- **Call 5**: publication planned end 2008; projects of 2 years

2. CONTENT OF THE PRESENT CALL

The present call fits within the research areas "**Climate"** and "**Atmosphere" (incl. Antarctica)** of the **research programme "Science for a Sustainable Development"**.

2.1 Context

The scientific knowledge which is necessary to support a climate and atmosphere policy within a context of sustainable development is based on a wide range of disciplinary and interdisciplinary research conducted across all of the natural and socio-economic sciences. It requires a better understanding of the functioning of the earth system, the interaction of biophysical and socio-economic systems on various temporal and spatial scales.

The research on climate and atmosphere must take account of the following two particularities:

- The interdependency of different time scales:
  Because of the inertia of the earth system's subsystems, the climate will stabilise only decades, centuries or millennia after emissions are reduced ; an equilibrium must be sought between more short-term adaptive measures and emissions reduction measures...

- The interdependency of different spatial scales:
  Most problems transcend the borders of a single country, a single continent... and require a worldwide approach. Moreover, one finds that a geographic inequality exists between the causes and the impacts of climate and atmosphere problems. In order to be able to deal coherently with these global dimensions, it is of fundamental importance to integrate the Belgian research into international research activities.

2.2 Priority themes within the research areas "Climate" and "Atmosphere"

The various research pillars are grouped into two main subparts (2.2.1 and 2.2.2). The objective of the first is to improve our understanding of the evolution of the climate system and atmospheric processes as well as their interactions. The second part is oriented towards providing multidisciplinary support to the preparation and evaluation of the emissions reduction policy and of the policy of adaptation to the climate changes. A third part (2.2.3) is open for research to support the development of standards for monitoring and implementing the climate and atmospheric policy.

Antarctica, which makes a special contribution to the study of climate changes, is one of the privileged research areas. Taking into account the strategic and logistical context of research in Antarctica and the Southern Ocean, priority will be given to Antarctica research that is of such a nature that the data required for the research must come from Antarctica and the Southern Ocean[4].

2.2.1 Understanding the climate system and atmospheric processes

Over the past ten years, research has made great progress in the area of understanding the climate system and the chemistry of the atmosphere. It has been demonstrated that various connections exist between the composition of the atmosphere and global environmental problems: climate change, eutrophication,

4 In execution of the Belgian law implementing the Madrid Protocol, all Belgian activity in Antarctica is subject to the permit obligation. For every activity written approval must be requested from the federal Minister of Environment. Possible exceptions to this are Belgian scientific Antarctica activities which fit within expeditions organised by other Treaty signatories and for which a permit has already been obtained.

acidification, thinning of the stratospheric ozone layer, and so on.

But very many uncertainties still exist: about processes such as the feedback mechanisms between ozone, the oxidation capacity of the atmosphere and climate changes; the role of aerosols, the ocean or sea ice in climate dynamics; the resilience capacity of the stratospheric ozone layer... There are also uncertainties associated with the projections of the atmosphere and the climate: the prevention of extreme events, critical threshold values beyond which changes become irreversible ...

The sub-part "Understanding the climate system and atmospheric processes" includes two research pillars within and between which projects must fit: the study of the **processes** on the one hand, and the **forecasting of trends** on the other.

Process studies

- Refinement of modules for climate models with a view to improving the models and reducing the uncertainties coupled with the models.

  - Biogeochemical cycles (C and N):

    - study of the role of the oceans, marginal zones, estuaries and the Southern Ocean in the C- and N-cycle and determination of the temporal variability of C- and N-fluxes;
    - study of atmosphere – ocean – sea ice interactions, their impact on physical and (micro)biogeochemical cycles and processes and their relationship to climate changes.

  - Study of the climate in the past with a view to better projections of the climate in the future:

    - quantitative determination/reconstruction of climate history and of historical climate changes, via paleoclimatological research of among others ice cores and marine sediments (e.g. in Antarctica);
    - the more precise and further identification of the causes of climate change: natural versus anthropogenic.

  - Dynamics of ice caps and glaciers:

    - the Antarctic cryosphere as indicator of climate changes: understanding the interactions and internal processes which control the ice cap, historical and future changes in the ice dynamics, quantitative determination of the stability of the ice cap...
    - the impact of climate changes on continental margins in Antarctica: qualitative and quantitative process studies of the stability of continental margins and glacial slopes;
    - the role of sea ice in climate dynamics: defining and understanding the key factors which determine sea ice stability and their relationship to climate changes.

- gain better insight into the interactions between the evolution of the climate system and constantly-recurring extreme meteorological conditions such as ´El Niño´, monsoons and tropical storms;

- better understand the mechanisms and factors which influence the climate system (including biogeochemical cycles, aerosols, clouds, stratospheric ozone, etc.) and study interactions between climate, changes in the atmosphere, the thinning of the stratospheric ozone layer and excess ozone in the troposphere;

- further analysis of known and new processes and conditions which lie at the basis of the destruction of ozone in the stratosphere, above the North and South poles and over Belgium;

- development of methods for and the study of physical-chemical characteristics of aerosols and their impact on the tropospheric ozone problem and the climate;

- role of biogenic hydrocarbons in the tropospheric ozone problematic.

Forecasting trends

- Performance of integrated and detailed research to evaluate the concept of and prevent ´dangerous anthropogenic interference of the climate´ cf. ´*dangerous interference*´ (article 2 of the *UN Framework Convention on Climate Change* (UNFCCC, 1992). In order to assess the changes in the emission pathways which are necessary to stabilise the climate and to prevent the average world-wide temperature from rising 2 °C above the pre-industrial level, one must understand the series of causal relationships between the emissions and the temperature and identify the sources of the climate system's inertia.

- Understand and make projections of regional and global climate changes and climate extremes on the basis of high-resolution climate modelling on various temporal (short and long-term) and spatial (regional, global) scales and, if possible on the Belgian level with a view to: developing integrated models for impact assessment, the evaluation of vulnerability, proposals of adaptation options, predictions of the frequency and magnitude of extreme conditions, the identification of threshold values for e.g. non-linear and/or irreversible sudden changes. For impact research, it may be necessary to develop a mechanism allowing rapid application of model results (regional and global).

- Understanding of the role and impact of the Southern Ocean and of changes in Antarctica on the global climate system, including the interactions with and impact on other regions for forecasting climate changes.

- Integrated modelling of the atmosphere:
  Further development of integrated atmospheric models and/or their modules. These models must make it possible to perform projections of changes in the atmosphere taking into account natural phenomena, anthropogenic activities and policy measures concerning climate change or air quality... with a view to an integrated air quality and climate policy.

