

MINISTRY FOR ECOLOGY  
AND  
SUSTAINABLE DEVELOPMENT

ECONOMIC STUDIES AND  
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Research and long-term planning department

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SECOND PHASE OF THE  
"CLIMATE CHANGE MANAGEMENT AND IMPACTS PROGRAMME"  
(GICC-2)

FIRST CALL FOR RESEARCH PROPOSALS (2003)

Closing date: 15 December 2003

This is the first call for research proposals in the second phase of the "GICC-2" Climate Change Management and Impacts programme coordinated by the French Ministry for Ecology and Sustainable Development in close collaboration with the Joint Ministerial Working Party on the Greenhouse Effect. It follows on from the calls for proposals sent out in 1999, 2000, 2001 and 2002 within the framework of the first phase of the GICC programme (see <http://medias.obs-mip.fr/gicc>). The overall objective continues to be to develop knowledge which will assist decision-makers in choosing the best strategies to prevent worsening of the greenhouse effect and for adapting to Climate Change (CC), in the context both of pursuing international negotiations following the Kyoto Protocol and introducing measures to implement the National Programme to Combat Climate Change<sup>1</sup> and the missions of the National Observatory on the Effects of Climate Change<sup>2</sup>.

GICC-2 has retained many of the same concerns as the programme's first phase (GICC-1) and studies which relate to these need to be continued and further developed (especially in terms of the consequences of climate change on risks associated with extreme events). It also aims to place greater emphasis:

- firstly, on the regional setting (which is defined in more detail in the introduction to topic II below), both from the point of view of the physics of Climate Change (changes in average and extreme climate features), and from the point of view of how CC is perceived in society, its environmental and economic impacts and the implementation of public policies to combat greenhouse gases and manage climate change and the technological innovations associated with it;
- secondly, on links with the living world, human health, biodiversity and in the long term, emerging diseases in the plant kingdom.

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<sup>1</sup> Programme national de lutte contre le changement climatique - PNLCC

<sup>2</sup> Observatoire National des Effets du Réchauffement Climatique - ONERC

This call for proposals also aims to develop both:

- research in disciplines which until now have not focused a great deal of attention on the subject of climate change: sociology, international relations, legal science... ;
- and interdisciplinary research between exact sciences and humanities and social sciences.

It covers five major research topics:

- *decision-making, players involved and the international scene;*
- *strategies to reduce GHG emissions and adapt to the impacts of CC on a regional scale;*
- *GHG emissions and GHG sinks*
- *climate change and health;*
- *biodiversity and climate change.*

In view of the forthcoming creation of an ERA-Net<sup>3</sup> network, within which the GICC-2 programme will coordinate with programmes run by major neighbouring countries, applicants are asked to describe how their project relates to the European context and to explicitly mention any related research project they are involved in. They should give details of the aims of such projects, the European teams who are involved and the type and amount of funding involved.

Applicants are also asked to describe where applicable how their project relates to other connected projects within the GICC programme or other national or regional programmes which deal directly or indirectly with the greenhouse effect, climate change and weather and climate related risks.

**The terms and conditions for submission and assessment of the projects are given at the end of this document.**

## **Topic I “Decision-Making, Players Involved and the International Scene”**

### **Overall Purpose**

At present, the international approach to combating climate change is incomplete: in the first instance, the United States and to an even greater extent the developing countries, have not made any commitment to reducing or limiting their greenhouse gas emissions. In the second instance, the Kyoto Protocol is a tool for coordinating reduction policies, but discussion about adapting to climate change and the role of adaptation in the international approach has not yet been tackled. It is hard to envisage a global system which did not take into account the needs of the countries that are most vulnerable to climate change. Finally and most importantly, the Kyoto Protocol only covers a five-year period, after which the targets to be set are still to be defined.

This situation, which is largely determined by political realities, raises many different questions for research in areas such as economics, sociology, law or climatology. The primary aim of this topic is to study the present and long-term international scene, from the angles of climate change management decisions and the various players involved (countries, NGOs and the corporate sector). As some of the sub-topics require dialogue between different disciplines, multi-disciplinary proposals will be very welcome.

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<sup>3 4</sup> European Research Area Network (European Union)

## **I.1. Future Commitments to Reductions**

This general topic covers the issues, the nature, the form and the extent of participation beyond 2012 by the United States, Europe, other developed countries, the most advanced developing countries (DCs) and other developing countries in a worldwide GHG reduction strategy. The questions open for debate on this topic are as follows:

### **I.1.1. Architecture of Potential Agreements**

What economic, political and sociological issues are at stake in the potential fragmentation of the climate protection system? What are the determining factors for the system's stability? What should the balance be between reduction targets and adaptation targets (cf. I.2.)? How could reduction targets similar to or more flexible than the Kyoto targets be formulated in such a way that they will be accepted by all countries? What criteria should they be based on? What timescales should be set for which groups of countries?

As far as possible, the current climate negotiation situation should provide the framework for developing these studies.

### **I.1.2. Incorporating the issue of responsibility into the way the burden of the targets that have been set (for reduction and adaptation) should be distributed**

Does international public law shed any light on the concept of responsibility which could be applicable in the case of climate change? Brazil's proposal, whereby countries' past contribution to the accumulation of greenhouse gases in the atmosphere should be taken into account when setting their reduction targets, could be used as a case study.

