

**MANAGEMENT AND IMPACTS OF CLIMATE CHANGE PROGRAMME
CALL FOR RESEARCH PROPOSALS
CRP 2000**

General background

The atmosphere and climate are undergoing a number of modifications due, in particular, to human activities. Public opinion and the authorities are increasingly concerned by the climate changes linked to the aggravation of the greenhouse effect, that may have a negative impact on ecosystems, natural resources, infrastructures, economic activity, and more generally on the well-being of future generations.

Faced with this situation, France, along with many other countries, ratified the Rio Convention on climate change and, within the European Union, undertook to limit its greenhouse gas emissions within the framework of the Kyoto Protocol. The efficient application and follow-up of the provisions of these international agreements must be based on sound scientific and economic evaluations of the risks incurred and of the technological, economic, social and political means of minimizing those risks.

To address this need, the French Ministry of Land Planning and the Environment (MATE, *Ministère de l'Aménagement du Territoire et de l'Environnement*) and the Interministry Taskforce on the Greenhouse Effect (MIES, *Mission Interministérielle de l'Effet de Serre*), in conjunction with the Ministry of Education, Research and Technology (MENRT, *Ministère de l'éducation Nationale, de la Recherche et de la Technologie*), the other concerned ministries (MEFI, Ministry of the Economy and Finance; METL, Ministry of Equipment, Transport and Housing; MAP, Ministry of Agriculture and Fisheries) and ADEME (Environment and Energy Conservation Agency) set up the research programme 'Management and Impacts of Climate Change' for a period of five years (1999-2003). This federating programme constitutes the 'Impacts' component of the national research scheme on the atmosphere and climate, encompassing the ongoing research projects sponsored by MATE under preceding activities. It is the focus of the generously funded Call for Research Proposals (CRP) considered here.

The general objective is to develop goal-oriented research carried out in France in the field of climate change impacts, in order to **elaborate tools and methods that will enable the public authorities to optimize strategies for preventing the aggravation of the greenhouse effect and adapting to climate change.**

This Call for Research Proposals is organized around four major themes:

- The international negotiation arena;
- Strategies to reduce emissions in France and in the European Union;
- The assessment and impacts of, and the strategies of adaptation to, climate-related risk;
- Methodological developments.

Research teams are invited, in answering this CRP, to seek the closest possible association of the themes proposed, through multidisciplinary collaborations or provisions for a possible geographical

extension (spatial integration on the scale of the territory). Such integrated and multidisciplinary qualities will be among the criteria on the basis of which projects will be selected, in particular projects of the third theme, for which efforts to bring together physicists, biologists and socio-economists will be expected. A limited number of large integrated projects with complementary teams working in cooperation will be funded. Applicants will need to state to which other national and/or European programmes whose support can be combined with that of GICC they wish their proposals to be linked.

Within each theme, proposals can be of two types - except when it is specifically required that they answer exclusively in the form of a declaration of intent only (*cf. infra*):

- Complete research projects that can be funded in the course of 1999;
- Declarations of intent, on the basis of which GICC will organize meetings and workshops during 1999 in order to promote the emergence of integrated proposals in response to CRP 2000.

Applicants are invited to specify, in a letter enclosed with their file, the type of project (complete research project or declaration of intent) they are submitting. The application files, presented according to the annexed standard format, should be sent in **60 copies before 31st March 1999 to:**

Maurice MULLER
Ministère de l'Aménagement du Territoire et de l'Environnement
DGAD / SRAE
20 avenue de Ségur
75302 PARIS 07 SP

The files will be examined by the Scientific Council of the programme (CS GICC), which will assess the scientific quality of the projects, seeking the opinion of foreign experts if need be. On the basis of the Scientific Council's recommendations, priority projects will be selected by the Steering Committee (CO GICC), in which those commissioning the programme (ministries and agencies concerned by the greenhouse effect, research results users, GIP Hydrosystems, GIP ECOFOR, INSU) will, *in fine*, decide on the awarding of grants.

Theme 1 – The international negotiations arena

1.1. The international negotiations arena, between equity and efficiency

Five issues will dominate negotiations within the framework of the Climate Convention:

- Issues linked to the participation of developing countries;
- The nature of the common or harmonized arrangements to be set up to assess emissions and sinks, to check that the quantified objectives are met, and to sanction and penalize countries failing to do so;
- The organization of the various international flexibility mechanisms specified by the Kyoto Protocol;
- The determination of the country-specific quantified objectives for periods beyond 2012;

- The identification of policies and measures that would need to be harmonized at the international level.

