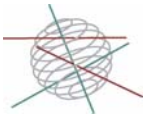

BELGIAN SCIENCE POLICY

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

TARGETED ACTIONS NORTH SEA

Call for proposals 4

April 2008

Closing dates

Expression of interest (obligatory): 19 May 2008

Research proposals: 16 June 2008 at 3:30 p.m.

INFORMATION FILE FOR USE BY PROPOSAL SUBMITTERS

TABLE OF CONTENTS

FOREWORD

- This document contains all information useful to the teams wishing to participate in the call for research proposals for the **"Targeted Actions North Sea"** of the **"Science for a Sustainable Development" research programme**.

- The Public Planning Service Science Policy ("PPS Science Policy") supervises and coordinates the Programme at both the scientific and administrative levels.

- The present call aimed at research proposals:
  - of the **targeted** type (see 1.2.2)
  - submitted by an **individual team** or by a **network**
  - with a maximum duration of **2 years**
  - with a **max.** budget of **180.000 EUR**

- The call is intended for **Belgian university institutions, public scientific institutes, non-profit research centres, and specialised consulting offices**.

- The project may require punctual expertise which can be delivered in **subcontracting** form. Such subcontracting may under no circumstances amount to more than 10% of the total budget requested by the network.

- If it brings in an added value to the project and to the development of Belgian expertise, submitters may propose a cooperation with a **non-Belgian universities or public research institutes** (except for international institutions such as the Joint Research Centre).
  This participation will take place on a **co-funding** basis. The funding of non-Belgian partners by PPS Science Policy will under no circumstances amount to more than 20% of the total budget requested by the network. The non-Belgian partner is responsible for the co-funding, from other sources, for at least the same amount as the amount asked from PPS Science Policy.

- The research network must be able to tackle the problem addressed on the national scale. Hence, cooperation between partners from **different Communities or Regions** is encouraged.

- The personnel funded in the project **must be recruited under an employment contract**. Thus, no scholarship student can be taken on in the framework of the project.

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

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

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

- Interested parties must submit an expression of interest, using exclusively the form available on the PPS Science Policy website (http://www.belspo.be), no later than **19 May 2008. Only those**

who submit an expression of interest may later submit a complete proposal. The expressions of interest will be used by 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"
CALL TARGETED ACTIONS NORTH SEA
WETENSCHAPSSTRAAT 8 RUE DE LA SCIENCE
1000 BRUSSELS

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

SSD_call4@belspo.be

The proposals (paper and electronic versions) must reach PPS Science Policy no later than **16 June 2008 at 3:30 p.m.**

- **Closing dates:**

Expressions of interest: 19 May 2008

Research proposals: 16 June 2008 at 3:30 p.m.

1. THE PROGRAMME "SCIENCE FOR A SUSTAINABLE DEVELOPMENT"

1.1 Context

The following elements of the international, European, and national contexts may 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 At the international level

- The Amsterdam Treaty, which notably 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-based economy, via a balanced economic, social, and ecological renewal. An underlying assumption is that the development of a top-quality scientific potential is indispensable to creating a knowledge-based economy. The European Council (Brussels, March 2005) is giving renewed impetus to the Lisbon Strategy aimed at growth and employment in a context of sustainable development where the role of knowledge and innovation is reconfirmed.

- The strategy of the European Union for sustainable development – the Göteborg Strategy (internal and external dimensions), and its current reform.

- Belgium's various commitments in the framework of different international Conventions and Agreements[1], the recommendations formulated by various international organisations[2], and all the European directives, strategic plans, implementation plans... with which Belgium must comply in the areas involved.

- The efforts 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-NETs).

- 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 allows developments taking into account all parameters necessary 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. The idea is that information and data exchange form the basis for the development of cooperations and give added value to individual actions. The participation of states implies that they support both the production of information (and hence research) and its structuring.

[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 OSPAR Convention for the Protection of the Marine Environment of the North-East Atlantic Ocean, the Bonn agreement, the antipollution activities at European level, the IMO conventions (International Maritime Organisation), 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 At 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 mentioned: 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 to global biodiversity, progress on sustainable development policy, the development of an integrated product policy, protection of the North Sea...

  - The chapter "Two Hundred Thousand New Jobs" concerning the introduction of new measures to keep older citizens working, to improve the quality of work, and to prevent work-related accidents and occupational illnesses...

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

  - The chapter "A More Equitable World", postulating that Belgium wishes to introduce an active policy for 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 asserted the following:

  - *"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 Belgian position at the European Spring Summit *(Brussels, 22 and 23 March 2005)* recognizing, along with the other Member States, the necessity of re-launching the Lisbon Strategy. *To meet these challenges, Europe must build new competitive advantages by developing* ***synergies between the economic, social, and environmental dimensions;*** *it must lay special emphasis on* ***knowledge and innovation***.

- The governmental declaration of October 2005 and notably the points that concern **reviving our economy** (stimulating the entry of young people into and avoiding the early departure of older workers from the workforce, stimulating innovation and creativity, making the price of energy reasonable for everybody) and the **new social contract** (raising awareness about what constitutes a healthy, balanced diet, post-2010 discussions on revising the Kyoto Protocol, tax incentives in

favour of the use of biofuels for reducing greenhouse gases generated by the transport and distribution sectors, continued work on REACH...).

- The 2005-2008 National Programme for Reforming the Lisbon Strategy, aiming for more growth and more employment, adapted by the « Comité de Concertation Gouvernement fédéral - Gouvernements des Communautés et des Régions » on 26 October 2005. This notably concerns **reinforcing synergies between growth and environmental protection**.

- The various policy plans and policy strategies which are being implemented or being prepared on the national and federal levels, 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 National Nutrition and Health Plan...

- 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 to achieving the '3% objective' concerning research and development, one of the pillars of the Lisbon Strategy.