### **I.1.3. The Conditions for Participation by Developing Countries**

There is a consensus that in addition to problems of development and poverty, the developing countries lack the necessary capacity, as well as having a different perception of the question of climate change. How do the major developing countries view their role in climate negotiations? What connections are there between development policy and climate change policy? What steps do developing countries need to take on a domestic level before considering undertakings on an international scale? In what circumstances would it be possible to envisage genuinely developing countries restricting the growth of their emissions, which is a prerequisite for controlling emissions on a worldwide scale?

### **I.1.4. The Question of Countries that Own and Manage A Large Proportion of Fossil Fuels (including OPEC).**

Certain countries are blocking the progress of international negotiations, on the grounds of the adverse effects of reduction policies on their future revenue. This matter should be dealt with from a wider perspective, taking into account effects on coal and oil but also on gas and alternative fuels, which could represent a radically different proportion of world supplies under CO<sub>2</sub> emission restrictions. What would be the position of these countries on the fossil fuels markets in an anti-greenhouse effect scenario? Are there any ways of participating in emissions limiting which could provide an incentive for these countries?

## **I.2. Assessment of Adaptation and its Role in Negotiations**

In addition to reductions (dealt with in point I.3. below), we are interested in adaptation issues in international negotiations, both from an economic and a sociological point of view. CC is to some extent unavoidable and will entail some impacts and damage which can be mitigated through adaptation measures (protecting coastal zones, managing water and crops, etc.). In Delhi, a discussion was held on adaptation and the costs it represents in the final analysis: should polluters (Northern countries) pay to reduce the pollution they cause, but also pay for the damage it entails?

### **I.2.1. The Need to Ensure the Reliability of Damage Assessments before Entering Negotiations about Damage**

Is the damage due to climate change caused by human activity, or is it a result of natural variations in climate? What scientific material should negotiations on adaptation issues be based on?

### **I.2.2. Assessing the Cost of Adaptation in the Relevant Parts of the World: Methodology**

How do DCs view climate change damage? Can adaptation be incorporated into "everyday" policies (such as poverty reduction, infrastructure development, overall economic development, management of climate-related crises such as drought, etc.)? How would such changes in development aid be received by the DCs? Have there been any similar experiences in the past?

Proposals could also relate to comparative studies on the way climate is viewed and represented, and its risks and role in everyday life.

### **I.2.3. International Approaches to Managing the Costs of Adaptation**

What resources could be mobilised for this purpose (the Global Environment Facility, Special Climate Change Fund)? How would they link in with damage prevention policies? Who would be the agents of adaptation policies? Which countries should receive this aid? Are there any lessons to be drawn from other international assistance programmes?

## **I.3. Cost-Benefit Models of Reduction Strategies**

### **I.3.1. Issues Involved in Economic Modelling of the Costs of Reduction and How to Deal with Progress in Economic Models**

Have the results of microeconomic research on learning curves and economies of scale been incorporated into the so-called macroeconomic models? What work should be developed on quantifying so-called 'no regrets' options, including evaluation of these after the event? This analysis should be done outside the macroeconomic issue of the double dividend, in order to look into the relationship between technological choices and economic rationale. Can models of the links between economics, energy and the environment provide a dynamic view of the interactions between international decision-making, changing technologies and lifestyles and economic implications?

### I.3.2. Technological Innovation and Change

Developing technologies that consume less energy and emit fewer GHGs is a fundamental element of any long-term reduction strategy. What are the constraints and obstacles preventing these technologies, both new and existing, from being developed and more widely used? What methods can be used (incentives, joint projects, institutional structures, public contracts, etc.) to stimulate these innovations? What experiences of innovation (best practices) could be used as examples for climate policy? Under what conditions would they be reproducible on a large scale?

Alongside an approach based on individual technology sectors, could models of technological development be produced that are based on a systemic vision at national, European and global levels?

### I.3.3. Developing Work on Integrated "Economics, GHG Emission, Climate And Damage" models

The research done in the first phase of the GICC programme highlighted certain weaknesses or limitations of integrated assessment modelling, but provided an opportunity to start building methodological solutions. Efforts should focus on further developing the following aspects:

- taking alterations in all the relevant climate variables, especially rainfall patterns (and associated hydrological patterns) into account in the damage functions of integrated models. Current practice is to make temperature the only control variable for damage in cost-benefit analyses of climate change. It would also be useful to take extreme values into consideration at this level, not only average values as is the case at present;
- evaluation of national or continent-wide damage reduction strategies, including proposals for improvements to and breaks with current practices. Regarding extreme events in particular: preventing climate risks further upstream, strengthening structures (building standards,...);
- the potential spread of regional crises to the global level, which requires the regional boundaries of the impacts to be more clearly defined (see II.B.) in order to avoid aggregation problems;
- taking uncertainty into account (absolute and model uncertainty) in the context of regional definition of impacts.

