

## TERMS OF REFERENCE

### ESPON Project 1.3.1:

## THE SPATIAL EFFECTS AND MANAGEMENT OF NATURAL AND TECHNOLOGICAL HAZARDS IN GENERAL AND IN RELATION TO CLIMATE CHANGE

(2002-04)

### *(o) Political challenges for the ESPON projects*

The Second Report on Economic and Social Cohesion, published in January 2001, presented for the first time a third territorial dimension of the cohesion (beside the economic and social cohesion), which calls for a better co-ordination of territorially relevant decisions. Stressing the persistence of territorial disparities within the Union, the report stated the need for a cohesion policy not limited to the less developed areas as well as the need to promote a more balanced and more sustainable development of the European territory.

The Second Cohesion Report represents in that respect a follow up of the European Spatial Development Perspective (ESDP), adopted at ministerial level in May 1999, calling for a better balance and polycentric development of the European territory.

The projects launched under the ESPON programme shall follow an integrated approach and, seen together, cover a wide range of issues, such as:

- Identifying the **decisive factors relevant for a more polycentric European territory**; accessibility of a wide range of services in the context of enlargement; integration of wider transnational spaces; promotion of dynamic urban growth centres; linking peripheral and disadvantaged areas with those centres; etc.
- Developing **territorial indicators and typologies** capable of identifying and measuring development trends as well as monitoring the political aim of a better balanced and polycentric EU territory
- Developing **tools supporting diagnoses of principal structural difficulties as well as potentialities**, such as disparities within cities and regenerating deprived urban areas; structural adjustment and diversification of rural areas; strategic alliances between neighbouring cities at transnational, national and regional scale; new partnerships between rural and urban areas; potential support from infrastructure networks in the field of transport, telecommunication, energy; etc.

- Investigating **territorial impacts of sectoral and structural policies** in order to enhance synergy and well-co-ordinated decisions relevant for territorial development within policy fields such as Structural Funds, agriculture, transport, environment, research and development; developing methods for measuring the territorial impact of sectoral and structural policies; etc.
- Developing **integrated tools in support of a balanced and polycentric territorial development**; approaches to enhance the potential of cities as drivers of regional development, new tools for integrated urban-rural development and planning, etc.

With the results of all the ESPON projects, the Commission and the Member States expect in particular to have at their disposal: **a diagnosis of the principal territorial trends** at EU scale as well as the difficulties and potentialities within the European territory as a whole; **a cartographic picture of the major territorial disparities** and of their respective intensity; a number of **territorial indicators and typologies assisting a setting of European priorities** for a balanced and polycentric enlarged European territory; some **integrated tools and appropriate instruments** (databases, indicators, methodologies for territorial impact analysis and systematic spatial analyses) to improve the spatial co-ordination of sector policies.

In this respect, the ESPON projects will serve as a strong scientific basis for the propositions of the Commission in the Third Report on Cohesion, at the end of 2003, in view of the reform of post-2007 Structural Funds.

#### ***(i) Relation to the ESPON 2006 programme***

The priorities describing the work-programme of the ESPON 2006 Programme are structured in four strands:

1. **Thematic projects** on the major spatial developments on the background of typologies of regions, and the situation of cities.
2. **Policy impact projects** on the spatial impact of Community sector policies and Member States' spatial development policy on types of regions with a focus on the institutional inter-linkages between the governmental levels and instrumental dimension of policies
3. **Co-ordinating and territorial cross-thematic projects** represent a key component of the programme. These projects evaluate the results of the other projects towards integrated results such as indicator systems and data, typologies of territories, spatial development scenarios. The cross section projects help to thematically co-ordinate the whole programme and add value to the results and to fill gaps, which are unavoidable when different themes are dealt with in different projects.
4. **Scientific briefing and networking** in order to explore the synergies between the national and EU source for research and research capacities.

This project belongs to the first strand and therefore holds a key position for the elaboration of the whole programme by the preparation of the common ground for the

investigation of the basic net of spatial structure in Europe. Therefore a strong co-ordination with all other ongoing projects is needed, in particular with the other project in the same strand and with the coordinating and cross-thematic under priority three and the Co-ordination Unit.