These issues would benefit from insights from economic, legal, political, social, ethical and philosophical research. Equity and economic efficiency will be prioritized, concentrating on the following themes:

- How should efforts be shared, taking into account acceptability and the various theories of justice and legitimacy - are criteria needed? And if so, which ones?
- Critical, retrospective and prospective examination of the concept of long-term convergence (of initial rights, of effective emissions);
- Organization of the negotiations (partial coalitions of Parties, procedures followed, influence of scientific opinion);
- The interplay of the various actors and organizations (on what grounds have these topics become real issues to them? How do they interact? How do they 'build up' these problems? How do they promote controversy and public debate? How do they exploit the 'risk' category?);
- The rules of the international trade in emission quotas, from the angle of environmental and economic efficiency (assessment of the gain potential, interpretation of the additionality clause; distribution of revenues; balance between a static efficiency in the short and medium term and a dynamic efficiency resulting from the extra stimulation provided by technological progress and from early decisions in matters of infrastructure; the Clean Development Mechanism (CDM) as an economic mechanism in developing countries; the Joint Implementation mechanism; tradeable permits and environmentally-oriented tax reform; impact on corporate competitiveness of the existence of areas subject to different regimes and of the non-harmonization of national regimes).

1.2. The legal dimension

The principle of trade in greenhouse gas emission rights (also called tradeable emission permits) between countries with fixed quotas regarding emission reductions, allows States – and by extension concerned businesses – that emit less than the quota they have been granted to sell the surplus to other States or businesses that have exceeded their own emission quotas.

This trade calls for regulation of the institutional mechanisms concerned: but what should be the legal approach to implementation, given that the State is at the same time judge (defining the institutional rules) and party (tradeability of the rights) on a domestic and international market? *The general question is: how are negotiations to be anticipated?*

In international law, the trade in emission rights will need to be evaluated at the level of the State as much as at that of businesses. The CDM and Joint Implementation make it possible to compensate one country's emissions with another country's equivalent reductions. It will be necessary to examine these mechanisms' repercussions in terms of international competition and its possible limitations. On what criteria should a market price be set for such compensations? What tax mechanisms should be applied in the emitting countries (taxation at source or not) and in the emission-reducing countries (tax credits or not)? Should such compensation be linked to an

international business contract? Under what legal regime? With what guarantees to secure this rights transfer? How can the mutual commitments of the contracting parties be enforced?

Theme 2 – Strategies to reduce emissions in France and in the European Union

2.1. France within the European Union

The greenhouse gas emission limitation objectives agreed by European countries within the framework of the Kyoto Protocol will need to give rise to specific measures by the public authorities at both the EU and national levels. Two types of question are worth investigating further:

- The first concerns the economic and social efficiency of the measures in relation to expected benefits, on the one hand, and, on the other, to marginal emission reduction costs in the various consumer sectors in the different countries. Modelling tools have been developed to classify the various emission reduction possibilities, and now need fine-tuning and disseminating. Proposals should strive to accurately evaluate measures that can exploit these possibilities and their associated costs, including the administrative costs of such measures, their effects on employment and income and the benefits expected from them, in particular regarding the implementation of adaptation strategies (*cf.* theme 3). The results should make it possible to rank in detail the actions to be undertaken in the various sectors and countries according to their efficiency;
- The second concerns the implementation conditions of emission-control measures and policies: in order to avoid distorting competition, some must be taken at the European level, while others pertain to more local levels. Identifying the most economically efficient measures should be complemented by determining the most relevant levels of implementation.

Applicants should seek to identify existing tools and research in this field in order to draw on existing achievements at the European and national levels (an overview is expected). The perspective of making full use of these tools at a supra-European level within a long-term vision (beyond the 2008-2012 target dates) may be considered.

2.2 The integration of instruments for control of the greenhouse effect

Most European countries will resort to a combination of policy instruments on their own territory to supplement or replace tradeable permits. This raises three types of question:

- In what circumstances would States find it advantageous to use a given instrument in a given sector (from power generation and transport to housing, land planning and heavy industry...)? What instruments are the most appropriate to involve local authorities and guide their choices in matters of land planning, infrastructures and transport flux regulation?
- Are different permit and quota trading systems conceivable? Would they be able to coexist? Would they be compatible and viable?
- To what extent and in what way would the simultaneous recourse to separate instruments be feasible, in terms of equity and economic efficiency? Can a single instrument or combinations of instruments that are both optimal and acceptable be found? What type of tradeable permit or credit would be the most compatible with other instruments?