2.2.2 Support for the preparation and evaluation of the climate policy

A long-term vision of what is considered as a suitable solution for the climate change problem is necessary, on the global, European and national levels. The actions to be conducted in the short term must derive from this long-term vision, since one must guarantee that during the coming decades the options remain open to meet the climate objectives in the future. Establishing these long-term ambitions entails that one switches from the traditional, largely economic-inspired policy to a reflection aimed at global sustainability.

The research must be sensitive to this conception of time which is necessary in order to arrive at a combination of short-term political feasibility with objectives of a long-term climate policy (such as the European objective of a temperature change of maximum 2 °C). This **long-term vision** is at the same time a common framework for all of the research to support the preparation and evaluation of the climate policy and its first research pillar. The second research pillar relates to the **international negotiations post-2012** and the potential consequences of the different international climate-related policy options on the world. The third research pillar relates to **the Belgian policy for reducing greenhouse gases and for the adaptation** to climate changes.

Long-term vision

This is a matter of reflecting on the coherency and complementarity between actions to reduce greenhouse gases and/or to adapt to the climate changes which must be conducted on different time scales, on the limitation of the total costs which are associated with a **proper timing** and a good management for the changeover to economic practices which are sustainable in sectors such as energy, industry, transport, land use, agriculture and forestry. In a perspective of sustainable development, the measures to be taken must concern both the **supply** and the **demand** side.

The research will devote attention to the role of transversal policy areas in the long-term transition to a less carbon-intensive society.
However, the role of land-use planning - and the related transport and housing policy - in a sustainable development policy (air quality, mobility, biodiversity, social cohesion, employment... and climate change) will be addressed within the framework of the calls "Transversal actions" and "Transport".

The role of **technological innovation** in the long-term approach to climate changes can also be studied with an emphasis on how current technologies can be converted into solutions for a distant future[5].

International post-Kyoto negotiations

Research can be conducted on **the possible architecture of the future international climate policy.** This concerns the delivery of input for the post-Kyoto negotiations by studying the scope and nature of the participation of every party, including their rights and duties. This includes among others the emission pathways which are compatible with the long-term reduction requirements, the participation of the developing countries, the taxonomy of the objectives, the rules and directives for defining the objectives, the policy-supporting instruments...

Future-oriented research will **study the potential consequences of the different international policy schemes concerning climate** on geopolitics over the medium and long terms, on international trade, migration movements... or will evaluate more generally the social, economic and environmental consequences over the long term and in the world.

Support of the Belgian climate policy (within a context of an integrated air quality and climate policy)

Every sustainable answer to climate changes must be a combination of a policy aimed at emission reduction and a policy aimed at adaptation. Given the time scales considered, the two are inseparably linked with one another.

Knowledge of the impacts can, through awareness-raising and a political determination to act, be an incentive to the development of measures aimed at emission reduction and measures aimed at the anticipation of the consequences. Moreover, such knowledge can help in the definition of the limits to adaptation and thus express the need for emission reduction.

The research will identify the necessary elements for weighing the socio-economic costs of reduction strategies with those of adaptive strategies: the costs of the measures, the damage costs, the benefits of avoided damage and the external costs or benefits including the evaluation of the effects – positive or negative – on other questions concerning the atmosphere. The research will present means for minimising or offsetting these costs.

- Evaluation and preparation of emission reduction measures

5 The European Council (Brussels, March 2005) recalls that innovation and technology are important levers within the framework of the Lisbon Strategy and emphasises the necessity of urgently implementing the Environmental Technologies Action Plan (ETAP).

Within the framework of the previous programmes, the first and second "Scientific Support Plan for a Sustainable Development Policy" (SPSD I and SPSD II), various simulation models of greenhouse gas emissions were developed in order to evaluate the instruments and measures with which greenhouse gas emissions in our country can be reduced.
What is involved in the framework of this call is not the development of new models, but the use and/or adaptation of **existing** national or international **models** in order to study questions which are relevant for Belgium. The proposal will have to explicitly defend the superiority of the chosen model compared to the other available models for producing an answer to the policy question studied.

These questions will relate to the evaluation from an economic, social and environmental perspective of the (sectoral or transversal) **instruments and measures** for greenhouse gas reduction adopted by Belgium, both on its territory and outside of it (flexible mechanisms). Each evaluation of measures for greenhouse gas reduction must take account of the effects on other emissions and atmosphere-related issues. The analysis must take place in terms of costs-benefits for society, with special attention for the related distributional aspects and the social impacts.
In addition, one can also study the effects on greenhouse gas emissions of policy choices or policy measures which are not specifically climate-oriented (including the air quality policy).

The research will take account of the **Belgian context**: the federal structure of Belgium, the role of Belgium in Europe and in the world. Moreover, special attention will be paid to the integration of **technological progress** in the models and, more broadly considered, to the consequences of technological change and innovation within the framework of the climate policy.

The research will also empirically study the results of **earlier Belgian policy choices concerning emission reduction.**

- Evaluation and preparation of adaptive measures to climate changes

The goal of the adaptive measures is to mitigate the negative consequences of climate changes and to make use of their possible benefits. Whether the options are well-founded is based on a thorough assessment of the consequences of the climate changes on human beings and the environment. In turn, this assessment depends on:

- the accuracy of the climate forecasts on different temporal and spatial scales (for outlining the adaptation policy, both the average variations and the extreme events are taken into consideration);
- a good analysis of the interaction of the environmental and socio-economic problems, as well as a clear view of their development.

The research to support an adaptation policy will, within the framework of this call, relate to the development of **instruments for an integrated management and for the evaluation of the risks** of climate changes on **vulnerable (eco)systems or sectors of activity**[6] .

Whatever the chosen sector or (eco)system might be, the research will integrate the social, environmental and economic dimensions.

It will be performed on an **appropriate scale** which, in particular, will depend on the **availability of scenarios and data in the area of climate, socio-economic and environmental aspects**. Hereby one will work together closely with the scientific community which develops the **local climate models** and with the involved stakeholders.

The research will study the (legal, institutional, economic, social, environmental...) limitations which go together with the application of an adaptation policy. It will study the – positive or negative – consequences on the adaptation policy of other measures (e.g. sectoral measures).

6 The vulnerability of a system or of a sector takes account of its sensitivity and its autonomous adaptability.

The research to support measures for greenhouse gas emission reduction in specific sectors such as energy, transport and land use as well as the studies on the biological, physical and chemical consequences of climate change on ecosystems and biodiversity will be addressed within the framework of call 2.

2.2.3 Standardisation

Within the above-mentioned priority research topics "climate" and "atmosphere", the Programme encourages taking the aspect of standardisation into account. This will take place either in a separate proposal, or in a proposal submitted within the framework of the parts 2.2.1 or 2.2.2.

It concerns:

- prenormative research that must make it possible to contribute to the drafting of standards;
- research that must make it possible to identify impacts, problems and shortcomings concerning standardisation;
- research that analyses the role of standardisation as an instrument for a climate and atmosphere policy aimed at sustainable development.