## *ii) Thematic scope and context*

Natural hazards refer to the pressure on the natural and built environment through the consequences of largely unpredictable, singular or more often appearing events which go beyond the impact of incremental changes of the environment. Technological hazards refer to the pressure on the environment through the consequences of accidents which have a direct impact on the environment. The consequences on territorial development represent the core interest of this action. Special attention has to be paid to areas where valuable natural ecosystems, environmentally sensitive areas, cultural landscapes, monuments and historical sites are endangered by pollution, floods, droughts, erosion, fires, earthquakes, and landslides.

Although scientist does not entirely agree in the reasons for climate change, there seems to be an increasing consensus on the existence of climate change. It is also clear that climate change has to be seen in the light of several policies (mainly agriculture, transports, energy, environment, industry, forestry, RDT, development etc.), especially those directly responsible for green-house gas emissions at global level.

Environment should not only be studied from the point of view of climate change. Coastal regions and inland regions exposed to flooding are faced with particular problems in the wake of climate changes. This, for example, ought to be discussed in the context of increasing water-related problems such as changing land use including the increasing surface of metropolitan areas, erosion, and land conservation. Also the disturbance of ecological networks, identified in the Pan European Ecological Networks (1995 Council of Europe) are affected. So in effect, the issue can only be tackled from a comprehensive approach, i.e. a two way relation of changing hydrological regimes and spatial planning. Vice versa inland regions in the South of the EU are exposed to increasing and serious drought which is conceived as a further consequence of climate change, and which causes severe effects for the territories affected. Both aspects should be treated as one element of the territorial development at the EU scale. The perspective of research under this measure shall be guided by the objective to identify broad development perspectives rather than meso-level projects.

The more general interdependence between environment, regional development and territorial balance should be addressed throughout the project. Apart from the sheer environmental effects of climate change, there are considerable social and economic effects on the economy, which by experience influence tourist regions in particular. Special reference should be made to the management of natural and technological hazards regarding in particular the territorial dimension of those phenomena. Coordination should take place with other relevant ongoing ESPON projects.

### ***iii) General objectives***

- a) To refer to the three fundamental objectives with in the ESDP with regard to balanced and sustainable spatial development: the economic and social cohesion, the conservation of natural resources and cultural heritage and more balanced competitiveness of the European territory;
- b) To contribute to the identification of the existing spatial structure of the EU territory, in particular the degree and diversity of physical and functional polycentrism at different geographical scales, and to gain concrete and applicable information on the EU wide effects of spatially relevant development trends and their underlying determinates. Therefore, the project should be sustained by empirical, statistical and/or data analysis;
- c) To define concepts and to find appropriate territorial indicators, typologies and instruments as well as new methodologies to consider territorial information linked to polycentrism, to detect territories (preferably below NUTS 2) most negatively and positively affected by the identified trends with special reference to regions in terms of accessibility, polycentric development, environment, urban areas, territorial impact assessment; particular attention will be paid to areas exposed to extreme geographical positions and natural handicaps such as mountain areas, islands , ultra-peripheral regions; reflections should as well be included on relevant issues from the perspective of Europe and its territorial structure in a global or world-wide context;
- d) To develop possible orientations for policy responses, taking the diversity of the European territory into account, and considering institutional, instrumental and procedural aspects;
- e) To consider the provisions made and to provide input for the achievement of the horizontal projects under priority 3, such as tools for diagnosis and observation and long term scenarios, as well as evaluation and assessment procedures.

In the efforts to meet these objectives the project shall make best use of existing research and relevant studies.

### ***iv) Primary research issues envisaged***

- To list and present the different kinds of indicators related to natural and technological hazards available at Community and Member State levels, including the available geographical level, the technology required for data collection, and the degree of comparability of data;
- Based on the findings of the first step, to reach an agreement in order to make an inventory of precisely the different kinds of indicators which are needed and which deal with, at least, the following themes:
  - Natural hazards: earthquakes, volcanic activity, tidal waves, snow avalanches, slope instability, flooding, drought, forest fires, etc.;
  - Technological hazards: industrial hazards (see “Seveso Directive<sup>1</sup>”), nuclear hazards, mining, including hazards relating to pipelines, marine transport etc.

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<sup>1</sup> Council Directive 96/82/EC of 9 December 1996 on the control of major-accident hazards involving dangerous substances (O.J .n° L 010 , 14 January 1997)

For each of these themes, the list of indicators should conform to the DPSIR model.