- How can these various domestic instruments be linked to the development of an international trade in emission quotas at corporate level?

These questions should be approached taking care to differentiate the points of view of the State, businesses, households and local authorities. The impact on the competitiveness of businesses active in France will be assessed according to various scenarios regarding the organization of the international trade in emission quotas: geographical extension of the market, possible existence of an upper limit, international harmonization of the rule concerning initial quota re-attribution to businesses (or no such harmonization). Special attention should be paid to the mechanisms of emission credits related to investment projects (Joint Implementation for Appendix 1 countries and CDM in developing countries): definition of an acceptable baseline for basic emissions, rules governing benefit sharing among Parties, opportunities for French businesses and the branches concerned.

From the point of view of the legal dimension and domestic law, such mechanisms will need to be regulated. How should environmental law (concept of sustainable development) and the emission rights 'market' be accommodated? On what basis should such rights be attributed? Should the primary allocation of rights be free of charge? How should the greenhouse gas emission level be set for each country and each enterprise? Should the specific regulations applying to classified facilities be used? What will be the legal nature of the sanctions (e.g. administrative, financial, etc.) should quotas be exceeded? Which judge (French, international?) will have jurisdiction in assessing the lawfulness of such sanctions? These intangible rights being attributed an economic value, what accounting and taxation rules should be applied: book depreciation, depreciation allowance, over what length of time? Existence of appreciation or depreciation in the event of transfer of ownership of this right as a result of sale of an intangible asset ('commercialization' of a public good, the 'atmosphere')?

2.3 Technological developments

As emission costs increase, technology appears as a major variable for the elaboration of a strategy, in particular for the long term. It is a matter of understanding the mechanisms that lead agents to opt for certain technologies and reject others. In order to address these issues, research projects will study the economics of technological changes, the sociology of innovations and political science. They will embrace various sectors, such as transport and power generation, and will strive as far as possible to consider both legal aspects (*cf.* 1.2) and economic models.

Several questions arise:

- What mechanisms have drawn economic agents to take into consideration the effects of greenhouse gases in their technological decisions? What are the respective weights of the various price-related incentives (market prices, corrected *via* public regulations, cessation of monopolistic situations)? Proposals will be focused on specific sectors of activity and should clarify decision-making mechanisms;
- Can the economic theories of technological change and innovation explain why some emission-abating technologies have developed more than others in the course of recent years? Can these analyses be extrapolated? Can they help to outline future developments?
- How were emission-control public policies devised? Have capture events been recorded and, if so, in what field and by what mechanisms? What should be the role of experts and their

- assessments? Can an inventory of these various policies and their effects be established, in particular *via* international comparisons? Is it possible to establish an inventory of the technological impacts of public policies that are not explicitly aiming to reduce emissions? How should the possible inconsistencies and incompatibilities between separate sectoral public policies be accounted for?
- Technology is often a means for States and business firms to impose new forms of competition. Applicants should attempt to describe and analyse the strategies through which various economic agents succeed in excluding, to their own advantage, some technologies while imposing the use of others. For example, under what conditions and in what institutional contexts can existing technologies such as co-generation develop? Are there niche market opportunities? The analysis will cover private and public agents and will take into consideration the international dimension of these power relationships.
 - Technological progress is decided on the market, while also being the focus of more specifically political debates. Some sectors entertain social debates that, with time, may bear on market organization (e.g. the nuclear waste issue in the nuclear power industry, or other issues in the transport or waste management sectors), implying that technological progress is increasingly discussed upstream from the market. What analyses can be made of such developments? How should such debates be organized? What effects can be expected?
 - How does the general public perceive technological progress? Grassroot debates, role of media and experts, role within the interplay of stakeholders (*cf.* 1.1), and so on.

2.4. Synergies and/or conflicts of objectives within environmental policies

"Environmental" objectives are numerous, with different scopes - from local (e.g. the firm) to global - and different time scales, from short-term to long-term. The means by which a given objective is pursued may have implications – positive, but sometimes negative – in other environmental fields. The sustainable development 'triangle' extends this interaction issue to encompass the economic, social and environmental dimensions.