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

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

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

1.2 Objectives of the Programme and Implementation modalities

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 required 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 itself into the various research initiatives at the European and international levels, in particular within the European Research Area.

From an **operational** perspective, the proposed Programme will contribute to developing 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 constitute the basis of the functioning of both anthropogenic and natural systems;

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

- 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 focused on prevention, adaptation, remediation, management…

1.2.2 Diversified implementation

To fulfil these objectives, the Programme provides a diversified approach which:

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

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

- offers space for **oriented basic research** and **targeted research actions**:

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

  - **targeted actions** aim to formulate, within a relatively short time span, answers to specific policy issues at the (inter)national level. This may involve applied research, exercises integrating scientific results, proposals for harmonising, standardising data and information…

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

  - the opening up of this Programme to foreign researchers;

  - initiatives promoting cooperation and synergies between national thematic research programmes, such as ERA-NETs (European Research Area –Networks). PPS Science Policy is currently involved in a number of ERA-NET projects[3]. This opens the way to developing and implementing joint transnational activities such as joint calls, project clustering, 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** funded within the different research areas of the Programme and/or in the framework of other initiatives of PPS Science Policy when these are mutually complementary or demonstrate common areas of interest (**clustering**). The aim is to

[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)

ensure greater coherency in research and to give the research added value in 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 whole set of priority research areas was chosen because of the need to address the complex, global, interrelated problems underlying a sustainable development policy. This choice is a response to strategic needs, at different levels of authority, for policy-supporting research and to the challenge of maintaining and developing national scientific expertise in complex and strategically important areas.

The **priority research areas** are:

- **Energy**
- **Transport and mobility**
- **Agro-food**
- **Health and environment**
- **Climate (including Antarctica)**
- **Biodiversity (including Antarctica and the North Sea)**
- **Atmosphere and terrestrial (including freshwater) and marine ecosystems (including Antarctica and the North Sea)**
- **Transversal Research**: In order to better translate/operationalise the concept of sustainable development, in and between the priority areas, **transversal and generic research** is necessary.

The goal of the research actions is to support specific decision-making in relation to both sector-related and trans-sectoral problems. The Programme thus promotes **interactions between the priority research areas**, so as to respond to common and complex problems such as air pollution (tropospheric ozone, aerosols…), environment-health relations, the impacts of genetically modified organisms (GMOs), 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 into account the (complexity of) interactions between the priority research areas. This constitutes an essential guideline throughout the programme (calls for proposals, project selection and management, the valorisation of research results).

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

Within these priority research areas, the Programme encourages the submission of proposals dealing with **standardisation**.

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 previous programmes "Workers' healthcare" and "Standardisation and Technical Regulation", which both formed part of the "Scientific Support Plan for integrating 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 conducted in the previous programmes** (see www.belspo.be/fedra).

On the other hand, a **research proposal that is a continuation of a project** funded in the framework of the aforementioned programmes must **clearly describe the relationship of the new proposal to the previous project and its added value** with respect to it. PPS Science Policy will provide the experts in charge of the scientific evaluation of the proposals (see point 4.2) with 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 (previous and/or current) research actions of 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.;
  - research within the federal scientific institutions.

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

According to the priority research areas of the Programme, the calls for proposals will establish more direct links with some of these research actions (see e.g. point 3.4).

2. CONTENT OF THE PRESENT CALL

The present call concerns the "**Targeted research actions North Sea**".

The research projects are of the **targeted type** (point 1.2.2) and will run for **2 years maximum** with a **maximum budget of 180.000 EUR per proposal**.

These targeted actions aim to give the government the needed scientific support for urgent (inter)national policies around specific themes concerning the North Sea.

These relate to research that is small scale, of short duration and primarly apllied in character, and which can take place in the fields of biology, physics and chemistry and also socio-economics and law.

The themes covered in this call for proposals are as follows:

1. Fishing and Local Ecological Knowledge.

Already-conducted research projects have made it clear that gaps still remain in our knowledge relating to fishing in the Belgian North Sea. The ICES data does not provide sufficient geographical information which can be used for a balanced management of the fishing that also takes account of local ecosystems in the Belgian North Sea. However, this doesn´t mean that there is no information available on the local ecosystems. The problem is that this data and knowledge is often to be found among experts in the form of personal experience and skills; and that this is not readily accessible for scientists, policy makers and the general public.

Within this framework, the project will develop a methodology and apply it in order to collect fishing and ecosystem-related data and information from professional and recreational fishermen via ´Local Ecological Knowledge´ (LEK), also known as ´traditional knowledge´. This will be done in order to both improve knowledge of the local ecosystems and help arrive at a sustainable fishing policy for the Belgian North Sea. The data/information obtained via the personal assessment and experience of the fishermen will be used to fill in the data gaps in the "Scientific Ecological Knowledge" (SEK).

2. Rescuing historical marine data and making it accessible.

Knowledge of the marine ecosystems of the Southern Bight of the North Sea and its adjacent estuaries has grown greatly in recent decades. Belgium has a long tradition of marine research and the various Belgian marine research groups have generated a significant amount of data. Nevertheless, due to a lack of (or inadequate) data management in the past, much of this data is not available for the research community, policy makers and other potential users. By upgrading a number of major datasets, they can be used for current and future research and policy makers can be informed about the condition of the North Sea in the past, long-term changes, etc.

The objective of this project is to locate, describe, archive and digitise "historical" marine data and make it freely accessible. The data to be rescued must be important within the framework of a sustainable management of the North Sea.