3.1 Type

The present call offers room for **oriented basic research** (projects of 2 or 4 years). Oriented basic research will anticipate the needs, particularly on the policy level, by playing a future-oriented role and/or an alarm-sounding role and eliminating specific uncertainties, in order to offer a scientific basis for decision-making. Oriented basic research contributes in general to the (inter)national research efforts.

3.2 Duration and budget

For the **themes "Climate" and "Atmosphere",** in principle the Programme foresees **two calls** (see table in point 1.6), for which a **total budget of 12.85 MEUR** is available.

The research projects of the **present call** have a **duration of two or four years**. Taking into account the resources made available, the projects selected within the framework of the present call will start at the end of 2005. The **second call** for the themes "Climate" and "Atmosphere" (planned for the end and the beginning of 2007, respectively) will only be open for research projects with a **duration of two years**.

Attention: the available budget for new proposals submitted within the framework of the second call for the themes "climate" and "atmosphere" will be very limited – and possibly zero, since the initial contract for 4-year projects selected within the framework of the present call will only attribute the budget for the first two years; the budget for the second phase is attributed in the event of a positive intermediary evaluation (see point 4.3).
The budget for these following calls thus depends, firstly, on the share of 4-year projects selected in this call and, secondly, on the results of the intermediary evaluation of these projects.

3.3 Networks and coordination

3.3.1 Network

Each proposal must be submitted in the form of an **interdisciplinary network,** composed of 2 to 5 financed teams which belong to at least two separate scientific institutions, of which at least one will be a university institution.

The network partners conduct complementary activities on a common issue and on the integration thereof.

All financed teams jointly share the obligations and responsibilities for the implementation of the project. The contribution of the partners of the network can vary as a function of the content and consequently result in a different share in the budget and the number of man-months - without losing sight of the principles of a network project.

The call is intended for **Belgian university institutions, public scientific institutes, non-profit research centres and specialised consulting offices.** The participation of specialised consulting offices is limited to a maximum of 25% of the total budget requested by the network.

The project may require a punctual expertise which can be delivered in the form of **subcontracting**. This subcontracting may under no circumstances be greater than 25% of the total budget requested by the network and 50% of the budget requested by the network partner which wants to call on subcontracting.

The network can include a **non-Belgian university or research institute**. This participation will take place on a co-financing basis. Maximum 50% is paid by the PPS Science Policy and this amount is limited to 20% of the overall budget of the submitted proposal.

The research network must be able to deal with the issue on the national scale. Within this context, a cooperation between partners from **different Communities or Regions** is encouraged.

The personnel financed in the project must be **recruited under an employment contract**.

3.3.2 Coordination

A **coordinator** must be designated in each proposal. The coordinator must, besides his scientific and management qualifications, be capable of preparing a synthesis and an integration of the research results and interpreting them for applications and as support to decision-making. The specific role of the coordinator is:

- the coordination of the entirety of the activities which must be carried out within the framework of the project;
- the coordination of the internal meetings between the members of the network;
- the coordination of the meetings with the Monitoring Committee and the reports of these meetings;
- the coordination of the interim and final reports of the project intended for the PPS Science Policy;
- the communication to the PPS Science Policy of any problems which might interfere with the proper implementation of the project;
- the coordination of the summary and the translation of research results, for applications and support to decision-making;
- the coordination of the publication and dissemination of research results.

3.4 Follow-up Committee, valorisation and data

3.4.1 Follow-up Committee

Each selected project is accompanied by a Follow-up Committee. The objective of this committee is to provide an **active follow-up** of the project and to promote the **valorisation of the research**, via the exchange and provision of data and information, the offering of advice, the suggestion of avenues of valorisation... This committee is convened once or twice a year (or more, if necessary).

The Follow-up Committee is composed of **potential users of the results** such as representatives of public authorities on the national, regional, European or international levels, social actors, scientists, industrial actors... The members of the Follow-up Committee are unfinanced partners.

In the proposal, the submitters must describe the profile of the members of the Follow-up Committee (institutions and a list of possible members). The actual composition is established in consultation with the PPS Science Policy. The committee will consist of at least 5 people.

3.4.2 Valorisation

Each project must include **concrete proposals for valorisation** of the research. This involves for example the organisation of thematic debates and meetings, proposals for dissemination and popularisation of the results, proposals to integrate data into computerised databases on the national and international levels, the elaboration of targeted messages intended for experts, policy makers, managers on the content of specific

results, whereby the limitations, uncertainties, hypotheses and methods used, etc. are specified. The target groups of these valorisation proposals must be explicitly described.

3.4.3 Data and intellectual property

Concerning the use of existing data or the collection of new data, the proposal submitters must take the following guidelines into account:

- the partners will as far as possible make use of existing (official or unofficial) data files which correspond to the needs of the proposed research. In so doing, they must explore whether the databases are accessible and how much time the acquisition procedure will take. They must provide the required budgets for their acquisition. If, after the start of the research, it appears that due to the carelessness of the researchers the data files will *not* be available in time, this can constitute a reason for the PPS Science Policy to cancel the contract;
- if the proposal includes a form of data collection (e.g. survey), it must be clearly and convincingly argued - referring to the objectives of the study - why this particular data collection is required and deserves preference over other approaches: added value compared to existing databases and data collection methodology (sampling, etc.). The partners must provide the required budgets for the realisation of the data collection;
- given that the data which are collected within the framework of the proposed research must also be available for other purposes (e.g. other research teams), the proposal must clearly indicate when and in what format the data are made accessible.

The research contract (see point 4.3) provides that the network of financed teams will transfer the entire intellectual property of the results deriving from the implementation of the project to the PPS Science Policy. By ´results´ must be understood all works performed, the collected data, the developed source codes and object codes of the developed programmes, the obtained interim results, the specifically developed methodology, and more generally everything which will be derived from the various stages and the entirety of the implementation of the project.

This transfer includes neither what is or will be found in the public domain, nor what finds itself in the possession of the network or one of its members prior to the start of the project, elements which are hereafter called ´the excluded elements´.

Therefore the proposal must:

- describe how the entirety of the results will be transferred to the PPS Science Policy;
- specify the ´excluded elements´.

3.5 Interactions with other initiatives of the PPS Science Policy

3.5.1 Space Research and Applications Service

Like other sources of information, remote sensing from space can contribute to better understanding and monitoring the evolution of the ecosystem Earth. A scientific expertise in this area is being progressively developed in Belgium, particularly through the various phases of the programmes TELSAT, STEREO, VG and the future STEREO II programme. The research within these programmes ranges from thematic basic research to pre-operational applications.

In order to make possible the conversion from earth observation data to useful "information", a multidisciplinary approach is necessary which requires close cooperation between the above-mentioned programmes and the programme "Science for a Sustainable Development".