Synergies and co-ordination should be established with the European Environment Agency and DG Joint Research Centre of the European Commission, where activities are carried out in the field of natural hazards (floods, droughts, landslides, forest fires).

- To develop appropriate tools for the creation of a database encompassing these indicators and offering compatibility with a map-making facility, in order to provide a consistent, homogeneous, reliable, and up-datable database;
- To review and document the main components of natural risk reduction and spatial planning, and review existing literature and practice of spatial planning for risk reduction in the EU and internationally;
- To gather information on how national, regional and local authorities manage natural and/or technological hazards, to review good practice; including good practice of risk reduction through land-use planning, and an integrated approach of emergency risk management and land-use planning;
- To compile a first typology of regions revealing the kinds of risks involved, their degree (in terms of potential impact) and the ways in which the authorities manage these risks;
- To document a “spatial planning response” to natural hazard risk reduction and to propose guidelines for such a response, including their review and testing by stakeholders;
- To assess the broad trends of climate change and its relative contribution to the magnitude and frequency of natural hazards, as regards potential territorial impacts;
- To realise a second typology of regions revealing the kinds of risks as regards climate change specifically, its degree (in terms of potential impact) and the way the authorities manage these risks, including through spatial planning and adaptation strategies as well as awareness raising among the public and business;
- To set the link to the spatial typologies developed under the other projects in particular under 1.1.1. and 1.1.2..
- To create a synthetic index of vulnerability, at an adequate geographical level (NUTS III and, as far as possible, NUTS V), taking into account all the information related to natural and technological hazards and summarising numerically the comparative degree of risk for the geographical unit concerned;
- Based on the typology and the synthetic index, to establish a list of highly sensitive areas, at an adequate geographical level (NUTS III and, as far as possible, NUTS V) with accompanying cartographic material;
- To develop applicable systems for the monitoring of new trends of territorial development as regards natural and technological hazards;
- To detect the relation of vulnerable areas to spatial typologies in order to detect which type of regions are mostly affected, which types of activities in those regions are mostly affected, and which consequences might be expected for spatial development?
- To elaborate input to medium and long term scenarios concerning spatial effects of climate change on land use, land cover and resources;
- To highlight the main points where policy responses might be brought to bear in relation to the ESDP and the Structural Funds.

### ***v) Expected results and timetable***

The research undertaken during the interim reports is supposed mainly to work on the data available at the national statistical offices, Eurostat and other national and European institutions, and normally be based on existing administrative units. From 2003 until August 2004, the research should complement the missing territorial/regional data and complement tools and territorial indicators if possible beyond the NUTS classification and the NUTS 3 level.

One of the main objectives of the ESPON 2006 Programme is to focus on research with policy relevance and to contribute to the development of relevant policies. Therefore, the deliverables of the research project should be highly operational and coordinated in time, as far as possible, to fit into the relevant political agenda. The following timetable and specification of output is reflecting this objective:

#### **February 2003 (first interim report):**

- a) Consensus on the data and indicators required, after a precise analysis of the availability and comparability of data at Community level, to develop new database, including territorial indicators and the facilities needed for map-making. For the analysis, the results of the study programme and the results of other ESPON projects in course, in particular under priority 3.1, should be taken into account. This task should also define the appropriate geographical level and technology required for data collection, taking into account the availability of relevant data.
- b) A first detailed and comprehensive list of main requests for statistical and geographical data to be collected mainly from Eurostat, the EEA and National Statistical Institutes and National Mapping Agencies in autumn 2002.
- c) A preliminary overview on concepts and methodology and hypothesis for further investigation.

#### **August 2003 (second interim report):**

- d) Preliminary results on the basis of available territorial indicators, including European maps showing the existing spatial structure and the vulnerability of areas, as far as possible related to the degree of polycentrism:
  - Synthetic index of vulnerability available at an adequate geographical level;
  - Compilation of good practice for the management of natural and technological hazards by the authorities and risk reduction<sup>2</sup>;
  - Two typologies of regions: the first one dealing with natural and technological hazards in general, the second dealing with natural hazards and effects specifically as regards climate change;
  - A list and a map of highly sensitive areas in relation to spatial typologies developed in the other projects measure 1.1.<sup>3</sup>;

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<sup>2</sup> JRC-IES is developing together with DG-ENV a European Flood Action Plan, where good practices for flood management are incorporated. Collaboration and co-ordination is therefore required

- First ideas and draft guidelines on spatial planning for natural hazard risk reduction;
  - First proposals to improve monitoring systems for natural and technological hazards<sup>4</sup>;
- e) A first overview on concepts and methodology and possible final results.
- f) Establishment of a new database, so far based on indicators available and with the ability to produce European maps. Database with variables related to natural and technological hazards, in respect of the DPSIR model;
- g) A second revised and extended request for further indicators to be collected (mainly from Eurostat and the EEA, by summer 2003 (the latest).