As regards analysis of global climate change policies, the following methodological questions are suggested:

- how can the masking effect of aggregation be reduced, whilst retaining a flexible modelling framework?
- how should adaptation be dealt with in integrated analysis, apart from simply compensating for the effects of climate change?

## **I.4. Expertise, Players Involved and Decision-Making**

The Climate Convention is based on a body of scientific knowledge, as are national and international policy decisions on combating the greenhouse effect, and their architecture is fundamentally influenced by economic science. Economic science will continue to play a role in negotiating future commitments, but various groups of players, whether these be the corporate sector, NGOs or international institutions, also play a determining role in defining regulations on climate at world level.

### **I.4.1. Relationship between Expert Knowledge and Decision-Making**

The aim is to shed light on decision-making processes, on the basis of comparisons between the major countries if possible: What type of interactions are taking place between political decision-makers and scientists? What, if any, were the political constraints which influenced the Kyoto negotiations, which in the end led to failure to obtain agreement from the United States? What role did scientific knowledge (primarily economics) play in the formulation of the American negotiating position – including America's justification of its position *ex-post*? Can the US withdrawal be explained solely by the fact that the gap between economic knowledge and the political reality was too wide? Given its current economic circumstances, why did Japan opt for ratification? And what factors are influencing Russia's actions in this field? What lessons can be learnt for future negotiations?

### **I.4.2. Role of Environmental NGOs and the Corporate Sector on the International Scene**

International negotiations are characterised by various different groups who are attempting to sway the intergovernmental process to reflect their own interests. The purpose of this topic is to look at the way in which various major companies on the one hand and various NGOs on the other, or other players still, have appropriated the climate change issue, what arguments they are presenting on the subject, what international networks they have and what role these play in negotiations, as well as the types of action they take and how effective these are. How is climate change portrayed as an issue on which industrial strategies can focus? What different types of strategy are the multinationals adopting (oil companies, chemical companies and other heavy industry) or national and international trade bodies? In what way do they participate in other international environmental regulatory bodies (ISO 14000, for example) and what influence do they have in this context?

### **I.4.3. Greenhouse Effect and Public Opinion**

The aim will be to understand trends in public attitudes, by looking at public perception of the risk, the public's approach towards the science and technology behind it and its awareness of environmental issues. How has the issue of CC come to the fore in developed countries? This question could form the focus for a comparative study relating to certain countries whose inhabitants have a strong awareness of the issue (Germany, Netherlands, Scandinavia, etc.). How is publicity around the greenhouse effect, as presented by politicians, scientists, socioeconomic players (corporations, NGOs, etc.) and the media received by public opinion? What role(s) do ICTs (Information and Communication Technologies) play in expanding this awareness? How does this information deal with the relationship between expert knowledge and lay knowledge about a complex subject that is characterised by a great deal of uncertainty and marked by a variety of different controversies? Are there any signs that expert knowledge is being manipulated?

#### I.4.4. Institutions and Worldwide Regulation on Climate and the Environment

This topic looks at the long term and is therefore likely to attract responses from specialists in various disciplines that deal with international relations. Current blocks in the international environmental governance system and the system for combating climate change in particular, open up several questions. In the first instance, what are the underlying causes of these problems? Are they not simply of an institutional and legal nature (*i.e.* multiplication of decision-making levels, overlapping up of multilateral environment agreements)? To what extent is the political factor responsible for the current stalling?

A second series of questions needs to be asked, depending on the outcome of this analysis: is institutional reform of the governance system an appropriate solution to the current problems? Is France's proposal to create a WEO<sup>4</sup> appropriate given the international context (America's opting out of climate commitments, tendency towards unilateralism, dominance of WTO<sup>5</sup> negotiations) and to the specific problems of environmental governance? In this instance, there are two aspects to the questioning: in the first instance, which European diplomatic partners are likely to support this approach? Secondly, what support might partners in Southern countries and the community provide, given that the proposal is about the environment (not sustainable development) and is coming from developed countries? Can a new intergovernmental institution provide solutions to the existing conventions and agreements, which are currently at a stalemate. What lessons can be learned from the Johannesburg Summit?

Finally, how should climate patterns be taken into account within this evolving system? Should it be kept in its current format or would it be better to change it? If so, how should the institutions which govern it change? A comparative approach based on other multilateral agreements on the environment such as the Biodiversity Convention, could be considered.

### **I.5. Climate Change Law and Policy**

In addition to the question of responsibility in international public law mentioned earlier on, four topics have been envisaged under the topic of legal science.

#### I.5.1. Compliance Mechanisms (International Law)

What international public law instruments are invoked to oversee implementation of protocols such as Kyoto, in terms of monitoring and sanctions? The role of international registers and lessons from situations other than the greenhouse effect: export of chemicals, Montreal Protocol? A comparative analysis could be based on other systems, including those outside the field of international environment law. Studies could also look at issues relating to the governance of agreements with strong financial repercussions (in this case, the Kyoto Protocol permits markets).