This cooperation is translated into the following specific modalities:

- provision - based on justification - of the necessary earth observation data to the research teams;
- the strengthening of the support capacity to the user community in general, via maintenance of an information and help service of the "EODesk" type: http://telsat.belspo.be.

3.5.2 Service for International, Interfederal and Interdepartmental Coordination[7]

Certain projects (or parts of projects) can be expanded **at a later stage** by complementary research within the framework of an international cooperation. In order to be eligible for this type of project expansion at a later stage, the candidates must include in the proposal a declaration of intent (section 4 of the submission file; see point 4.1.2), where they must list the foreign partners and describe the added value which is brought in by the cooperation.

This complementary research must be situated within the context of:

- the commitments in the field of research which the federal government has made within the framework of international organisations, such as the various relevant organisations of the United Nations/UNESCO (Intergovernmental Oceanographic Commission (http://ioc.unesco.org), World Heritage Programme); the World Conservation Union (http://www.iucn.org); NATO - CCMS (Committee on the Challenges of Modern Society); the International Energy Agency (Implementing Agreements), etc.;
- the bilateral agreements for science and technology with China, Russia and Vietnam.

These complementary research projects have a maximum period of 2 years and can be the result of a request from one or several partners of the network.

The financing of this type of complementary project can cover both the research activities of the Belgian partner and the stay of foreign employees in Belgium during the period of the project.

7 Note: the possibility of including a non-Belgian partner in the network (see point 3.3.1) is different from the possibility of supplementary research in collaboration with the Service for International, Interfederal and Interdepartmental Coordination, as described in point 3.5.2.

4. PROCEDURES

4.1 How to answer this call for proposals?

The submission takes place in two steps, first by filing an expression of interest and then by filing a research proposal.

4.1.1 Expressions of interest

The interested parties must, using the form intended for this purpose, submit an expression of interest. These expressions of interest will be used by the PPS Science Policy **only** in order to **seek foreign experts for the evaluation of the research proposals**.

Expressions of interest are submitted in **English**.

The interested parties are asked to use **exclusively** the on-line form which must be completed on the PPS Science Policy website:

http://www.belspo.be

The completed on-line form must reach the PPS Science Policy at the latest on:

Friday 8 July 2005

The PPS Science Policy will ignore expressions of interest submitted after the closing date.

Only those who submit an expression of interest may later submit a complete proposal.

4.1.2 Submission of a proposal

General guidelines

The proposal is submitted by an **interdisciplinary network** in accordance with the conditions set forth in point 3.

The submitter is asked to use **exclusively** the forms which can be downloaded from the internet site of the PPS Science Policy (http://www.belspo.be).

No annexes to the submission file will be taken into consideration during the evaluation and selection procedure.

The proposal is submitted in **English** in **5 copies**[8].

The proposal must be sent to the following address:

PPS SCIENCE POLICY
RESEARCH PROGRAMME "SCIENCE FOR A SUSTAINABLE DEVELOPMENT"
"CLIMATE" AND "ATMOSPHERE"
WETENSCHAPSSTRAAT 8 RUE DE LA SCIENCE
B-1000 BRUSSELS

The proposal must also be sent in electronic form to the following address:

SSD_call1@belspo.be

The proposal (paper and electronic versions) must reach the PPS Science Policy at the latest on:

Friday 29 July 2005 at 3:30 p.m.

The PPS Science Policy will disregard proposals which are submitted after the date and the hour of closing of the call.

Forms

Each proposal includes four separate sections. Section 4 is optional and only applies if the proposal is supplemented by a research proposal within the framework of the activities of the Service for International, Interfederal and Interdepartmental Coordination of the PPS Science Policy (see point 3.5.2).

Section 1 - Administrative data
Section 2 - Description of the proposal
Section 3 - Qualification and experience of the participants
Section 4 - International cooperation - **optional**

The forms can be obtained from the internet site of the PPS Science Policy
at the following address:

http://www.belspo.be

8 If the submitters deem it useful, a version can also be submitted in the coordinator´s language.

4.2 Evaluation and selection

4.2.1 Bases for the evaluation

The proposals which are submitted within the framework of the call will be evaluated externally by foreign scientific experts who are qualified in the research field involved.

Only **complete submission files** - English-language version - are presented for evaluation. **No annex** to the submission file will be taken into consideration during the evaluation and selection procedures.

The present text of the call for proposals serves as the basis for evaluating and selecting the proposals.

4.2.2 Evaluation criteria

The general evaluation criteria which must be taken into consideration by the experts are the following[9]:

Compliance with the aims, the content and the characteristics of the Programme in general (see point 1) and of the present call in particular (see point 2).

Scientific quality

- clarity of the objectives and the tasks, relevance of the method, positioning with respect to the state of the art in the proposed area;
- scientific originality of the proposed research, the innovative character of the expected results, strengthening of existing expertise, contribution of the proposed research to ongoing research in the area involved.

Scientific support for decision-making

- connections between the potential scientific results of the proposal and the scientific support which is necessary for preparing and implementing a supranational, federal, regional or local sustainable development policy.

Quality of the network

- experience and international contacts of the submitters;
- added value of the network;
- complementarity of the skills of the partners;
- clarity of the division of tasks between the partners;
- equilibrium of the division of the funds between the partners;
- realism of the requested funds (duration, budget, personnel).

Quality of the management and the coordination

- scientific quality, management, synthesising and communication skills of the coordinator.

Interdisciplinarity

- interdisciplinary approach necessary in order to correspond to the concept of sustainable development, in particular the cooperation between natural sciences and human sciences.

Elaboration of the proposal in a context of sustainable development

- how and the extent to which social, economic and environmental dimensions are integrated into the

9 The proposals for complementary research within the framework of an international cooperation will form the object of a simultaneous but separate evaluation by the same experts, according to criteria the most important of which are the added value of the cooperation and the scientific qualities of the foreign partner.

proposal;
- how the proposal takes account of the relevance and/or applicability of the fundamental principles of sustainable development (precautionary principle, prevention principle, principle of vertical and horizontal policy integration, the polluter pays principle, the subsidiarity principle, the principles of solidarity, social justice and participation...), particularly in the formulation of policy advice.

Valorisation
- relevance of the proposals for disseminating and making available the information, especially in a perspective of support to political decision-making;
- the profile of the members and the role of the Follow-up Committee.

Added value with regard to projects financed in preceding programmes (SPSD I, SPSD II, "Workers' Healthcare" and "Standardisation") (see point 1.4)

4.2.3 Selection

The research projects selection procedure takes place in two phases: a scientific evaluation, followed by a strategic choice. The scientific evaluation is performed by foreign scientific experts who are qualified in the research areas of the submitted proposals. The strategic choice takes place between the scientifically best ranked and best grounded projects.