**January 2004 (third interim report):**

- (g) A working report on the main results elaborating the approach introduced in the previous report including databases, indicators, map-making and a analysis/diagnosis in Europe, as well as the existing territorial imbalances and regional disparities based on the research questions above, including an extended number of available territorial indicators and European maps showing, as far as possible, interrelationships between the aspects concerning the and the territorial integration of candidate countries in an enlarged EU.
- (h) Development of appropriate tools for the processing of the new data base, indicators and map-making
- (i) Applicable systems for the monitoring and benchmarking of new trends of territorial developments in the context of the European territory, including candidate countries and neighbouring countries;
- j) Detection of typologies of regions revealing risks and potentials for the identified types of regions;
- k) Policy recommendations, which could provide the basis for future focus of Community interventions post 2006, to improve an integrated territorial approach in the management of natural and technological hazards, including institutional settings and instruments. Particular attention should be paid to peripheral and ultra-peripheral regions.

**August 2004 (final report):**

- l) An executive summary of the main results of the research undertaken and recommendations for policy development.
- m) Comprehensive presentation of trends in relation to a polycentric and balanced development of an enlarged European Union;
- n) Presentation of access points and concrete ideas for policy responses to improve an integrated territorial approach in the management of natural and technological hazards, at different scales and in different parts of the Union, that could improve territorial cohesion;
- Proposal for guidelines on spatial planning for natural hazard risk reduction;

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<sup>3</sup> JRC-IES is developing together with DG-ENV a European Flood Risk Map, showing areas sensitive to river flooding. Thus for floods, such a map of sensitive areas is already being developed

<sup>4</sup> JRC-IES is developing a European Flood Forecasting System, which will be extended to droughts and landslides during FP6 to provide 10-day flood and landslide pre-warnings and seasonal drought forecasts at EU scale. Co-ordination is thus required.

- Proposals to improve monitoring systems for natural and technological hazards<sup>5</sup>;
- o) Presentation of the developed territorial indicators, concepts and typologies linked to transport infrastructure and services, including maps;
- p) Presentation of the database and the mapping facilities developed, covering as far as possible an enlarged EU and neighbouring countries: Medium and long term scenarios on spatial effects of climate change on land use, land cover and resources<sup>6</sup> that could be inputs to the forthcoming scenario development under ESPON project 3.2;
- r) Listing of further data requirements and ideas of territorial indicators, concept and typologies as well as on further developments linked to the database and mapping facilities;

### ***vi) Rationale and structure***

The following text has the role of shaping the mind of thinking in developing a proposal for undertaking the ESPON action 1.3.1. The text is not meant to be exhaustive, but only to provide guidance for the tenderer.

## **1. Approaches to the definition and methodology, background information on approaches so far which should be taken into account**

The basic foundation for the project is the territorial integrated approach and the spatial policy orientations put forward by the ESDP and carried further by the Commission in the Second Cohesion Report proposing a territorial dimension in future Structural Funds. Apart from the points addressed under the specific research questions the following points should be deepened.

### **1.1. DPSIR Model**

The work of the European Environment Agency is built around a conceptual framework known as the DPSIR assessment framework. DPSIR stands for Driving forces, Pressures, States, Impacts and Responses. Particularly useful for policy-makers, DPSIR builds on the existing OECD model and offers a basis for analysing the inter-related factors that impact on the environment.