3. Study of the ecology of natural hard substrate habitats in the North Sea.

Research in the past and present has brought to light the fact that habitats of hard substrates can be found in the Belgian part of the North Sea, and more specifically in the area of the Hinderbanken. In these gravel areas the benthic fauna is much more diverse than in the surrounding sandy areas, and the habitat is potentially a substrate for spawning herring and for oyster beds. Beds of flat oysters used to exist in these areas, but they were exploited in the 19th century by English fishermen and had virtually disappeared by the beginning of the 20th century.

Areas farther off the coast, areas with hard substrates, and areas where oyster banks existed in the past have a higher degree of biodiversity. Species are regularly found there which earlier were unknown in the Belgian marine areas. However, there is little knowledge about these areas.

On the basis of the findings of research projects conducted earlier, the Westhinder area was proposed as a possible protected marine area under OSPAR.

The purpose of the research is to expand our knowledge of the natural hard substrate habitats in the North Sea (ecology, role within the ecosystem, long-term changes).

4. Favourable conservation status in Natura 2000 areas

The EU Habitats Directive (art 1.e and i) define only in general terms the "favourable conservation status" for the types of habitat (including the typical species of the habitat types) and the species for which the Natura 2000 areas are designated. The "conservation status" of the habitat type and of the species concerned is determined by the sum of all influences acting on the habitat and the species with as parameters the natural area, the structure and function of the habitat or the population dynamics, area of distribution and habitat size of the species from Annex II or the species typical of the habitat.

The objective is to set up a study in order to – as a function of the influences on the habitat (trawl fishing, overall quality of the seawater, disruption, etc.) and on the basis of the parameters - select relevant indicators, propose the relevant monitoring techniques, define the limits of the “favourable conservation status”, so that one can report on the conservation status and, if necessary, redefine the policy.

The research objectives of this project must treat the following aspects:
For the structure of the habitat: development of physical and geological indicators;
For the macrobenthic communities and their function: development of qualitative and quantitative indicators (including specific attention for reef builders);
For the typical species and bird species and their function: development of qualitative and quantitative indicators (and if possible links with food sources);
Secondly, it must be determined to what extent the indicators proposed for the Bird and Habitats Directive can be integrated with those of the European Water Framework Directive and the European Marine Strategy.

In particular with regard to monitoring, the project can be conceived by analogy to the Water Framework Directive (WFD). With regard to the macrobenthos, for the WFD-monitoring four parameters are monitored for four different macrobenthic communities (total biomass, total density, number of species and species composition). These communities can to a certain extent be taken over for the definition of the conservation objectives of the EU Nature Directives. Especially for the further application of the EU Habitat and Birds Directive one still has to define with what frequency the parameters must be used and whether a more (species)-specific follow-up is necessary for the conservation objectives.

The research must also take account of indicators which have already been developed in the framework of the projects Deduce, SAIL, BWZee, etc.

5. The characteristics and quantities of marine litter, on the beach and in the port, and the damage this causes to the coastal and marine environment.

Marine litter constitutes a rapidly-growing threat for the coastal and marine environment. Most marine litter consists of material which degrades slowly, if it is biodegradable at all. A continuous influx of large quantities of litter is leading to a gradual accumulation in the marine and coastal environment. A number of studies in different areas clearly indicate a trend that the situation is becoming steadily worse, yet there is little concrete data about the quantity of litter that can be found at sea and in the food chain in the Belgian marine waters. Marine fauna get entangled in such waste or ingest it via food intake. Litter is also regarded as a source of accumulation of toxic substances within the marine environment. Biologists and chemists have also demonstrated that coastal waters are polluted by microscopic fragments and fibres of plastic as degradation products of the larger plastic litter that is omnipresent there. These fragments and fibres are encountered in beach and soil sediments and in the water column, and are eaten by marine organisms such as acorn barnacles and worms.
Litter is one of the pressures on the marine environment that is regarded as a priority by the European Marine Strategy for mapping out and developing countermeasures. The research that has been performed until now is not sufficient for adequately assessing the problem in the Belgian marine waters.

This research is meant to focus on aspects which are not discussed by the OSPAR programme for monitoring beach litter or such initiatives, but which can be integrated with it, with the intention of clarifying the overall picture of the impact of marine litter and the extent to which (micro-)fragments of waste are ending up in key species and the food chain.

The research objectives of this project must elucidate ecological, chemical and economic aspects, including research in order to be able to determine the quantity of litter and their degradation products such as (micro-)fragments on the seabed, in the water column and in a number of key species. It is thus the intention to screen the seabed to a certain degree for the presence of litter, and to determine to what extent it is related to that which washes up on the beaches. In this way one can also verify how representative the litter that washes up on the beach is for that which is found in the sea. A second part must elucidate the presence of (micro-)fragments in the sediment, the water column and a number of key species in order to be able to assess the distribution of these (micro-)fragments. The third (economic) part must estimate what costs are entailed by the presence of litter and the cleanup or removal thereof, and balance this against the benefits of preventive measures and awareness-raising in a cost-benefit analysis.

6. The razor clam *Ensis directus*, an invasive species introduced by human activities, and its quantitative impact on the ecosystem.

The introduction and increase of invasive species is generally recognised as a significant problem that can sharply disrupt the equilibrium in indigenous communities and often has negative consequences for biodiversity in the area involved. A telling example is the razor clam *Ensis directus*, which was introduced into the European marine environment from America. Research on the seabird populations on the Belgian coast has led to the hypothesis that shifts in the stopping places of the Common Scoter may be the consequence of the frequent appearance of these razor clams in certain areas on the Belgian coast. The extent to which they have influenced original macrobenthic communities and disadvantaged other species is unclear, however. The possibility is also being considered of harvesting this species commercially, even if this is currently not legally possible. Yet it is unclear how adaptable this species is to disruption, and whether fishing this species might disadvantage the original communities even more. Invasive species exert great pressure on the marine ecosystem, and the European Marine Strategy regards it as a matter of high priority to study this phenomenon and develop countermeasures. The research that has been performed until now is not sufficient for adequately assessing the problem in the Belgian marine waters.