4.3 Contractual obligations

4.3.1 Contracts

For the selected proposals a contract is drawn up between the PPS Science Policy and the network of financed teams.

For this, the submitters of the proposal will be asked at the end of the evaluation and selection procedure to concisely formulate the specifications on the basis of which the contract is drawn up. This **technical annex** to the contract will be drawn up in consultation with the PPS Science Policy and in particular will take account of the recommendations formulated by the foreign experts and the Programme Committee. Adaptations to the original proposal can relate to the content of the research, the composition of the network or the Follow-up Committee, the choice of the coordinator, the proposals for valorisation of the research, etc.

The PPS Science Policy attributes to the selected projects the **financing** which is necessary for their implementation. The PPS Science Policy shall reimburse, up to a defined maximum amount, the real costs which have been substantiated by the contract responsible and which relate directly to the implementation of the project.

4.3.2 Intermediary evaluation

All research projects are subject to one or several intermediary evaluations, whose modalities are specified in the research contract. These evaluations, conducted by foreign experts, concern the scientific quality (methodology and interim results) and the strategic impact of the project, in light of the project's initial objectives. The evaluation process results in recommendations for the further continuation (or discontinuation) of the project.

In the case of four-year research projects, initially only a two-year contract will be concluded, which in the event of a positive intermediary evaluation will be extended to four years.

4.3.3 Reports

The contract defines the various reports which must be submitted to the PPS Science Policy. These reports are prepared within the work plan of the project and are charged to the project budget (including the translations).

4.3.4 Data, results and ownership

The contract provides that the network of financed teams will transfer the entire intellectual property of the results deriving from the implementation of the project to the PPS Science Policy. By ´results´ must be understood all works performed, the collected data, the source codes and object codes of the developed programmes, the obtained interim results, the specific developed methodology, and more generally everything which results from the various stages and the overall implementation of the project.

This transfer will include neither what is or will be found in the public domain, nor what finds itself in the possession of the network or of one of its members prior to the start of the project.

The network of financed teams reserves the right to publish or valorise the results in whatever form, subject to prior authorisation of the PPS Science Policy.

For archiving and further dissemination, all (meta)data/results of the projects will be submitted to the PPS Science Policy and/or to indicated data centres, in accordance with the guidelines provided in the contract between the PPS Science Policy and the network of financed teams.

5. CONTACT INFORMATION

All additional information can be obtained at the following telephone numbers and e-mail addresses:

Secretariat
Mrs M. Lecoutre +32 (0)2 238 34 80
leco@belspo.be
Mrs V. Michiels +32 (0)2 238 36 13
mich@belspo.be

Climate and Atmosphere
Mrs A. Fierens +32 (0)2 238 36 60
fier@belspo.be (Climate policy)
Mr G. Jamart +32 (0)2 238 36 90
jama@belspo.be (Climate policy)
Mrs M. Vancauwenberghe +32 (0)2 238 36 78
vcau@belspo.be (Antarctica)
Mrs M. Vanderstraeten +32 (0)2 238 36 10
vdst@belspo.be (Climate and atmospheric processes)
Mrs Aline Van der Werf +32 (0)2 238 36 71
vdwe@belspo.be (Climate policy)

Service for International, Interfederal and Interdepartmental Coordination
Mrs B. Decadt +32 (0)2 238 35 70
deca@belspo.be

Space Research and Applications Service
Mr J. Vandenabeele +32 (0)2 238 35 23
vdab@belspo.be
Eodesk: http://telsat.belspo.be

ANNEX I. Description of the research areas and their interactions (extract from the Memorandum to the Council of Ministers)

This annex contains an extract from the Memorandum to the Council of Ministers, approved on 4 March 2005, which briefly describes the content of the research programme "Science for a sustainable development". This annex addresses:

A. The 7 priority research areas of the Programme (energy, transport and mobility, agri-food, health and environment, climate, biodiversity, atmosphere and terrestrial and marine ecosystems);
B. Standardisation within the priority research areas;
C. The interactions between the priority research areas;
D. The "transversal research" part.

This description offers an overall picture of the content of the Programme and forms the starting point for elaborating the calls for proposals. Each element of the Programme is worked out in detail in the involved calls (see point 1.6), taking into account the scientific developments and the evolution of needs in the area of policy support. The research proposals must therefore be based on the calls for proposals and not only on this extract from the Memorandum to the Council of Ministers.

A. Priority research areas

1. Energy

Domestic gross consumption of energy in Belgium is rising from year to year, just as it is in Europe and throughout the world. In Europe this is leading to an ever-increasing dependency on fossil fuels, which has pernicious consequences for the security of energy supplies, the environment and health, geopolitical equilibriums, fuel prices... An active energy policy, a top-priority sector for every economy, cannot be conducted without a policy for simultaneously managing demand and supply.

Within the Programme the priority research topics are:

- **Rational energy use** (REU) with the study of the social, cultural and economic variables which influence the energy consumption of households, the study of technical variables such as those which influence the energy efficiency of buildings, the study of communication instruments to promote changes in behaviour, the evaluation of the REU programmes and other policy instruments, the study of the role of new processes which can improve energy efficiency such as soft chemistry (new materials and superconductivity)...

- **The alternative and/or renewable forms of energy** (wind, biomass, sun, hydrogen, etc.) with the analysis of growth possibilities (including by comparing successful examples of dissemination of various technologies abroad), the barriers to introduction and the consequences of their development (employment, security of the network, emission of greenhouse gases, etc.), the analysis of the role of biotechnology..., within a perspective of sustainable development.

- **Organisation of energy systems over the medium and long term:** socio-economic study of the potential of technological improvements of energy systems (use of residual heat during energy transformation in centralised versus decentralised systems, reduction of losses during energy transport and energy production, vulnerability, dependency on a single form of energy versus usability of a diversified range of sources, integration of cogeneration including on a non-industrial scale, combination of energy sources for multiple objectives (e.g. fuel cells for both heating and transport) in order to increase efficiency and effectiveness).

- **The energy policy** with firstly the analytical or future-oriented study of such varied and interdependent themes as energy prices, energy supply security, liberalisation of the markets, expansion of the market, geopolitical considerations... and secondly the analysis of the role of

energy in Belgian society (relationship between energy and employment, energy and poverty, energy and the economy, etc.).

2. Transport and mobility

In various policy documents on the (inter)national, regional and local levels, sustainable transport and sustainable mobility are translated into concrete objectives such as: access to mobility, accessibility, traffic safety and traffic liveability, reduction of the external effects of transport... The objective is to reduce the tension between the increasing (needs for) mobility and the social, economic and environmental challenges entailed by it.