The proposals should focus on the following interaction issues:

- The place of greenhouse gases in concepts such as that of the 'best available technology', in tools such as environmental management and audit systems, in standards, in certification systems, life cycle analyses, etc..
- The possible synergies, in terms of economics and political legitimacy, between local policies (such as public health-motivated mobility control, urban sustainable development, etc.) and control of the greenhouse effect.
- The possible synergies or conflicts between national or European issues (such as job preservation, reduction in working hours, agricultural policy) and global issues (climate, biodiversity, etc.).
- More generally, beyond these themes, the analysis of synergies and/or conflicts between objectives in areas affected by greenhouse gas emission issues but also by identification of the many benefits or, on the contrary, causes of obstruction.

2.5 Land-use changes, forests and agriculture

Strategies to reduce emissions must be supported by reliable greenhouse gas balance data, hence the need to promote closer cooperation between technical research on the various terms of the balances and socio-economic research aimed at developing emission reduction strategies.

The proposals should contribute to address issues concerning:

- The assessment of the impact of the increasing greenhouse effect on carbon sequestration in soils and vegetation (*cf.* 3.3. and 3.5);
- Implementation opportunities for strategies using land-use and land-management adjustments to control the greenhouse effect, and the assessment of their relevance;
- Assessment of the economic, social and environmental consequences of the various strategies that may be proposed.

The intensification of tree plantations may be a possibility for policies aiming to enhance land-based carbon storage. This issue obviously stimulates research on the dynamics of these ecosystems (*cf.* 3.5). Priority lines of research therefore concern forests, farmland and wilderness areas.

Forests:

- The carbon balance under the main types of forest cover, integrating storage in durable wood products. The historical variations of this balance and potential future developments (climate and forest management practices, in relation with § 3.5). The taking into account of carbon storage in soils.
- The assessment of opportunities to contain emissions or to store carbon, according to various timber production management practices (planting and harvesting, fuel wood, timber, etc.) and incurred costs. What incentives (tax-based or otherwise) may be considered to promote such options?

Farmland (cultivated areas and pastures):

- The assessment of trends in soil carbon stocks as affected by current and changing farming practices. The assessment of carbon re-storage opportunities through adjustments in farming practices (reduced tillage, etc.) and land use. The influence of climate change on such developments.
- The emissions/absorptions balance of N₂O in these representative areas. The design and impact assessment of strategies to reduce such emissions.
- The emissions/absorptions balance of CH₄ of soils and livestock waste treatment facilities. The design and impact assessment of strategies to reduce such emissions from soils. The design and impact assessment of strategies to reduce such emissions from ruminants.

Wilderness areas:

The assessment of the contribution of the various types of natural areas to the emission and absorption of CO₂, N₂O and CH₄. The design and impact assessment of strategies to reduce such emissions. Particular attention will be paid to the processes at work in wetlands (marshes, gallery forests, grass-planted contour strips, etc.).

Theme 3 – Evaluation and impacts of, and strategies of adaptation to, climate-related risk

3.1 The regionalization of climate scenarios (*Declarations of Intent*)

The prediction of local and global climatic environmental conditions - a prerequisite for any determination of socio-economic impacts - is based on trends calculated with large-scale climatic models. Several problems arise at this point, some algorithmic or numerical in nature, and others physical (compatibility of representation of orographic and land-surface processes, etc.). In addition, the sensitivity of regional models strongly depends on the structures and sensitivity of the climatic model used to work out large-scale conditions. Changes in climatic conditions may induce changes in regional conditions (regarding land use, for example) that may in turn significantly affect the large-scale climate. Impact analysis also depends greatly on the time scale used, whether it focuses on the consequences of climatic fluctuations over the next two decades or on adaptation strategies for the end of this century.

Gaining a better knowledge of the local environment's physical, chemical and 'biospherical' parameters - with emphasis on those particularly relevant to hydrological and agronomic impacts and ecosystem vulnerability - requires the expansion of research on interactions between the regional and global scales of climate. Such research is supported by PNEDC (National Programme for the Study of Climate Dynamics). Its application to impact assessment in mainland France and in the French overseas départements and territories, which comes under the jurisdiction of GICC, will need to take account of the uncertainties linked to the current methods. A joint PNEDC/GICC workshop will be organized in order to narrow down these methodological uncertainties and to devise a common work plan for the two programmes.