The aim of such an approach is:

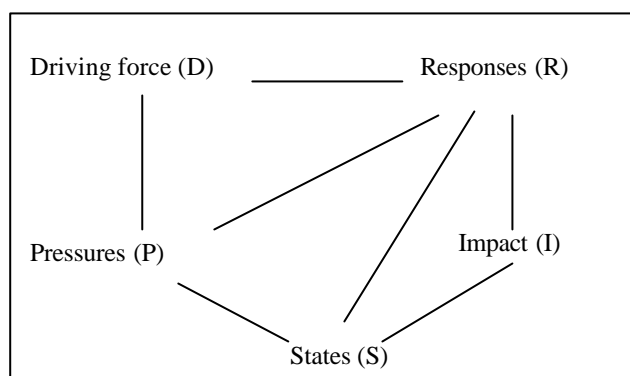
- to be able to provide information on all of the different elements in the DPSIR chain;
- to demonstrate their interconnectedness;
- to estimate the effectiveness of Responses.

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<sup>5</sup> JRC-IES is developing a European Flood Forecasting System, which will be extended to droughts and landslides during FP6 to provide 10-day flood and landslide pre-warnings and seasonal drought forecasts at EU scale. Co-ordination is thus required.

<sup>6</sup> The resulting maps of land use under a different climate could be used to estimate the effect on natural hazards, to incorporate both the effect of changed climate/weather itself, but also changed land use. JRC-IES has tools to perform this analysis for floods and droughts. Thus, co-ordination is needed.





The state and impact should also consider the relation of vulnerable areas to spatial typologies in order to detect which type of regions are mostly affected, which types of activities in those regions are mostly affected, and which consequences are expected for spatial development? Such as costal areas, arid central areas with high potential of fires a.s.o.

## 1.2. Synthetic index of vulnerability

Elaborating the synthetic index of vulnerability should be based initially on the information and the methodology already used for creating an indicator of natural hazards, in the framework of the SPESP. This indicator combines data on earthquakes, volcanic activity, tidal waves, snow avalanches and slope instability. Flooding is an additional important hazard, but here no appropriate data was available at this stage.

A map including seismic and volcanic risks, risks of tsunamis, slope instability and snow avalanches have been realized. The value given for seismic and volcanic risk and tsunamis varies according to the proportion of the NUTS region overlapping each danger class in the source map (United Nations Environment Programme/Global Resource Information Data set GNV63). The slope instability and avalanche risks are obtained from elevation and slope data, which come from the Digital Elevation Model HYDRO1K (US Geological Survey).

## 2. Indicators and data

### 2.1. Indicators published by the European Environment Agency

The EEA has already published some indicators in respect of the DPSIR model which could be useful to examine climate change and technological hazards. For further information, see : [http://themes.eea.eu.int/all\\_indicators\\_box](http://themes.eea.eu.int/all_indicators_box)

#### Pressures related to climate change:

- Carbon dioxide emissions;
- Emissions of greenhouse gases;
- Fluorinated gas emissions;
- Methane emissions;
- Nitrous oxide emissions;

Pressures related to technological hazards:

- Accidental and illegal discharges of oil by ships at sea;
- Generation of nuclear waste;
- Percentage contribution to soil contamination from localised sources;
- Related to issues mentioned in the Communication – Towards a Thematic Strategy on sustainable use of pesticides<sup>7</sup>

States related to climate change:

- Global and European mean temperature
- Hazards such as mentioned in the Council Regulation EEC n° 2158/92 concerning forest fires<sup>8</sup>,

States related to technological hazards:

- Input of hazardous substances in the north-east Atlantic;

Responses related to technological hazards:

- Expenditures on clean-up of contaminated sites
- Progress in management of contaminated sites

## **2.2. MARS - The European Commission's Major Accident Reporting System**

MARS is based on the requirements of EU Directive 96/82/EC ("Seveso II") and dedicated to the collection of data on major industrial accidents. A major accident is defined as a major emission, fire or explosion resulting from uncontrolled developments in the course of the operation of any establishment covered by the Seveso Directive, and leading to serious danger to human health and/or the environment, immediate or delayed, inside or outside the establishment, and involving one or more dangerous substances. Apart from the points addressed under the specific research questions the following points should be deepened.

## **2.3. Other indicators are already compiled by the ESPON Projects**

- Based on the findings of the first step, to reach an agreement in order to make an inventory of precisely the different kinds of indicators which are needed and which deal with, at least, the following themes:
  - Natural hazards: earthquakes, volcanic activity, tidal waves, snow avalanches, slope instability, flooding, drought, forest fires, etc.;
  - Technological hazards: industrial hazards (see "Seveso Directive<sup>9</sup>"), nuclear hazards, mining, including hazards relating to pipelines, marine transport etc.