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<sup>4</sup> World Environment Organisation

<sup>5</sup> World Trade Organisation

### I.5.2. International Quota Markets (comparative law and EU law)

The questions which arise here relate to:

- the way in which the European Directive on industrial GHG emissions interlinks with the different national laws;
- methods for transferring entitlements (including their fiscal implications);
- comparative analysis of existing quotas markets, even if these do not relate to CC (fishing quotas, dairy quotas, taxi licences, ...), in order to highlight potential obstacles (of a cultural, sociological, administrative nature, etc.) to the operation of entitlements markets.

### I.5.3. Competition Law

Does the public allocation of quotas to private agents under the "Quotas Directive" and the possibility of private sources accessing information on emissions and possession of quotas pose a threat to competition?

### I.5.4. Technology Transfer

The standpoint of national and international law. Is patent law adequate to deal with approaches to technology transfer in the context of the Climate Convention? What role might the WTO play as regards the transfer of technology assets?

## **Topic II “Regional Scale Strategies to Reduce GHG Emissions and Adapt to CC Impacts”**

### **The Regional Setting**

The regional setting is defined here as an area containing a clear functional unit in which various different problems can be dealt with together. This regional scale area corresponds to a functional unit in the bio-physical environment (catchment basin, mountains, coastline, forest, wetlands,...) and/or to a structural unit of society (administrative region, large regional city or cross-border region).

The regional setting is variable therefore, depending on whether we are talking about physical impacts (for example within a river basin), eco-physiological impacts (for example within a forest) or sociological impacts (for example within an employment pool), or about introducing public policy on Climate Change and approaches to economic regulation (for example within an administrative region). The regional setting crosses national borders if this is dictated by the constraints of a particular functional unit. Nonetheless, the region should relate to areas which are neither too small geographically (for example a farm field or a village community, ..) nor too large (e.g. France, ...). *The regional settings may be within mainland France and French overseas territories or Africa.*

Publicising the results of research to a wider audience such as political or administrative

decision-makers is just as important, though sometimes more difficult to do, than the usual publicity among the scientific community through the publication of articles in specialist journals. *It is therefore recommended that the players involved in these regional areas be brought on board, for example by raising awareness of those involved:*

- *at an early stage in the research, in order to look closely at the possibility of an intellectual and/or financial contribution from a local partner, who would then be involved throughout the project,*
- *during the course of the research, in order to gradually bring on board players involved in the region in question who will be affected in the long term by the work (local councillors, engineers...).* *These people could, for example, form a working group into which the project would feed, and with whom the findings would be discussed throughout the research.*

## **II.A. Strategies to Reduce GHG Emissions**

### **Overall Aim**

The aim is to analyse the strategies for reducing GHG emissions that are being used at the level of regions and the local authorities within the framework of the National Plan to Combat Climate Change (PNLCC), and to assess the consequences of these. These studies will focus on a regional analysis of innovative or other techniques for reducing GHGs and their effects in both environmental and socioeconomic terms (cf. I.3.2. above, as applied to this geographical scale), and an analysis of the roles played by groups in society with diverging interests (cf. I.4.1. to I.4.3. above, adapted to this geographical scale, and II.C. below). More generally, the studies will be based on identifying the environmental and socioeconomic indicators of CC and the use of a very broad spectrum of methodologies borrowed from sociology and political science, to define the roles of the different players, using economic theory to gauge what is the ideal distribution of reduction efforts.

### **II.A.1. Regional Strategies for Implementing Programmes to Combat GHG Emissions**

The aim will be to identify who is involved, examine the issues, conflicts of interest and/or approach, the arguments of the main pressure groups and how they impact on decision making and regional application of public policy and to examine the respective roles of the different levels (Europe, State, Regions and local authorities, ...) in the introduction of strategies at regional level. The way the targets are split between the different levels should be studied, and approaches to dividing national targets among the local levels should be proposed, taking into account the different local areas' types of production, agriculture, industry (whether or not they are big energy consumers) and service sector structures , etc.

### **II.A.2. Examining the Instruments**

The focus should be on analysing which instruments are most suited to each operational level, looking among other things at regulations, grants and subsidies, taxation, emissions permits, etc., as well as the relationships between these different instruments, and how the income and expenditure is split between the different operational levels. The question should be asked as to how well they function (plurality and complexity of the instruments versus their effectiveness), the causes behind any problems, and what kinds of joint work should be sought.

In the field of legal standards and French law, questions should relate both to combating GHG emissions and adaptation to CC (cf. II.C.7.).

## **II.B. Regional Scale Adaptation Strategies: Modelling Climate and Analysing/Modelling and Assessing CC impacts**

### **Overall Aims**

Different issues regarding adaptation to CC can be dealt with in the following areas

(these are suggestions only and the list is not exhaustive):

- (i) prevention and management of the risks associated with extreme weather and climate-related events (risks of flooding, storms, cyclones, coastal flooding, heat waves, drought, forest fires...);
- (ii) managing water quantity and quality at the catchment basin scale, linked with conflicting usage needs of an increasingly precious resource (irrigation for crops, withdrawal for industrial activities, production of hydraulic or nuclear electricity or drinking water supplies, etc.);
- (iii) integrated management of coastal zones and shores, in which human activity is concentrated downstream of catchment basins and interacts with a rich and fragile marine environment;
- (iv) sustainable management of food production and resources in agricultural ecosystems and continental or marine hydrological systems;
- (v) development and sustainable management of forests, in view of the need to maintain forests' health and diversity and their many functions (including their 'carbon sink' function) at national and regional levels;
- (vi) management of mountain zones, with the shifting definitions of high mountain and highlands, the consequences of which concern both the physical and biological environment and economic activities (crop and livestock farming, forests/woods. energy, tourism);
- (vii) management of energy production and consumption in relation to industrial practices and lifestyles, especially urban lifestyles and in relation to adaptive changes in farming and forestry strategies, reorganisation of infrastructures, services and tourism, etc.