This research must investigate the impact of introducing this species and the possible shifts which it has produced in the composition of the macrobenthic community and possible changes in the food chain. When high densities of predator species such as the Common Scoter are observed in specific areas, one can verify via a field study whether this corresponds at that moment to high densities of these razor clams. It is also of great importance to indicate whether the fishing of this razor clam species helps or harms the competitiveness of this species.

7. Atmospheric deposit of nutrients and bioaccumulable toxic substances as a result of emission by shipping in the Belgian marine waters.

Studies have attempted to quantify the emission of shipping in the Belgian marine waters and ports. However, the atmospheric deposit of these emissions in the Belgian marine waters is not known, nor to what extent this contributes to the enrichment of nutrients and bioaccumulable substances in the Belgian marine waters. This problematic is of increasing importance in evaluations of the condition of the Belgian marine waters. The scale of monitoring deployed by already-existing monitoring initiatives of atmospheric deposits and international reporting is not sufficient to be able to accurately assess the problem for the Belgian marine waters.

The issue for this project is the quantification of deposits in the Belgian marine waters of emissions by shipping and the relation of these deposits to the enrichment of nutrients and bioaccumulable substances which reach the Belgian waters from rivers.

8. Controlling accidental oil pollution in the Belgian marine areas:

The use of ´dispersants´ is one of the control options provided by the Belgian legislation (the other option being ´mechanical recovery´). On the one hand, there exists expertise with regard to the use (on field) and the certification of dispersants; in other words, their operational application to oil spills. On the other hand, one has to have a decision-making procedure in order to give the green light for using dispersants as demanded by the Marine Environment Protection Law; a documented and scientifically-based method for weighing the costs and benefits for the marine environment of using dispersants. Until now decisions have been primarily based on "expert judgment", and such a systematic procedure has been lacking.

The research must include the following :
- Definition of operational application criteria for the use of ´dispersants´ to control oil spills in the Belgian marine areas;
- Development of operational decision-making instruments in order to be able to rapidly determine when the use of ´dispersants´ can be authorised by the competent authority, in accordance with the legal provisions.

9. Operational surveillance of marine pollution caused by ships in the Belgian zone of interest in the North Sea:

Surveillance of illegal discharges by ships is an essential instrument of the policy to protect the environmental quality of the marine areas under Belgian jurisdiction. Belgium implements surveillance of marine pollution within the framework of international agreements (Bonn Agreement) and on the basis of the national legislation for protection of the marine environment. In recent years new surveillance techniques, such as satellite-based techniques, have become operational. All techniques have their strengths and weaknesses, however, and so there is a need to study how these different techniques can be combined in a complementary manner with a view to optimising the surveillance (cost/efficiency). UAVs (Unmanned Aerial Vehicles) are one of the new platforms which have recently

come into consideration for surveillance activities over the sea. Belgium already possesses know-how with regard to the development and use of different types of UAVs. Their use for monitoring marine pollution as well as for supporting anti-pollution operations (surveillance from the air) offers interesting prospects which could lead to progress with respect to the flexibility, safety and efficiency of the surveillance of marine pollution.

The project will include the following:
- study of the combination of different complementary detection techniques and types of monitoring platforms (airborne, spaceborne and seaborne) with a view to an optimal surveillance of marine pollution within the special context of the marine areas which Belgium must monitor within the framework of international and national agreements.
- study of the use of UAVs (Unmanned Aerial Vehicles) for monitoring marine pollution and supporting anti-pollution operations.
- development of instruments for optimising (cost/efficiency) the planning of the checks (frequency, place, time) within the framework of monitoring marine pollution with a view to optimising the use of the means of surveillance in the field and maximising the chance of catching ships which engage in illegal discharges.

10. Comparison of the impact of fishing techniques.

Currently, both trawl fishing and gill net fishing are being used by Belgian fishermen, and the issue of their respective ecological impacts is a regular topic of discussion. A thorough comparison between the integrated ecological impact of these two fishing techniques would be useful for defining fishing policy. The problem in this discussion, however, is that so far the ecological impact of the two techniques has little or not been quantified (and certainly not for the Belgian situation).

A thorough knowledge of the impacts of both fishing methods would help to better reorient Belgian fishing. Inter alia with regard to spatial planning: e.g. avoid trawl fishing in benthically rich systems, avoid gill net fishing in areas and/or periods with high densities of diving sea birds and sea mammals.

The research will have to take account of the results of the WAKO project and the research financed within the framework of the National Fishing Plan.

11. Research proposal on the ocean energy potential on the Belgian continental shelf

For several years now, the use of ocean energy has received increasing attention. The R&D framework programme of the European Commission has devoted increasing funds for the implementation of prototypes, especially for wave energy, and this effort has proven a success. Several prototypes, close to the size of industrial installations, are currently being subjected to on-site testing. The anticipated costs of producing electricity with wave energy converters have been lowered substantially over the past twenty years; they are now situated below 10 cent/kWh, and these costs should decline further : the technological network looks increasingly promising.

The present call concerns a scientific study which primarily will establish the potential of wave and sea-current energy on the Belgian continental shelf. Regarding tides, thermic and saline gradients it has to be reassured not to miss an important potential (to be mentioned on the contrary). In this study it is not necessary to consider either the transmission of the electricity production or its effects on the electrical network.

This project addresses the two following areas :

1. State of the art and evolution of energy converters :

A review of converters as they appear in the specialised literature, of scenarios as to the evolution of these converters, including cost estimates of the kWh produced and the constraints on implementation and operations (physical or economic).