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<sup>7</sup> COM/2002/349 final

<sup>8</sup> Official Journal L 217, 31/07/1992

<sup>9</sup> Council Directive 96/82/EC of 9 December 1996 on the control of major-accident hazards involving dangerous substances (O.J .n° L 010 , 14 January 1997)

### 3. Quantitative and qualitative analysis

The analyses should be the base to answer the following question already mentioned under the primary research questions. (For each of these themes, the list of indicators should conform to the DPSIR model.) In addition the following should be considered:

- Ruptures and continuums in the development of spatial structures: a comparison between cases of contaminated site decontamination: Developments in the contaminated site management (CSM) have been towards increasing case-based risk assessment emphasising the local context of management decision. While there are community and regional effects (resources, land use pressure etc.) with varying significance for the construction of risk and the chosen management option in different contamination cases, similarly the CSM has its impacts on spatial structure - either changing or strengthening it (regional actors, fairness of risk distribution etc.). A two-way analysis of the effects is emerging: from the spatial structure into the CSM in local agenda and the effects of CSM on spatial structure. The comparative case study analysis of selected development processes should be chosen.
- Spatial development barriers resulting from natural and technological hazards: If approved by the research rivers with extended flooding areas, areas of risk for fires because of lacking humidity, coastal areas, could become barriers for spatial development

### 4. Conclusions and recommendations

The project should highlight the main points where policy responses might be brought to bear taking into account the results of good practice and inputs to medium and long term scenarios concerning spatial effects of climate change on land use, land cover and resources:

- on spatial planning for natural hazard risk reduction;
- gather information on how national, regional and local authorities manage natural and/or technological hazards, to review good practice; including good practice of risk reduction through land-use planning, and an integrated approach of emergency risk management and land-use planning;
- propose improvements of monitoring systems for natural and technological hazards<sup>10</sup>;

In contributing to the development of policy strategies reference should be made to all policy options in the ESDP which are connected with this issue. Recommendations have to address all relevant Community and national policies in order to promote the potential of the regions. The role of territorial governance as well as the European Strategy for Sustainable Development has to be integrated into propositions.

It should be investigated how for the findings are relevant and could be applied to Structural Funds policy and other policies with territorial impact (e.g. competition,

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<sup>10</sup> JRC-IES is developing a European Flood Forecasting System, which will be extended to droughts and landslides during FP6 to provide 10-day flood and landslide pre-warnings and seasonal drought forecasts at EU scale. Co-ordination is thus required.

transport, telecommunication, research) should also be made, bearing in mind co-ordination and coherence among them.

In view of deriving policy recommendations the study should also focus on the influence of territorial governance and institutional aspects, revealing the mechanism of power partitioning, decision making and co-operation processes. In this context, networking seems to be of great importance, in particular between “neighbours” across borders.

### ***vii) Existing access points***

The access points listed below can serve the purpose of providing the tenderer useful information for preparing a proposal. It is by no means meant to be exhaustive, but only as information that can be helpful in tracing additional useful background information

- One of the four thematic priorities of the Fifth framework programme of the European Community for research, technological development and demonstration activities (1998 - 2002) deals with “Energy, Environment and sustainable development”. One of the key actions developed under this priority aims to develop technologies and methods for environmental impact assessment, risk forecasting, prevention, evaluation and mitigation. The priorities of this actions focus on the following key areas:
  - analysis of factors increasing the level of natural risks;
  - methods, models and tools for hazard vulnerability and risk assessment;
  - effective tools and methods for information management;
  - innovative methods and technologies to combat disasters and alleviate their consequences;
  - improvement of the operational safety of hazardous installations.

Ref. : <http://europa.eu.int/comm/research/eesd/leaflets/en/generic01.html>

- The European Commission (DG Environment) has launched a two-year project called Eurosion. Its objective is to provide a package of recommendations for policy-making and information management practices to address coastal erosion in Europe, after thorough assessment of knowledge gained from past experiences and of the current status and trends of European coasts. However, the project also aims at producing results of immediate value for policy-makers and managers at other administrative levels.

The major outcome expected from Eurosion is an analysis of where erosion management is focused today and where it should be focused in the future – at what administrative levels and with what types of measures – in order to determine where more action needs to be taken.