In addition to these examples, the call for research proposals is open to all proposals provided that they are concerned with future changes in the regional system, including both ecosystems (natural or with human involvement), with their physical, chemical or biological sub-systems, and social systems. Generally speaking, it would be helpful to focus on regions in which the climate risks are very high and the socioeconomic, ecological or GHG-related stakes are also high.

There are a number of different issues for research at this spatial scale. The aim is:

- (i) to develop high resolution climate models, in liaison with the climate science community (PNEDC<sup>6</sup> in particular) and to construct climate change scenarios for different timescales, whilst ensuring that these tools are prospective rather than predictive and minimising the number of uncertainties which still affect the outcomes of these models;
- (ii) to develop strategies for observing, measuring and monitoring relevant parameters that are chosen specifically for the functional units and areas under study and are known to be sensitive;

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<sup>6</sup> Programme National d'Etude de la Dynamique du Climat – National Climate Dynamics Study Programme

(iii) to analyse and model the environmental, health and socioeconomic impacts of CC, define their respective roles in order of priority, establish the most likely change scenarios of the functional unit in question and assess the various medium and long term risks and costs associated with them;

(iv) to examine the way in which regional institutional decision-makers (local and regional authorities, government departments, economic stakeholders) plan ahead and incorporate CC impacts and their associated risks into their sector-specific and local policies, with the support among other things of the scientific findings obtained from points (i) to (iii), and to look into other possible policies (either inspired by the example of other countries or more original policies) which might lead to minimising the impacts and risks at that particular scale;

(v) to determine the environmental, social and health impacts and economic costs of these new policies and identify any potential opposition and obstacles or conversely any collaborative work which could come from their introduction (adaptability concept);

(vi) to study and compare the changing awareness of different players in society (voluntary organisations, political, social or cultural organisations, citizens, young people) of the issues and risks and changes in their behaviours or lifestyles.

#### Assessment of impact on this spatial scale requires:

(i) an experimental approach in the initial stages of the study, which will supply measurements for different variables (both natural and economic) associated with sensitive environments and habitats; this will inevitably be linked with the use and development of new long-term measurement technologies. The creation of a network of monitored stations focusing on a similar subject at national and if possible international level would be a first step towards gauging the spatial distribution of the impact;

(ii) the creation of archived and live regional databases with parameters relating to the environment and society; the quality and validation of the series of models which are developed relies on the creation of these databases and on their being organised into a network for comparison with other geographical sectors, incorporating the interactions occurring between the ecosystems in their physical, chemical or biological sub-systems and the regional social systems in the context of Climate Change;

(iii) developing modelling tools that are as reliable as possible given the current state of our knowledge; in view of their resolution, these regionalised models will only be robust if they are based on the experimental approach developed in the initial stages.

"Zones Ateliers" workshop sites (long-term, medium-scale observatories of human ecosystems) and OREs<sup>7</sup> (Environmental research observatories) managed by INSU<sup>8</sup> (where they fulfil the definition of regional scale as defined above) are appropriate contexts for research in this respect. The use of other workshop sites may also be proposed where justified.

It might also be beneficial to base integrated modelling and assessment efforts on an analysis of any changes that have been observed in the recent past in connection with the warming recorded (over the last fifteen years and more widely, since the beginning of the century).

Within the above framework and the above fields, research proposals are invited on the following topics.

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<sup>7</sup> Observatoires de Recherche en Environnement

<sup>8</sup> Institut National des Sciences de l'Univers - National Institute for Universal Science

### **II.B.1. Developing High Resolution Spatiotemporal Climate Models**

The models should enable us to determine what climate changes can be anticipated (changes in average climate conditions and climate variability) with as little uncertainty as possible, and then to track the actual development of physical and climate change parameters. The following are some of the key questions to be asked in this context:

- what are the relevant scales for describing regional climate changes depending on the nature of the impacts under study?
- what methods can be used to assess any changes to the pattern of extreme events (storms, cyclones, flooding, storm surges, extreme hot or cold weather, drought, extreme cold, etc.)?
- what regional forcing factors (natural or human-induced) need to be taken into account in simulating regional changes in climate, while taking into consideration interactions between the regional climate and the global climate?
- what are the specific uncertainty factors affecting regional climate change modelling?
- what methods should be applied to separate the physical and chemical climate model parameters according to the nature of the impacts under study?