3.2. The water cycle and hydrosystems

The aim is to find out how hydrosystems change in response to modifications of the climatic regime. Proposals will focus on the design of coupled atmospheric and hydrological models that take into account scenarios of climate change as well as concurrent changes in land use and in surface- and ground-water resource exploitation patterns. The following issues will be addressed:

- The consequences of climate change for hydrological regimes. The case of the occurrence and intensity of extreme events (floods, droughts, soil erosion, etc.). Risk-inducing mechanisms.
- The repercussions of changes in hydrological regime in terms of water quantity and quality. The dimensioning, exploitation and security of facilities for power generation, the extraction of materials in alluvial zones, the tapping of rivers and aquifers, and urban sanitation.
- The consequences of changes in the accessibility of water resources for land planning and farming practices.
- The definition of hydroclimatic data, experiments and/or experimentation areas needed to validate the simulations.

For each issue, the models should propose answers in terms of changes in physical variables characterizing the hydrosystems (water course discharge, water content of soils, state of aquifers, state of snow cover, etc.), and the simulations should lead to diagnoses or strategies that take account of economic and social factors.

3.3. Agriculture (*Declarations of Intent*)

Through both its causes (increasing CO₂, variations in O₃, etc.) and its consequences (temperature, humidity, precipitation, etc.), any climate change produces modifications in the land-use strategies of rural areas to optimize the agricultural exploitation of the environment while preserving or improving its long-term farming potential (*cf.* 2.4 and 2.5). Climate alterations also affect plant biomass production, with repercussions on water and mineral nutrient requirements.

The questions raised concern the assessment of the impact of such changes on the annual cycles of agro- and ecosystems, at scales ranging from 100 to 1,000 km or more, using integrated models of the water and energy and/or production balances, based on well-documented soil-plant-atmosphere continuum processes. Integration into climate-change scenario models is encouraged in order to better take into account the possible feedbacks of the interface on land-surface microclimates.

These models must make it possible to manage water balances and irrigation requirements of current and future crop systems over long periods (30 to 50 years), and thereby to shed light – through feedback coupling – on the possible transition from land clearance for cultivation purposes to aridification and desertification. The models should also enable one to analyse the risks that extreme fluctuations of temperature or precipitation, or too frequent or too persistent unfavourable conditions, present for these systems (production, water use efficiency). Lastly, they should facilitate the analysis of new practices in terms of adaptation (implementation conditions) and probable associated socio-economic costs.

3.4. The conservation of biodiversity and the management of protected areas (*Declarations of Intent*)

Long-term biodiversity conservation calls for more than a protected areas policy. If climate change affects the species' local conditions, they must adapt, migrate or become extinct. One must therefore analyse the conditions for the species' survival within a dynamic framework of changing habitats. Existing knowledge is still insufficient, and too fragmented. A workshop to set up research activities will be organized on the basis of declarations of intent received.

The issues already identified concern:

- The input from palaeoenvironment studies for biodiversity trends scenarios in tropical and temperate zones; the adaptive capacities – genetic as well as physiological – of plant and animal organisms; the migratory capacities of these organisms in relation to the speed of climate changes.
- The sensitivity of population dynamics to climate variability and meteorological extremes according to their biological characteristics.
- Migratory differences in species from a same biome according to their biology. Constitution and stability of new assemblages. The role of newly-introduced plant and animal species.
- Agricultural and industrial land areas as material obstacles to the migration of terrestrial species. Possibilities of mitigating measures. The trends in continental aquatic systems: colonization of other systems if connections develop between watersheds, or dead-end trap in isolated systems.

- What priority should be given to the conservation of species in refuge areas likely to be reactivated in the future ?
- Should conservation policies be implemented regarding cultivated species?

3.5. Forests (*Declarations of Intent*)

The foreseeable consequences of environmental changes and climate change for the functioning of forest ecosystems (modification of vegetation cycle, risks of extra vulnerability owing to geochemical deficiencies, etc.), their medium-term trends and their management are many:

- Some are positive, through increased wood production and the storage of carbon in the forest ecosystem;
- Some are negative, through the increased vulnerability of some plant formations and biogeographical regions, and through the negative balance of geochemical elements that threaten the medium-term sustainability of such ecosystems.

Existing results must be supported by new research on the identification of the specific effects of climate change (to be distinguished from atmospheric deposits and possible management intensification) and on scaling (from tree to ecosystem). In addition, robust and efficient management strategies and tactics should be tested to optimize the balance between the forests' contribution to greenhouse effect abatement, and obvious climate-change-related risks (*cf.* 2.5). In order to gain insights into these issues, which are difficult to place in the general picture of the forest ecosystem's processes, and in order to specify requirements in metrology, integrated sites and observation networks, a seminar will be organized during the first semester of 1999 on the basis of the declarations of intent received, with the objective of defining the contents of the CRP.