Within the framework of this Programme, the following priority research topics - and their mutual interactions - are addressed:

- **Mobility and modal choice**
  - Mobility in time and space: land-use planning, urban planning, demographic trends; new forms of organisation in the economy, leisure, globalisation (increase in international transport), congestion...;
  - Social and cultural aspects: right to mobility, evolutions in travel behaviour and modal choice (habit formation, price, impact of advertising and awareness-raising...);
  - The future of inter-modal and multimodal transport (within the framework of logistics, freight and passenger transport): interoperability, standardisation, competitiveness, cost evaluation, pricing policy, supply and financing of infrastructure...;
  - The possibilities and the role of intelligent transport systems and technological innovations for arriving at a more sustainable mobility.

- **Transport and the environment**
  - Environmental impacts of transport: air quality, noise, odours, vibration, fragmentation of space...;
  - Environmentally-friendly technologies (for the various modes of transport): analysis of technical and socio-economic problems as well as possible solutions for the application of alternative energy sources (electricity, hydrogen, bio-energy (such as bio-ethanol), etc.);
  - Role and possibilities in the area of technical inspection and vehicle maintenance, environmental labels, the purchase, replacement and recycling of vehicles, environmentally-friendly driving behaviour...

- **Traffic safety**
  - Social costs of traffic unsafety;
  - Analysis of behaviours; analysis of determining factors; relationship between types of road users;
  - Improvement and utilisation of statistical data;
  - Possibilities in the area of awareness-raising, training, regulations, enforcement, infrastructure measures, land-use planning...;
  - Freight transport and safety;
  - The possibilities and the role of intelligent transport systems and technological innovations in the area of traffic safety.

The research concerns both the analysis of **processes and impacts** and the analysis, development and evaluation of **policy measures**. The research must contribute to the **development of tools to support decision-making**. Specific attention is asked for the institutional aspects (e.g. the integration of transport and environmental policy, the European context, etc.); the mutual interactions between mobility, environmental and traffic safety issues; possibilities, impediments and effects on the social, economic and environmental levels.

3. Agri-food

The quality both of foodstuffs and of the processes which are used for their production in industry or agriculture is a priority objective of the European and national governments.

In order to be able to guarantee that striving for quality, a great deal of research must be done covering a variety of aspects, among others human health, impact on the environment, as well as the socio-economic dimensions of the sectors involved.

In order to be able to respond to these challenges, the following research topics are addressed in the Programme:

- **Food safety**: chemical safety and microbiological safety, pathogenic micro-organisms (priorities of the Federal Agency for the Safety of the Food Chain - FASFC), resistance to antibiotics, viruses, materials in contact with foodstuffs; study of and change in the current modes of consumption towards a sustainable food consumption.

- **Food allergies and food intolerances**: food-health interactions, study of the causes, identification tests, impact studies, behavioural analysis...
  Especially in Belgium one is seeing an alarming increase in food intolerances and food allergies, particularly among young children.

- **Food and "novel foods"**: study of diet, macro- and micro-nutrients, antioxidants and oligo-elements, pre- and probiotics, health foods, vegetable oils, GMO´s, use of little-known biological resources... Putting on the market "new foodstuffs", which combine nutritional effects and marketing, raises questions which must be answered by introducing a legal framework (directives and standards).

- **Integrated systems for quality management:** study of the environmental and quality management systems (HACCP (Hazard Analysis and Critical Control Point), LCA (Life Cycle Analysis), systems for rapid warnings about foodstuffs, standards, labels, specialised guides for best practices, traceability, authentication, reduction of pesticides, fertilisers, the content of heavy metals and the emission of greenhouse gases...).
  The systems for quality management must also be adapted to the problematic of small producers (SMEs, artisans, etc.), who in our country are important partners in this economic sector.

- **Upcoming production methods - multifunctionality of production:**
  - New cultivation and production methods in the margin of dominant methods of production and their social, economic and environmental impact.
  - Increasing the added value of existing products, a different use of production factors, collaborating on environmental protection and/or quality programmes, the production of "non-commodity" goods, making production factors and infrastructure available to third parties...
  - The analysis of agricultural environmental measures: caring for the quality of natural systems, the maintenance of biodiversity, landscape protection, tourism...
  - Study of the possibilities for valorising agricultural surpluses, among others via biofuels.

4. Health and environment

The "Health and environment" part is based on the finding that the evolutions in both individual and collective behaviours, in how people work or consume and produce goods and services, produce new and sometimes unexpected effects for the environment and health. Indeed, it is estimated that 20 % of all illnesses can be attributed to environmental factors and one finds that certain population groups run an increased risk.

If we look at the WHO´s definition of health[10], we find that it integrates physical, psychological and social well-being. Working in the health field thus entails that none of these aspects is neglected. This is a

10 General condition of physical, mental and social well-being that does not consists merely of an absence of disease or handicap.

comprehensive problematic where account must be taken of the numerous risk factors and their cumulative effects.

The research which will be performed within the Programme supports the elaboration or the adaptation of the national or European policy strategies, policy plans and programmes (NEHAP, the Government policy on well-being, CEHAPE, the programme for reducing plant protection agents and biocides in Belgium[11], etc.).

Within this context the research will be concentrated on 2 lines of research and limited to understanding the risks, their development and their cumulative effects on health, as well as the development of methods for evaluating, managing, regulating and reducing risks:

- **Health risks relating to biological, chemical, physical exposures**
  A horizontal and/or sector-related approach is taken to the health problematic. The research runs through the entire programme (transport, energy, climate, agri-food, terrestrial environment, aquatic environment, atmosphere) and must make it possible to attain greater insights into the threats for human health. For example, the repercussions on health of food production and consumption will be worked out in synergy with the Programme's agri-food theme (cf. sub themes "Food allergies and food intolerances" and "Food and novel foods").

- Since **the work environment** is a specific environment, it offers possibilities for better delineating some causal relationships than would be the case in a general environment. The research performed in this context can determine the pressure and impact of exposures more precisely and reach more reliable and faster decisions for various aspects of the problematic, particularly concerning the development of methods. Some research can be fit into the study of a general environment, such as research on the contamination within work spaces or the (bio)monitoring of employees exposed to existing or new hazardous products, to pesticides/biocides...

  Well-being in the workplace is also studied via an approach to the organisational aspects, namely the study of psychosocial risks, musculoskeletal problems and human errors. The research performed here will analyse, for different population groups (among others women and older employees), the following dimensions: organisational changes and their consequences, the limitations of the work organisation in specific involved sectors (government departments, agriculture and SME's, etc.), subject to technological innovation and to the principles of highly demanding European regulations in terms of "quality systems", standardisation or the evaluation and management of chemical risks.

5. Climate

The priority research lines take account of (among others) the recommendations of the Intergovernmental Panel on Climate Change (IPCC) and the European Council's Working Party on International Environmental Issues - Climate Change (WPIE/CC) and support the implementation of the Climate Convention, the Kyoto Protocol as well as the definition of new post-Kyoto reduction targets. The research on climate changes is situated on various geographic scales: national, European and global, with specific attention for Antarctica.