### **II.B.2. Establishing Scenarios for Impact Studies**

These scenarios should allow certain critical factors to be incorporated in such a way as to produce the forcing needed for the impact prediction models. It will be useful beforehand to examine:

- what are the critical variables in the analysis levels in question (variables relating to climate, soil, land-use, water and land exploitation habits, approaches to land development, lifestyle, etc.)?
- what spatial effects do these have and how can we distinguish between them?
- in what ways do the functional mechanisms synchronise/coincide or otherwise and how can these be monitored?
- is it useful to prioritise the physical, biological and socioeconomic processes involved in the co-evolution dynamics of sub-systems as they interact with the climate?

An assessment should be made of the potential impacts if no adaptation measures are taken and an attempt should be made to define adaptation scenarios at different spatial scales. These should not be restricted to a simple extrapolation of current policies, but should also include potential new strategies which could be introduced in the context of climate change, characterised both by a change in the average values and in the variability of climate parameters. These scenarios should relate to economic activities (crop & livestock farming, forests/woods, energy, tourism, fishing, etc.), protection or potential loss of certain coastal zones, land-use strategies, etc. They should incorporate uncertain elements of context, such as the occurrence of unanticipated economic shocks. As far as possible, the scenarios should be:

- expressed in a relevant set of variables which play a part in forcing in climate models (cf. II.B.1.);
- assessed in the context of economic and social cost-benefit models (cf. II.B.3.).

### **II.B.3. Developing Methods for Economic Assessment of Damage**

On the basis of the results obtained from the studies described above, methods should be developed for economic assessment of the local and regional damage resulting from simulated CC impacts. This includes analysing damage prevention strategies and analysing the various different strategies adopted by insurance and reinsurance companies to cope with the increasing risk of damage. Special attention should be given to examining and appraising the conditions and hypotheses used for the scenarios that are adopted (factoring in unforeseen circumstances, unanticipated shocks, etc.).

### **II.B.4. Identifying the Couplings Required for Relevant Integrated Assessment Modelling**

The emphasis should be placed especially on feedback between climate and land occupation and use, agricultural, forestry, urban and industrial practices, soil degradation (erosion, loss of organic matter...), surface energy budget and water budget at relevant scales, etc. Some of the key questions are as follows:

- how can the quality of integrated or non-integrated and coupled or non-coupled models which simulate the functioning of the system be improved?
- how should the adaptability of human activities to CC be factored in?

### **II.B.5. Evaluation of Uncertainties Likely Along the Entirety of the Modelling Chain**

These uncertainties come from various sources: those arising from simulation of physical processes (regional climate models, relationships between air flow and rainfall, ...) and the introduction of socioeconomic parameters into the model, which can still be improved on, those arising from the difficulty in imagining scenarios involving a large number of linked processes involving a human factor and those arising from the partly chaotic nature of the various sub-systems. Insofar as this uncertainty will be difficult to quantify in a model ensemble combining quantitative and qualitative models, it will be important to first look at the following points:

- how can trends reference situations be identified in the context of simulation tools?
- how relevant are the results of downstream models, which more often than not will be more accurate and work better than upstream climate models?
- can we accept the results of these models and take the risk to invest, knowing that the uncertainty margin of the initial critical climate parameters is far greater than the uncertainty introduced by the models themselves?

## **II.C. Analysing the Introduction and Implementation of Sector-Specific and National Policies to Fight and Adapt to Climate Change. Assessing Their Impacts. Understanding the Different Groups in Society**

In formulating public policy, political decision makers and local administrations are in the position of having to make decisions against an uncertain background. While focusing on the objective of sustainable development, they need to take into consideration not only the findings of expert scientific reports on cutting GHG emissions and their impacts on CC, but also constraints regarding the specific natural, socioeconomic and regional cultural context, the ecological engineering processes used to counter the effects of CC and the standards and regulations introduced by national policy and international agreements.

The environmental and socioeconomic impacts (cost-benefit advantages among other things) of these new policies should be assessed on the basis of the methods described earlier on (cf. II.B.3). Regional policies that are being implemented to reduce the vulnerability of environments and human establishments to extreme weather and climate events should be looked at in particular (portrayal of the problem, steps taken, implementation of measures, costs, benefits, etc.).

This leads to a series of questions about the types of institutional approaches taken at different administrative levels, the institutional, collective and individual strategies that are likely to mitigate harmful effects (or increase beneficial effects) and the roles played by the various groups in society in the strategies that are introduced

Research proposals are invited on the following topics (*these are suggestions only and the list is not exhaustive*).

### **II.C.1. Perceptions in Society and the Players Involved**

How are the subject of CC, its associated risks and cutting GHG emissions perceived by the public and how are they portrayed at the regional level? Which players present the issue and why? How do they publicise the issue?

### **II.C.2. Decision-Making**

How are the decision-making processes which lead to political choices formulated? Which criteria are given priority (environmental, economic, social etc.)? Within which bodies (official, informal)?

### **II.C.3. Subsidiarity**

How are the public climate policies that are formulated at national or European spatial scales interpreted and applied?

#### **II.C.4. Implementation**

What concrete shape is given to CC-combating projects and programmes by those involved at local level, whether they be part of the political and administrative spheres or the private sphere? What is going on in terms of negotiations, decisions, and budget? How are job structures changing? Are new posts being created?