2. Physical, technical potentials and costs on the Belgian continental shelf :

- implementation of models to describe the wave and current climate and determine the physical potential of the available energy which can be converted
- deduction from the physical potential thus estimated of the potentials of the zones which should be excluded, partially or wholly, with or without conditions, due to activities already in progress or planned (also to be considered are the synergies with, inter alia, the activities of wind power production) ;
- deduction from the usable potentials (possibly under certain conditions) thus obtained of the potentials to be excluded for technical or logistical constraints (anchoring...), the offer giving ideas on this subject ;
- consideration of the wave and current climate, the geological and geotechnical characteristics, and the functioning of the converters, in order to provide, under different hypotheses and scenarios, classifications of the various zones capable of being exploited, notably as a function of the electricity production cost levels, associating with this the expected annual production of electricity and the description and modes of operation of these zones (location, surface area, dimensions and power of the converters, exclusion zones, etc.).
- proposal of pathways for progressively deploying wave energy converters on the Belgian continental shelf

The results of the study should constitute a scientific (from all points of view, geological, wave and current climate, energy outputs, etc.) and regulatory (North Sea master plan) basis making it possible for the decision-makers to take adequate decisions for this technological network (whether it involves industrial development or research, development and deployment).

3. PROFILE OF THE PROPOSALS

3.1 Duration and Budget

The present call offers room for **2-year research projects** of the **targeted type**.

The projects selected within the framework of the present call will start at the beginning of 2009.

The overall available budget for this call is 1,438 million Euro. The total project budget is limited to **180.000 Euro**.

3.2 Submission modalities

The call is intended for **Belgian university institutions, public scientific institutes, non-profit research centres, and specialised consulting offices.**

In order to be eligible in this call, non-profit research centres and specialised consulting offices need to have scientific research and/or the delivery of scientific services as their (main) objective, which has to be stipulated in their statutes. This has to be shown in the forms 19 and 20 of the submission file through the description of the scientific unit, the relevant scientific experience and the most important publications.

A proposal can be submitted by an **individual team** or by an **interdisciplinary network,** composed of 2 to 5 funded teams belonging to at least two separate Belgian scientific institutions, of which at least one is a university institution.

The network partners must conduct complementary activities related to a common issue and its integration.

All funded teams will jointly share all obligations and responsibilities during the implementation of the project. The contributions of the different network partners may differ according to the content. Accordingly, different partners may receive different shares of the total budget and devote different numbers of man-months to the research, provided they all bear in mind the principles of a network project.

The project may require punctual expertise, which can be delivered in the form of **subcontracting**. The cost of this subcontracting may under no circumstances exceed 10% of the total budget requested by the network.

If it brings in an added value to the project and to the development of Belgian expertise, submitters may propose a cooperation with **non-Belgian universities or public research institutes** (except for international institutions such as the Joint Research Centre):

- This participation will take place on a **co-funding** basis. The funding of non-Belgian partners by PPS Science Policy will under no circumstances amount to more than 20% of the total budget requested by the network. The non-Belgian partner is responsible for the co-funding, from other sources, for at least the same amount as the amount asked from PPS Science Policy.

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

The personnel funded in the project **must be recruited under an employment contract**. As a consequence, no scholarship student can be taken on in the framework of the project.

3.2.1 Coordination

A **coordinator** (belonging to a Belgian research institute in accordance with point 3.2.1, § 4) must be designated in each proposal. In addition to his/her scientific and management qualifications, the project coordinator must be able to synthesise and integrate the research results so as to promote applications and support to decision-making. The specific role of the coordinator is:

- to coordinate all activities to be carried out in the framework of the project;
- to coordinate the internal meetings between the network members;
- to coordinate the meetings with the Follow-up Committee and production of the reports on these meetings;
- to coordinate the production of the interim and final project reports intended for PPS Science Policy;
- to inform PPS Science Policy of any problems that might interfere with the proper implementation of the project;
- to coordinate the synthesis and translation of research results, with a view to applications and support to decision-making;
- to coordinate the publication and dissemination of research results.

3.3 Follow-up Committee, Valorisation, and Data

3.3.1 Follow-up Committee

Each selected project is accompanied by a Follow-up Committee. The objective of this committee is to provide **active follow-up** of the project and to promote **valorisation of the research**. It will carry out this role via the exchange and provision of data and information and by giving advice, suggesting valorisation avenues... 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 at the national, regional, European, or international level, social actors, scientists, industrial actors... The members of the Follow-up Committee are non-funded partners.

In the research 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 will be established in consultation with PPS Science Policy. The committee will consist of at least 5 people.

3.3.2 Valorisation

Each research proposal must include **concrete proposals for valorising** the research. This might involve, for example, the organisation of thematic debates and meetings, proposals for disseminating and popularising 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, or managers regarding the content of specific results, including its limitations, the related uncertainties, the hypotheses and methods used, etc. The target groups of these valorisation proposals must be explicitly described.

3.3.3 Use and management of data

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

- Whenever possible, the partners should make use of existing (administrative or non-administrative) databases to meet the needs of their research. For this they must check beforehand whether the data are accessible, at what cost, and how much time it will take to acquire the data. Should it appear after the start of the research that due to partner negligence or insufficient knowledge of the field the data files will *not* be available in time, this may constitute a reason for PPS Science Policy to cancel the contract.
- If the proposal requires collecting new data (e.g. via a survey), the team must justify with **clear and convincing arguments** its choice of methodology, referring to the objectives of the study and specifying why this particular form of data collection is required and preferable to other approaches. This means the proposers must provide sound and detailed argumentation in support of the chosen methodology (sampling, etc.) and highlighting its added value as compared to existing databases. In addition the partners must provide the budget required for this data collection.
- As the data collected in the framework of the proposed research must be available to other users for other purposes, the proposal must clearly indicate when and in what format the data are made accessible, specifying which categories of users are likely to benefit from access to the data.