11 Decision of the Council of Ministers of 10 December 2004.

Research is necessary for:

Understanding the climate system

- Studying the evolution and the causes of climate changes (natural versus anthropogenic origin);
- Better understanding the mechanisms and factors which influence the climate system (biogeochemical cycles, aerosols, stratospheric ozone, oceans' CO_2 balance...);
- Contributing to the international efforts to identify the various "pathways" which allow the reduction targets to be achieved (cf. art 2 UNFCCC);
- The development of projections of future climate evolutions on the basis of climate modelling on the global and regional levels;
- Introducing scientific elements for evaluating the level of "dangerous interference" (art. 2 of the UNFCCC).

Analysing the impact, adaptation and vulnerability (particularly in Belgium)

- Evaluating the impact of the climate changes in combination with other pressure factors on hydrological cycles, sea level, the availability of water reserves and their management in various sectors (agriculture, transport, energy, etc.);
- Evaluating the risks and the impact of extreme climatic events on ecological systems and vulnerable socio-economic sectors;
- Evaluating from a scientific and socio-economic perspective the adaptive measures which are necessary in order to anticipate this impact.

Supporting the preparation and evaluation of mitigating measures concerning climate changes

- Evaluating from an economic, social, environment and legal perspective the measures relating to:
  - the sequestration potential in terrestrial and marine ecosystems;
  - the reduction of the emission of greenhouse gases in Belgium (taking into account the three Regions in Belgium and their mutual interactions, as well as the relationship to neighbouring countries);
  - the reduction of the emission of greenhouse gases outside Belgian borders within the framework of the Joint Implementation (JI) and the Clean Development Mechanisms (CDM)...;
  - the integration of the climate policy into other areas, including development cooperation and foreign trade.

More sector-related studies (such as in the area of energy, transport, etc.) performed within the framework of these priority research areas can supplement the global instruments developed here.

6. Biodiversity

"Biodiversity" or "biological diversity" means the entirety of the living world. Along with the diversity of species (flora, fauna, micro-organisms), this also includes the genetic diversity within a given species and the (terrestrial and aquatic) environments in which the species live. Because biodiversity is the very basis of life on earth, with a broad offer of goods and services (production of food and fibres, carbon storage, nutrients cycle, resistance against the climate, etc.), an increased loss of biodiversity such as is being found at present constitutes one of the major problems that we are confronted with. Europe and its Member States undertook to "halt the loss of biodiversity before 2010". That goal can only be attained with reliable and coordinated science.

Within the framework of this Programme, the goal of the "biodiversity" research area is:

- to understand the causes for the loss of biodiversity: the impact of invasive species, the fragmentation of the landscape, the climate changes, the nitrogen pollution, etc.;
- to analyse the condition and the trends of the populations, species, habitats and to evaluate ecological services which these species and systems provide;
- to identify the priority responses concerning conservation, restoration and sustainable use of biodiversity and provide the scientific instruments for assessing the feasibility and efficiency of these responses.

This Programme addresses the *in situ* biodiversity of the marine ecosystems of the North Sea, the North Atlantic Ocean and the Southern Ocean, as well as that of the terrestrial ecosystems and the Belgian freshwater areas. In a perspective of sustainable utilisation and conservation, the *ex situ* biological resources which are kept on our territory are also being studied.

7. Atmosphere, terrestrial (including freshwater) and marine ecosystems

Within this research area, attention is devoted to the three compartments of the earth system - i.e. the atmosphere (the troposphere and stratosphere), terrestrial ecosystems (incl. freshwater ecosystems) and marine ecosystems - and their mutual interactions.

The study of the atmosphere is situated on the global as well as on the European and local levels, to support the air quality protection policy: LRTAP, the Vienna Convention and the Montreal Protocol, the Climate Convention (UNFCCC) and the Kyoto Protocol. Each of these agreements requires implementation in Belgium, which among others is based on research on the synergy or conflicts between conventions.

The study of terrestrial ecosystems relates to research on our territory and also includes the research relating to surface water and river banks and valleys, and this to support the implementation of the European Water Framework Directive.

The marine ecosystems include among others the North Sea and Antarctica, where research is important for the implementation of (inter)national conventions and agreements which were signed by Belgium (including the Antarctic Treaty, the Madrid Protocol, the Belgian Law on the Protection of the Marine Environment, the Law on the institution of an EEZ (exclusive economic zone), the OSPAR convention).

The research within these three compartments concentrates on the **"drivers" of ecosystem processes and environmental policy problems**, such as the change in land use (soil erosion, acidification, depletion...) and biological and chemical interference (eutrophication, photochemical ozone and aerosols in the troposphere, the greenhouse effect, the thinning of the stratospheric ozone layer...) as a result of anthropogenic activities.

Given that generally the same anthropogenic activities are at the basis of these problems and given the mutual interaction and connection of these various problems, there is a need for an integrated approach to both the research and the policy.
The research attempts via **process studies** (understanding and quantifying chemical, biological and physical processes) and the development of aids (quality monitoring systems, simulation models, etc.), to offer measures, instruments and/or recommendations for the reduction of sources of pollution, the establishment of standards, the development and evaluation of integrated **management and policy measures**... Where possible, the studies will be supplemented with a socio-economic evaluation of the results.

Relevance of the Antarctica research

Antarctica and the surrounding Southern Ocean (SO) are global climate regulators: as a "biological pump", the SO can help to mitigate the effects of increasing CO_2 discharge into the atmosphere, the further giving way of ice sheets and glaciers as a result of climate rise will have a significant effect on the total sea level increase, anthropogenic chemicals above Antarctica degrade the protective ozone layer... Research furnishes important information on climate evolution, the dynamics of ice caps and glaciers and biogeochemical processes in and between the atmosphere and the SO, which in turn leads to understanding and modelling sea level and climate changes.

Through its physical isolation, its extreme environment and its unspoiled state, Antarctica also constitutes a unique ecosystem, with special species and populations, that can act as a model in order to understand universal biological (ecological, physiological and biogeographical) processes. Research contributes to better understanding the complexity of biotic communities under extreme conditions and delivers potential medical and industrial applications. Biodiversity research in Antarctica also lies at the basis of the proposed international measures for the protection of Antarctica and its surrounding oceans.

Relevance of the North Sea and North Atlantic research

The North Sea is characterised by a very high productivity and highly diversified habitats, but is also a sensitive ecosystem that is under heavy pressure from intense human activities. In order to arrive at a sustainable management and a sustainable exploitation of the North Sea, there is a need for research that focuses on deepening existing scientific knowledge about the structure and functioning of the North Sea ecosystem (including biodiversity) and the processes which take place within it, including the response to anthropogenic pressure and a better understanding of the social/economic impact of the direct and indirect human activities on the ecosystem.