#### **II.C.5. Effort-Sharing**

How are the efforts required in terms of combating and/or adaptation split among the different groups in society? What genuine changes are these leading to in the practices of the players involved and in the way that policies are implemented? What participative democracy processes are being introduced and at whose initiative? What part does lobbying play in choice of technological innovations for combating and adapting to CC?

#### **II.C.6. The Role of Technology in Fighting CC**

How do the players involved at the local level (contracting authorities, local councillors, Government agents) perceive the role of new technologies and their use in the fight against climate change (transport, housing, etc.)? Are they overestimating the potential of certain future technologies that have already been announced by the research community? Is this lessening their motivation to act? Conversely, are these players unaware of the benefits of some less publicised innovations? Is the effect of this that some initiatives that are actually already technologically feasible not being taken? The aim is to study these problems and assess whether there is a lack of action in this respect.

#### **II.C.7. Law**

There are several legal questions that are worth looking into:

- an analysis from the comparative law point of view of how climate risks are dealt with in insurance law;
- an analysis from the French law point of view of the jurisdiction that local administrations have or do not have in the area of GHG emission cutting and adaptation to CC, and the legal instruments that are or should be at their disposal. The subject of urban travel and traffic control such as congestion charging comes under this heading. The analysis could be based on a study of strategies that local authorities are implementing.

#### **II.C.8. Education**

What part is played by the education of young people and new information and communication technologies in the portrayal of the greenhouse effect in society, raising awareness of the issues and risks involved and changing public behaviours and attitudes in society? It would be particularly interesting and useful to carry out a comparative analysis of approaches to combating the greenhouse effect and strategies for adaptation to CC and their costs and benefits in relation to different regional and cultural contexts.

## **Topic III “GHG Emissions and GHG Sinks”**

### **General Aim**

The aim of this topic is to develop the knowledge, methods and tools needed:

- for assessing the potential for carbon capture in natural environments;
- for quantifying and monitoring the amount of GHGs emitted and stored (emitted by GHG sources and absorbed by sinks), with the international agreements in mind;
- for an economic assessment of the actions/policies that need to be introduced, based on the results of the previous two points.

This should eventually lead to developing complex modelling systems for the Earth over the 21<sup>st</sup> Century (scenarios describing inter-dependent changes in industrial, urban and farming practices, GHG emissions and concentrations and the climate and its impacts). Research priorities are described below.

### **III.1. Developing Quantitative Surveying Methods**

These methods should provide a means of assessing CO<sub>2</sub>, N<sub>2</sub>O and CH<sub>4</sub> emissions and sinks from local to regional scale. They may be based, for example, on inverse models of flows of these gases in the atmosphere. It will be necessary to estimate the uncertainties associated with these methods and to develop the intercalibration protocols that are vital in order to participate in European and international discussions.

### **III.2. Improving Assessment of the Greenhouse Effect in the “Farming, Breeding and Forestry” Sector (N<sub>2</sub>O and CH<sub>4</sub> emissions in particular) and Improving Knowledge and Economic Assessment of the Action Necessary**

The aim is to devise integrated assessment models that will provide an exhaustive environmental and economic assessment of the impacts of crop and livestock farming practices, here again from the local to the regional scale.

*Joint projects between research teams in the fields of agriculture and economics are therefore strongly encouraged.*

The following are priority areas:

- Furthering our knowledge of the facts about N<sub>2</sub>O and CH<sub>4</sub> emissions;
- Setting up overall assessments covering both storage and withdrawal and taking all the gases concerned into account (CO<sub>2</sub>, CH<sub>4</sub>, N<sub>2</sub>O);
- Furthering our knowledge about the technical costs per tonne of carbon captured via the various possible biosequestration routes;
- Relating actions to articles 3.3 and 3.4 of the Kyoto Protocol;
- Quantifying the potential leverage effect of different market prices of carbon on decisions regarding actions to reduce the greenhouse effect in the farming and forestry sectors;
- Comparing action to reduce the greenhouse effect in the farming and forestry sectors with other sectors (in terms of public cost, direct costs, etc.);

- Acceptability of changes to practices and alternatives to the greenhouse effect and interactions with other issues;
- Complementary or opposing effects vis-à-vis other policies (CAP, integrated farming, non-food crops).

### **III.3. Aerosols**

How can aerosol emissions (carbon aerosols in particular) be calculated and monitored and how can their environmental impact be assessed?

### **III.4. Capture and Storage in the Terrestrial Biosphere**

The aim is first to assess the capacity for storing carbon in the terrestrial biosphere and how this will develop over the course of the century in terms of physico-chemical, biological, economic, legal and social impacts, and second, to develop the methodological tools needed to identify the direct and indirect anthropogenic effects of carbon capture within the ecosystems

One of the goals is to arrive at a clearer understanding of the different factors governing potential artificial storage in the terrestrial biosphere, including studies of the environments and storage methods and their mutual relationships.