3.3.4 Intellectual Property

The research contract (see point 4.3) provides that all results deriving from the implementation of the project will become the intellectual property of PPS Science Policy rightfully and in full. The project network will accordingly transfer the results to PPS Science policy. By "results" must be understood all project achievements, all collected data, all source codes and object codes of developed programmes, all interim results, all specifically developed methodology, and more generally everything that results from the various stages and the entirety of the implementation of the project.

This transfer does not include what is or will be in the public domain nor anything in the possession of the network or one of its members prior to the start of the project. These elements are hereafter called the "excluded elements".

In order to meet the future contract requirements, proposals must thus:

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

In this context, the researchers must bear in mind that the analysis and measurement data must be transferred to the data bank IDOD/BMDC (http://www.mumm.ac.be/datacentre).

4. PROCEDURES

This paragraph describes the procedures for submitting a proposal, the project selection procedures, and the principal contractual obligations applying to selected projects.

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.

Only those who submit an expression of interest before the stipulated deadline may later submit a complete proposal.

4.1.1 Expressions of interest

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

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

Interested parties are asked to use **exclusively** the form available at the PPS Science Policy website:

http://www.belspo.be

The expression of interest must be sent in electronic form to the following address:

SSD_call4@belspo.be

The expression of interest must reach PPS Science Policy no later than:

19 May 2009

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

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

4.1.2 Proposal submission

General guidelines

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

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

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

Each proposal must be submitted in **English** in **5 copies**[4].

The proposal must be sent to the following address:

PPS SCIENCE POLICY **RESEARCH PROGRAMME "SCIENCE FOR A SUSTAINABLE DEVELOPMENT"** **CALL TARGETED ACTIONS NORTH SEA** **WETENSCHAPSSTRAAT 8 RUE DE LA SCIENCE** **1 000 BRUSSELS**

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

SSD_call4@belspo.be

The proposal (paper and electronic versions) must reach PPS Science Policy no later than:

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

16 June 2008 at 3:30 p.m.

PPS Science Policy will disregard proposals submitted after the above-mentioned closing date and time.

Forms

Each proposal form includes three separate sections.

Section 1 - Administrative data
Section 2 - Description of the proposal
Section 3 - Qualification and experience of the participants

The forms can be obtained from the PPS Science Policy website at the following address:

http://www.belspo.be

4.2 Evaluation and selection

4.2.1 Bases for the evaluation

Proposals submitted in the framework of this call will be evaluated externally by foreign scientific experts qualified in the research field involved.

Only **complete submission files** (the 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 to be taken into consideration by the experts are the following[5]:

Compliance with the aims, content, and 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 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 to decision-making

5 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.

- The link between the project's potential scientific results and the scientific support required in order to prepare and implement a supranational, federal, regional, or local sustainable development policy.

Quality of the research team(s)/network
- Experience and international contacts of the submitters
- Added value of the network
- Complementarity of the partners' skills
- Clarity of the division of tasks between partners
- A balanced distribution of funds among the partners
- Realism of the requested resources (duration, budget, personnel)
- Added value of foreign partner's contribution

Quality of the management and coordination
- The coordinator's scientific quality and management, synthesising, and communication skills.

Interdisciplinarity
- An interdisciplinary approach in order to meet the requirements of the sustainable development concept, in particular cooperation between natural sciences and human sciences.

Elaboration of the proposal in a sustainable development context
- How and to what extent social, economic, and environmental dimensions are integrated into the proposal;
- How the proposal takes into account the relevance and/or applicability of fundamental sustainable development principles (the precautionary principle, the prevention principle, the 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
- Pertinence of proposals for disseminating and making available the information, especially in a perspective of support to policy decision-making;
- The member profile and role of the Follow-up Committee.

Added value with regard to projects funded under previous programmes (SPSD I, SPSD II, "Workers' Healthcare", and "Standardisation") (see point 1.4)

4.2.3 Selection

The research project selection procedure will take place in two phases: a scientific evaluation, followed by a strategic choice. The scientific evaluation is performed by foreign scientific experts qualified in the research areas of the submitted proposals. The strategic choice is made 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 PPS Science Policy and the network of funded 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 to be drawn up. This **technical annex** to the contract will be drawn up in consultation with PPS Science Policy and will take into account the recommendations formulated by the foreign experts and the Programme Committee. Adaptations to the original proposal may relate to the content of the research, the composition of the network or Follow-up Committee, the choice of the coordinator, the proposals for valorising the research, etc.

PPS Science Policy grant the selected projects the **funds required** for their implementation. PPS Science Policy shall reimburse at most, and up to the amount specified in the granted budget, the real costs substantiated by the people responsible for the contract provided those costs are directly related to the implementation of the project.

4.3.2 Intermediary Evaluation

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

4.3.3 Reports

The contract will define the various reports to be submitted to PPS Science Policy. These reports are to be included in the project work plan and the cost of preparing them (including translations) is to be covered by the project budget.

4.3.4 Data, Results, and Ownership

The research contract provides that all results deriving from the implementation of the project will become the intellectual property of PPS Science Policy rightfully and in full. The project network will accordingly transfer all results to PPS Science policy. By "results" must be understood all project achievements, all collected data, all source codes and object codes of developed programmes, all interim results, all specifically developed methodology, and more generally everything that results from the various stages and the entirety of the implementation of the project.

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

The network of funded teams retains the right to publish or to valorise the results in whatever form it chooses, subject to prior authorisation by PPS Science Policy.

For archiving and further dissemination, all project (meta)data/results will be submitted to PPS Science Policy and/or to indicated data centres, according to modalities specified in the contract between PPS Science Policy and the network of funded teams.