3.6 Sustainable land planning (*Declarations of Intent*)

In inland urban areas, climate warming will have a dual effect:

- An increase in water consumption. The issue of water resources and quality at the level of highly urbanized catchments is already emerging and more research will be needed to work out possible scenarios for the future;
- A reduction in heating requirements, on the one hand, and an increase in air-conditioning appliances (in buildings and transport) on the other. The main issue remains that of the implementation of urban-planning strategies to reduce emissions through the limitation of fossil fuel and biofuel consumption. In the case of new settlements or the reorganization of recent settlements, research is needed on each region's optimal adaptation strategy (depending on the climate, style of architecture, etc.) of the compact Haussman-type city concept (repercussions on heating requirements, mobility, public transport, etc.).

Transportation (of all types) is the biggest source of energy consumption, and the one with the fastest growth. The priority is to reduce this consumption and to steer mobility towards modes of transport for individuals and goods that produce less greenhouse gases. A national and international (Germany, Japan, etc.) prospective study on technological options in the field of transportation is required. Research is needed on the viability and economic costs of the various possible options at the regional and national levels, and on their impact in terms of CO₂ production, jobs, health improvement due to pollutant reductions, etc..

In the littoral zone, the hydrosystem to be considered includes the river, the watershed, and its interface with the sea. Changes in the shoreline, which depend on interactions between continental flows and ocean dynamics, should be studied in the short and long term to separate the consequences of exceptional events from the effects of a climatic trend, and to develop regional prevention strategies. In the coastal and coastal margins zones, regional studies should focus on two highly climate-dependent systems, i.e. wetlands and prodeltas. These two systems record each alteration of flow, water quality and particle composition. The sink function and the biogeochemical activity thus generated make these areas particularly favourable to CH₄ production.

3.7 Health (*Declarations of Intent*)

The direct effects of greenhouse-effect-related climate change on health is widely debated. Faced with the extremes of 'doom and gloom' and risk-demeaning attitudes, it is important to find out the possible consequences of climate change for public health. Impacts on some pathologies are likely, particularly in view of the ageing of the French population.

One important objective could be to assess the impact of high summer temperatures on morbidity. In addition to risks of cardiovascular disorder linked to high temperatures and respiratory problems linked to the increased concentration of various photochemical pollutants, one should expect an increase in allergic reactions (northward shift of the geographical distribution of many allergenic plant species, increased quantities of pollen in the atmosphere due to less precipitation?). It is moreover important to pay attention to the potential impacts of climate change on vector-borne diseases. On the basis of the declarations of intent on the above themes, a consultation of experts on health problems could be arranged in 1999 in order to identify research orientations to be developed within the framework of the programme.

In the French overseas départements and territories (DOM-TOM), the indirect effect of climate change on health *via* its impact on renewable resources at the basis of human food currently appears as the prime concern. Research on the consequences of climate change for DOM-TOM marine resources in particular must be initiated, on the basis of declarations of intent likely to lead to proposals to be rapidly funded.

3.8. Insurance (*Declarations of Intent*)

Mutual and other insurance companies that insure against risks of damage caused by natural disasters (storms, floods, landslides, etc.) or loss of income (e.g. in the agriculture or tourism sector) due to unfavourable meteorological conditions (drought, severe frost, etc.) are looking for a way to pass on, in the management of insurance contracts, the foreseeable increase of these climate-related risks. Declarations of research intent that take account of the socio-economic importance of this particular field are encouraged.

Theme 4 – Methodological developments on 'Images of the future'

The general public, opinion leaders and policy-makers must be informed of the possible futures ahead. These futures are established on the basis of economic projections (OECD, World Bank,

etc.), which are themselves entered into climatic models *via* atmospheric greenhouse gas concentration figures. It is just as vital to explain to the same audience how the various modelling hypotheses affect the resulting predictions. It must be remembered that climatic extremes may have very severe socio-economic consequences, and it must be made clear that these extremes themselves continue to be predicted differently from one model to the next. It must therefore be stressed that these predicted extremes are not to be 'averaged', but that each resulting situation must be considered individually. The whole range of situations, from the best to the worst, must be shown, and the latter in particular explained using the soundest scientific arguments. The global perspective must always be considered, given the economic interdependence of the different parts of the world. Applicants for such exercises in communication are invited to present their project (methods, information medium to be used, etc.).