### **III.5. Ocean Sequestration**

A discussion seminar will be organised in early 2004 to study the current state of knowledge and the capacities present in the national community in the field of evaluating possibilities for ocean sequestration. *Teams interested in taking part in this seminar are asked to make themselves known by submitting a letter of intent.*

## **Topic IV “Climate Change and Health”**

### **IV.1. Aim of Research**

Assessing and Planning ahead for the CC Impacts on Two Types of Health Risk:

#### a) Excess Mortality Caused by Extreme Hot or Cold Weather

The extremely hot summer of 2003 sadly confirmed that heat waves claim large numbers of victims, mainly among the elderly in certain major urban conurbations, where the combined effects of heat islands and air pollution (ozone, NO<sub>2</sub> and particles) are particularly severe. According to the IPCC experts, it is highly likely that CC will produce increasing numbers of these lethal episodes. It is therefore important to assess how the resulting excess mortality risk may be heightened (in the absence of adaptation measures), and to define strategies and mechanisms for preventing and managing this risk in the context of CC.

*We are appealing for multidisciplinary research proposals which address this aim for France (full projects or statements of intent). As far as possible, they should adopt the integrated approach recommended in II.B and II.C (taking into consideration simultaneous developments in the principal factors underlying excess mortality associated with extreme hot or cold weather: climate-related factors, environmental factors (urban pollution in particular) and health, social or economic factors etc., and studying the responses of the human body and society to these developments). They may also use the epidemiological studies started under the GICC-1 programme as a basis.*

**b) The emergence or re-emergence of certain human and animal diseases in which various biological, environmental and anthropogenic factors are involved.**

The biological factors cover both the pathogens and the potential human and animal hosts and their level of contact with carriers and the functioning of ecosystems. A number of anthropogenic factors are implicated, such as alteration of ecosystems (for example by deforestation), reduction of the genetic biodiversity of selected species (farmed animals), use of GMOs<sup>9</sup> and pesticides, or population growth, concentration of populations in urban areas and travel via ever faster means of transport. CC can also alter ecosystems and exert a strong influence on the functioning of the host-pathogens-carriers trio which triggers epidemics.

The aim is therefore to develop an integrated approach to assessing the effects of CC-related risks on the emergence (or re-emergence) of certain human and animal diseases, by taking the factors relevant to the study of the pathologies in question into account in a balanced way. The multidisciplinary approach should be centred on the appropriate climate change parameters for the spatiotemporal scale of the disease in question and should develop the knowledge, methods and tools required, one approach being to devise monitoring or information systems for epidemics.

*The proposed research work may relate to the national scale but may also relate to regional units in tropical Africa or the Mediterranean Basin. As far as possible, the work should be carried out within the framework of laboratory associations set up during the GICC-1 programme and should be based as closely as possible on the initial studies begun under the programme.*

## **IV.2. Emerging Plant Diseases**

With a view to preparing for a possible future call for proposals, *statements of intent are invited on the topic of climate change impacts on emerging plant diseases.*

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<sup>9</sup> Genetically modified organisms

## **Topic V “Biodiversity and CC”**

### **Overall Aim**

The aim of this topic is to develop the knowledge, methods and tools required for assessing the potential interactions between CC and biodiversity and living resources, and for formulating and implementing conservation policies that are appropriate to the new climate situation.

The initial research priorities are as follows:

### **V.1. Databases**

The aim is to create databases using existing data on the relationships between biodiversity and climate change. One of the core elements should be a well-reasoned and documented critical analysis of the data and its contribution with respect to the communities in question.

### **V.2. Critical Summaries**

The production of critical summaries of the current state of knowledge on relationships between biodiversity and climate change is encouraged.

### **V.3. Historical Aspects**

The aim is to determine what influence recent climate history has had (over the last century, typically) on biodiversity, through the changes it has caused in ecosystems. These changes should be distinguished from changes that have been caused by direct human pressure (fishing, farming, clearing, urban development, fragmentation of habitats,...) or more indirect human pressure (e.g. air pollution).

### **V.4. Relationship with Policies to Combat CC**

The aim is to assess the impact of policies and practices aimed at combating the greenhouse effect (carbon storage in forest ecosystems or farmland, etc.) on biodiversity.

### **V.5. Launch Seminar**

Proposals on these various questions should be prepared after a discussion and coordination seminar, to be held in early 2004, which will bring together the following:

- the teams selected under the call for research proposals sent out in 2003, coordinated by GICC and IFB<sup>10</sup>;
- *Other interested teams, who are asked to make themselves known by submitting a letter of intent;*
- representatives of bodies concerned (IFB, MEDD, MAAPAR<sup>11</sup>, ... ).

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<sup>10</sup> Institut Français de la Biodiversité – French Biodiversity Institute

<sup>11</sup> French Ministry of Agriculture, Food, Fisheries and Rural Affairs

## **Submission and Assessment Procedure for Projects**

### **Projects will be assessed by the GICC-2 programme's two organising bodies**

The **Scientific Panel**, made up of experts in the various disciplines concerned and chaired by CERFACS director Jean-Claude ANDRE, will study and assess the scientific quality of the projects and how defining and innovative they are in their response to the terms of the call for proposals.

The **Steering Committee**, comprising MIES representatives, the relevant MEDD departments and its public establishments, other ministries and bodies involved, and users of the research products, will select the projects on the basis of the expert reports by the Scientific Panel and the established research priorities. The selected projects will receive funding in Spring 2004.