Along with the Belgian part of the North Sea and in particular the coastal area, the areas through which it is directly influenced (the Channel, Scheldt estuary) and/or where the effluents of this part of the North Sea can have a measurable impact (the Southern Bight and the central North Sea) also merit the necessary attention. The transition between the ocean and the North Sea is also an important area of study.

B. Standardisation within the priority research areas

The Programme encourages, within the priority research areas and if this appears relevant, the submission of proposals on standardisation.

Standardisation is a powerful means for achieving technical progress and developing the economy; it can contribute to a better quality of life in general by raising quality, safety, reliability and efficiency levels. Standards have a positive effect on the entire society (business organisations, governments and economic leaders, suppliers and buyers of products and services, and finally consumers and users in general).

On the economic and social level, standardisation is an instrument that harmonises and facilitates transactions, an instrument that inspires confidence and limits the risks as well as supports the dissemination of innovation.

Standardisation is also an essential instrument that supports the implementation of the European policy choices concerning the environment. Indeed, the implementation of the environmental policy (in the areas of noise pollution, waste, soil, biomonitoring, discharge of pollutants, etc.) requires appropriate standards

for the tests, samplings and analyses, since it is of essential importance that environmental quality be comparably measured throughout the world. That is therefore the task of international standardisation.

Moreover, there is an increasing awareness of the importance of standards and how they are designed. The Commission (DG´s Enterprise and Environment) is preparing a communication on the integration of environmental aspects into European standardisation. The CEN is striving to fit all environmental aspects horizontally into all of its standards, even as they are being developed within a sectoral framework. The objective of all this is to ensure that no unnecessary barriers are introduced and to keep the negative impact on the environment as low as possible.

The research that will be performed within this framework must respond to the following elements:

- the research fits within the priority research areas proposed in the Programme;
- it concerns prenormative research that must make it possible to contribute to the development of standards;
- the research must make it possible to contribute to the identification of impacts, problems and shortcomings linked to standardisation within a context of sustainable development;
- the research analyses the role of standardisation as an instrument for a sustainable development policy.

C. Interactions between the priority research areas

The evaluation of the impacts of a problematic or of the validity of a measure, a strategy or a technology on the social, economic and environmental levels; the optimal consideration of the complexity of the problematic, the reality in the field and the institutional context; the contribution to an appropriate fulfilment of the national and international commitments require that the research be approached in a trans-sectoral and integrated manner.

The Programme will therefore encourage the **interactions between the priority research areas**, in order to be able to react to common and complex problems, including for example:

- *air pollution (ozone, particles...),* shared problematic between energy ? transport and mobility ? atmosphere, terrestrial and marine ecosystems ? climate ? health;
- the impacts associated with *genetically modified organisms* (GMO´s), a problematic which interfaces with agri-food ? consumption ? health ? terrestrial ecosystems ? biodiversity;
- *the work/leisure relationship* which interfaces with ? energy ? terrestrial and marine ecosystems ? biodiversity ? health;
- the *life cycle of products and processes* which interfaces with terrestrial ecosystems ? atmosphere ? biodiversity ? energy ? agri-food ? working conditions;
- the *renewable forms of energy* which are associated with the areas of energy? agriculture ? terrestrial and marine ecosystems ? climate;
- the *global character of challenges* ? production and consumption ? transport and mobility ? energy ? health ? biodiversity ? climate;
- the *integrated management of the coasts or the catchment areas* that are connected with the areas energy ? agriculture ? transport and mobility ? terrestrial and marine ecosystems ? climate ? biodiversity ? production and consumption;
- ...

The research must take account of the (complexity of the) interactions between the priority research areas. This forms an essential guideline throughout programme (the calls for proposals, the selection and the management of projects, the valorisation of research results).

For this are planned: integration of the interactions and common themes in the appropriate calls, *joint calls* between the priority research areas (e.g. energy – transport, agri-food – biodiversity, health – climate, health – agri-food), the *"clustering"* of projects which cover different aspects of shared and complex problems...

D. "Transversal research" Part

In order to better translate/operationalise the concept of sustainable development, within and between the priority research areas, **transversal and generic research** is necessary. Accordingly, the Programme includes a "Transversal research" part to deal with the following questions:

- the change of unsustainable production and consumption patterns;
- the role of spatial and temporal dimensions of sustainable development;
- the search for and analysis of instruments to support a policy of sustainable development, in particular instruments aimed at a better equilibrium between the social, economic and environment-related pillars of sustainable development.

In order to arrive at sustainable development, the crucial issue of **the harmonisation between human being, means and space** must be addressed. This presupposes analysis of the links between the geographic or climatological framework of a region and the entirety of the economic, social and cultural productions of the same region. It also requires a transversal approach via an analysis of different topics.

In order to strengthen the coherence of the Programme, the transversal research topics are preferably developed with regard to the 7 proposed priority research areas, without hereby excluding areas which can also make a major contribution to an operationalisation of the concept of sustainable development (e.g. residential construction).

Within the context of this part, the following research topics are addressed:

- **spatial dimensions in relation to the sustainable use of the ecosystems**, which underscore the importance of a policy on land-use planning, habitat, infrastructure, etc.;
- **the production patterns**, taking into account the economic, environmental and social impacts throughout the entire production chain;
- **the search for sustainable consumption** on both the individual and the collective levels (well-being, health, employment, quality of life, excessive debt burden, redistribution, pollution, waste, natural resources, etc.);
- **time management in relation to the modes of consumption and production** (leisure, combination of private and professional life, flexibility of companies, etc.);
- **the globalisation of the economy** and its consequences, particularly with respect to geostrategy, North-South relations, use of natural resources, climate changes, inequality and poverty;
- **the social changes** (demographic development, (im)migration, etc.) and their implications within a perspective of sustainable development;
- **the quest for an economic development** (competitiveness of companies, employment...) **which is compatible with a sustainable management of human and natural capital** (uncoupling, dematerialisation, qualitative growth, etc.);
- **the ethical aspects which are linked with sustainable development as this relates to** the responsibility of the various actors, the access to resources...;
- the different **visions of sustainable development** and their implications;
- **the role of the decision-making processes** in striving for sustainable development;
- **the multifunctionality of the primary, secondary and tertiary sectors,** i.e. agriculture, industry and services;
- the **role of standardisation** as an instrument for a sustainable development policy;
- the **raw materials policy** with therein an analysis of the present dependency on finite raw materials, a bottleneck analysis over the short-, medium- and long-term and the connection of raw materials consumption, energy consumption and environmental pollution and more research on the reduction of the environmental utilisation space, the ecological footprint and the ecological debt.