5. CONTACT INFORMATION

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

Secretariat
Mrs V. Michiels +32 (0)2 238 36 13
mich@belspo.be

Marine ecosystems of the North Sea
M. D. Cox, +32 (0)2 238 34 03
coxd@belspo.be

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

This annex contains an excerpt 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 concerns:

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

This description offers an overall picture of the content of the Programme and constitutes 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 scientific developments and the evolution of needs in the area of policy support into account. Research proposals must therefore be based on the calls for proposals and not only on this excerpt from the Memorandum to the Council of Ministers.

A. Priority Research Areas

1. Energy

The 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 equilibria, fuel prices... An active energy policy, a top-priority sector for every economy, cannot be carried out 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 influencing 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 that can improve energy efficiency, such as soft chemistry (new materials and superconductivity)...

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

- **Organisation of energy systems over the medium and long terms:** 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).

- **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 (relationships between energy and employment, energy and poverty, energy and the economy, etc.).

2. Transport and Mobility

In various policy documents at 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.

In 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, trends in travel behaviour and modal choice (habit formation, price, impact of advertising and awareness-raising...)
  - The future of inter-modal and multimodal transport (in the framework of logistics, freight and passenger transport): interoperability, standardisation, competitiveness, cost evaluation, pricing policy, supply and financing of infrastructures...
  - Possibilities for and role of intelligent transport systems and technological innovations in 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;
  - Possibilities for and role of intelligent transport systems and technological innovations in the area of traffic safety.

The research concerns the analysis of both **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 should be paid to institutional aspects (e.g. the integration of

transport and environmental policy, the European context, etc.); mutual interactions between mobility, environmental, and traffic safety issues; possibilities, impediments, and effects at the social, economic and environmental levels.

3. Agro-food

The quality of both foodstuffs and the processes 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 this striving for quality, a great deal of research must be done, covering a variety of aspects, among others human health, impacts on the environment, as well as 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"**: the study of diet, macro- and micro-nutrients, antioxidants, and oligo-elements, pre- and probiotics, health foods, vegetable oils, GMOs, the use of little-known biological resources...
  Putting on the market "novel foods" combining nutritional effects and marketing, raises questions which must be answered by introducing a legal framework (directives and standards).

- **Integrated systems for quality management:** the study of environmental and quality management systems (HACCP (Hazard Analysis and Critical Control Point), LCA (Life Cycle Analysis), systems for rapid warnings about foods, standards, labels, specialised guides for best practices, traceability, authentication, reduction of pesticides, fertilisers, heavy metal contents, and the emission of greenhouse gases...).
  Systems for quality management must also be adapted to the problems facing 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 beyond the 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 trends in both individual and collective

behaviours, in how people work or consume and produce goods and services, have new and sometimes unexpected effects on 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[6], 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 comprehensive issue where account must be taken of the numerous risk factors and their cumulative effects.

The research to be carried out under the Programme supports the elaboration or the adaptation of 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[7], etc.).

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

- **Health risks related to biological, chemical, or physical exposures**
  A horizontal and/or sector-related approach is taken to address health issues. This research spans the entire programme (transport, energy, climate, Agro-food, the terrestrial environment, the aquatic environment, the atmosphere) and must make it possible to attain greater insights into 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 Agro-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 fit into the study of a general environment, such as research on workplace contamination or the (bio)monitoring of employees exposed to existing or new hazardous products, to pesticides/biocides...

  Well-being in the workplace is also studied by addressing 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 SMEs, 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 hazards.

5. Climate

The priority research lines take into account (among others) the recommendations of the

6 A general condition of physical, mental, and social well-being that does not consist merely of the absence of any disease or handicap.
7 Decision of the Council of Ministers of 10 December 2004.

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, and the definition of new post-Kyoto reduction targets. Research on climate change is carried out on various geographic scales: national, European, and global, with specific attention paid to Antarctica.

Research is necessary for:

Understanding the climate system

- Studying the evolution and causes of climate change (natural versus anthropogenic origin);
- Better understanding the mechanisms and factors which influence the climate system (biogeochemical cycles, aerosols, stratospheric ozone, the ocean CO_2 balance...);
- Contributing to the international efforts to identify the various "pathways" which allow the reduction targets to be reached (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 impacts, adaptation, and vulnerability (particularly in Belgium)

- Evaluating the impact of the climate change 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 impacts 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 measures to mitigate climate change

- Evaluating from an economic, social, environment and legal perspective the measures relating to:
  - the sequestration potential in terrestrial and marine ecosystems;
  - reducing greenhouse gas emissions in Belgium (taking into account the three Regions in Belgium and their mutual interactions, as well as relations with neighbouring countries);
  - reducing greenhouse gas emissions outside Belgian borders in the framework of Joint Implementation (JI) and Clean Development Mechanisms (CDM)...;
  - integrating 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 in 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 genetic diversity within a given species and the (terrestrial and aquatic) environments in which 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, nutrient cycles, resistance against climate, etc.), an increased loss of biodiversity such as that currently observed constitutes one of the major problems that we face. Europe and its Member States have undertaken to "halt the loss of biodiversity before 2010". This goal can only be attained with reliable and coordinated science.

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

- to understand the causes of the loss of biodiversity: the impact of invasive species, fragmentation of the landscape, climate change, nitrogen pollution, etc.;
- to analyse the conditions and trends of populations, species, habitats and to evaluate ecological services which these species and systems provide;
- to identify priority responses concerning conservation, restoration, and the sustainable use of biodiversity and to provide 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 terrestrial ecosystems and Belgian freshwater areas. In a perspective of sustainable utilisation and conservation, the *ex situ* biological resources kept on our territory are also being studied.

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

In this research area, attention is paid 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 atmosphere is to be studied at the global as well European and local levels, to support 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 will focus on our territory and also includes the research relating to surface water and river banks and valleys, so as to support the implementation of the European Water Framework Directive.