A digital geographical database will provide a consistent framework for integrating existing multidisciplinary data-sets produced at local, national and regional levels into a seamless European database, and for reporting to European policy-makers the status and trends of relevant features such as elevation and bathymetry, infrastructure, hydrographical features, littoral geo-morphological aspects, sea level rise, driving forces, pressures and coastal reporting.

Ten pilot sites within the European Union and accession countries have been selected in order to explore the present and potential role of Geographical Information Systems (GIS) and other decision-support tools for managing coastal erosion processes, the involvement of local stakeholders in decision-taking processes, and the prerequisites for implementing integrated coastal zone management practices. The state-of-the-art of current practices in coastal erosion prevention and management at various levels, based on a Europe-wide review of successful and unsuccessful strategies, measures and experiments, will be analysed. The immediate result of this undertaking will be an on-line shoreline management guide of practical examples from all over Europe, highlighting the weaknesses and strengths from technical, economic, and social points of view.

Finally, policy recommendations will be formulated, backed up by figures derived from the data base and based on results from the pilot case studies and the state-of-the-art report. The executive summary will be printed and disseminated Europe-wide and presented to the expert community in March 2004. Ref. : <http://www.euroasion.org/>

- The Sixth Environmental Action Programme of the European Community 2001-2010 entitled “Environment 2010: Our Future, Our Choice” identifies four priority areas:
  - Tackling climate change: to stabilise the atmospheric concentrations of greenhouse gases at a level that will not cause unnatural variations of the earth's climate.
  - Nature and Bio-diversity - protecting a unique resource: to protect and restore the functioning of natural systems and halt the loss of bio-diversity in the European Union and globally. To protect soils against erosion and pollution.
  - Environment and Health: to achieve a quality of the environment where the levels of man-made contaminants, including different types of radiation, do not give rise to significant impacts on or risks to human health.
  - Sustainable use of natural resources and management of wastes: to ensure the consumption of renewable and non-renewable resources does not exceed the carrying capacity of the environment. To achieve a de-coupling of resource use from economic growth through significantly improved resource efficiency, dematerialization of the economy, and waste prevention.
  
- The Global Monitoring for the Environment and Security (GMES) Initiative (1998-2008) is to support the implementation of the 6<sup>th</sup> Environmental Action Programme (6<sup>th</sup> EAP) as it represents the environmental dimension of the Community's Sustainable Development Strategy.

GMES is a European initiative. The aim is to support Europe's goals regarding sustainable development and global governance, by facilitating and fostering over the next decade the provision of enhanced quality data, information and knowledge. It will do so by paying particular attention to better use of information technologies and by stimulating partnership and co-operation across the whole variety of stakeholders and actors.

The components of the initiative are institutional (e.g. federating needs, securing long-terms efforts) and technical (e.g. monitoring infrastructure, building information

networks). Its added value resides in the relation of coherence and efficiency from the data acquisition to the production and use of information. The aim is to achieve a significant leap forward in the quality of information and services delivered.

The Environmental Reports of the EEA already built a good starting base for the investigation of those kinds of hazards with particular reference to their spatial effects. The SPESP already considered this topic under the spatial criteria of land use and natural assets.<sup>11</sup> The land use study already compared the list of important types of landscapes with the categories compiled in the land use statistics of Eurostat. The combination of these data with climate data supports the identification of areas with specific problems under climate change. In addition, the study presents the results of a survey undertaken among Member States on the assessment of different indicators in terms of their usability and availability in each Member State. The study on natural assets also compares different indicator systems available at EU (EEA), UN and OECD level referring to the driving force pressure and response system which provides a good starting point for further work. GIS referenced data and satellite information systems will play a major role for the investigation under this action. The new Commission's/Eurostat's Initiative on Environmental European Spatial Data Infrastructure (E-ESDI) can also considerably contribute. Interreg IIC and IIB projects are also dealing with this issue, therefore, providing some experience on a transnational scale.

- Interreg IIC and IIB projects, in some cases also dealing with spatial effects, nature and technology, can provide some experience on transnational scale.

In addition, an ESPON Data Navigator creating an overview, a handbook, giving information on principal data sources, contact points etc, is under elaboration. The Data Navigator is expected to cover, in principle, all countries in an enlarged European Union as well as neighbouring countries. The Data Navigator is scheduled to be finalised by end September 2002.

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<sup>11</sup> SPESP 2000 CD report of working group on natural assets p. 66 ff and working group on land use point 3.