The marine ecosystems to be studied include the North Sea and Antarctica, where research is important for the implementation of (inter)national conventions and agreements 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).

Research within these three compartments concentrates on the **"drivers" of ecosystem processes and on environmental policy problems**, such as changes 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.

Since generally the same anthropogenic activities cause these problems and given the mutual interactions of and links between these various problems, there is a need for an integrated approach to both research and policy.
Research will attempt via **process studies** (understanding and quantifying chemical, biological, and physical processes) and the development of tools (quality monitoring systems, simulation models, etc.), to propose 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 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 melting of ice sheets and glaciers as a result of climatic warming will have a significant effect on the total sea level increase, anthropogenic chemicals above Antarctica degrade the protective ozone layer... Research provides 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 change.

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

Relevance of North Sea and North Atlantic research

The North Sea is characterised by a very high productivity and highly diversified habitats, but it is also a sensitive ecosystem 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 responses to anthropogenic pressures and a better understanding of the social/economic impacts of 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, the 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 deserve 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 of 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).

At the economic and social levels, standardisation is an instrument that harmonises and facilitates transactions, inspires trust, limits risks, and supports the dissemination of innovation.

Standardisation is also an essential instrument supporting the implementation of European environmental policy choices. The implementation of environmental policy (in the areas of noise pollution, waste, soil, biomonitoring, discharge of pollutants, etc.) requires appropriate standards for

tests, sampling, and analysis, since it is essential that environmental quality be comparably measured worldwide. This is the task of international standardisation.

Moreover, there is an increasing awareness of the importance of standards and how they are designed. The Commission (DG Enterprise and DG 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 to be carried out in this framework must meet the following criteria:

- The research should fit within the priority research areas proposed in the Programme;
- It should be prenormative research making it possible to contribute to the development of standards;
- The research should make it possible to contribute to the identification of impacts, problems, and gaps related to standardisation in a sustainable development context;
- The research should analyse the role of standardisation as an instrument for a sustainable development policy.

C. Interactions between priority research areas

A trans-sectoral, integrated approach to research is needed for several reasons: to evaluate the impacts of a problem or the validity of a measure, strategy, or technology at the social, economic, and environmental levels; to take into account in an optimal manner the complexity of a problem, the reality in the field, and the institutional context; to contribute towards adequately fulfilling national and international commitments.

The Programme will therefore encourage **interactions between priority research areas**, making it possible to tackle common, complex problems such as:

- *air pollution (ozone, particles…),* a problem common to the areas energy ↔ transport and mobility ↔ atmosphere, terrestrial and marine ecosystems ↔ climate ↔ health;
- impacts associated with *genetically modified organisms* (GMOs), a, issue interfacing with Agro-food ↔ consumption ↔ health ↔ terrestrial ecosystems ↔ biodiversity;
- *the work/leisure relationship* interfacing with ↔ energy ↔ terrestrial and marine ecosystems ↔ biodiversity ↔ health;
- *product and process life cycles,* interfacing with terrestrial ecosystems ↔ atmosphere ↔ biodiversity ↔ energy ↔ Agro-food ↔ working conditions;
- *renewable forms of energy*, 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 coasts or catchment areas, which is linked to the research areas* energy ↔ agriculture ↔ transport and mobility ↔ terrestrial and marine ecosystems ↔ climate ↔ biodiversity ↔ production and consumption;
- ...

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

For this are planned: integration of interactions and common themes into appropriate calls, *joint calls* between priority research areas (e.g. energy – transport, agro-food – biodiversity, health – climate,

health – Agro-food), the "*clustering*" of projects covering different aspects of common, complex problems...

D. "Transversal Research"

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 "Transversal Research" dealing with the following questions:

- Changing unsustainable production and consumption patterns;
- The role of the spatial and temporal dimensions of sustainable development;
- Devising and analysing instruments supporting a policy of sustainable development, in particular instruments aimed at a better balance between the social, economic, and environment-related pillars of sustainable development.

Sustainable development is all about **equating the human population with the available resources and space**. This implies analysing the links between the geographic or climatic framework of a region and all of the region's economic, social and cultural productions. This requires a transversal approach and can be analysed via the different research themes.

In order to strengthen the coherence of the Programme, the transversal research topics should preferably be addressed in relation to the 7 proposed priority research areas, without excluding other areas that might contribute towards operationalising the sustainable development concept (e.g. residential construction).

Under this heading the following research topics are addressed:

- **Spatial dimensions of the sustainable use of the ecosystems**, underscoring the importance of policies for land-use planning, habitat, infrastructures, etc.;
- **Production patterns**, taking into account the economic, environmental, and social impacts throughout the production chain
- **Striving for sustainable consumption** at both the individual and collective levels (well-being, health, employment, quality of life, excessive debt burden, redistribution, pollution, waste, natural resources, etc.)
- **Time management in relation to consumption profiles and production methods** (leisure, combining a private and a professional life, flexibility of companies, etc.);
- **Globalisation of the economy** and its consequences, particularly with respect to geostrategy, North-South relations, the use of natural resources, climate change, inequality, and poverty
- **Social changes** (demographic development, (im)migration, etc.) and their implications in a sustainable development perspective
- **The quest for an economic development** (competitiveness of companies, employment...) **compatible with the sustainable management of human and natural capital** (uncoupling, dematerialisation, qualitative growth, etc.)
- **Ethical aspects linked to sustainable development,** notably in relation to the responsibility of the various actors, access to resources...
- Different **visions of sustainable development** and their implications
- **The role of 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;
- **Resource management**; this includes analysing the present dependency on finite resources, analysis of bottlenecks over the short, medium and long terms, studying links between resource use, energy consumption, and environmental pollution, and conducting further research on how

to reduce the discrepancy between environmental stress and the environmental carrying capacity, the ecological footprint, and the ecological debt.