November 2004

EDEN

Emerging Diseases in a changing European eNvironment

A new Integrated Project for the 6th PCRDT of the European Commission

DG Research, priority 6.3 – Global Changes and Ecosystems

49 partners from 24 countries

5 years

Subvention of the EC: 11,5 millions euros

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EDEN summary

In recent years, several vector-borne, parasitic or zoonotic diseases have (re)-emerged and spread in Europe and elsewhere with major health, ecological, socio-economical and political consequences. At present little is known about the causes of such changes and the relative contributions to them of human-induced landscape changes, changing activity patterns, the breakdown of traditional control methods and global and local changes in climate. Europe must anticipate, prevent and control new emergences to avoid major societal and economical crises. EDEN (Emerging Diseases in a changing European Environment) offers a unique opportunity to prepare for uncertainties about the future of the European environment by exploring the impact of environmental and other changes on human health.

EDEN's aims are to identify, evaluate and catalogue European ecosystems and environmental conditions linked to global change, which can influence the spatial and temporal distribution and dynamics of human pathogenic agents. The project will develop and co-coordinate at the European level a set of generic methods, tools and skills such as predictive emergence and spread models, early warning, surveillance and monitoring tools and scenarios, which can be used by decision makers for risk assessment, decision support for intervention and public health policies both at the EU and at the national or regional level. Part of EDEN's innovation will be to combine spatial data (earth observation data, GIS etc) with epidemiological data.

EDEN has selected for study a range of indicator human diseases that are especially sensitive to environmental changes and will be studied within a common scientific framework (involving Landscapes, Vector and Parasite bionomics, Public Health, and Animal Reservoirs). Some of these diseases are already present in Europe (tick- and rodent-borne diseases, leishmaniasis, West Nile fever), others were present historically (malaria) and so may re-emerge, whilst others are on the fringes of Europe (Rift Valley fever) in endemic regions of West and Northern Africa.

EDEN integrates research in 49 leading institutes from 24 countries with the combined experience and skills to reach the project's common goals. The eco-geographical diversity of the project area covers all relevant European eco-systems from the polar circle in the North to the Mediterranean basin and its link with West Africa in the South, and from Portugal in the West to the Danube delta in the East. EDEN is organised into a series of vertical Sub-Projects led and managed by internationally recognised experts, and linked together by a series of Integrative Activities that include biodiversity monitoring, environmental change detection, disease modelling, remote sensing and image interpretation, information and communication.

EDEN Project Objectives

Project's goal

The goal of EDEN is to identify, evaluate and catalogue **European ecosystems** and **environmental conditions** linked to global change, which can influence the spatial and temporal **distribution** and **dynamics** of pathogenic agents. A co-ordinated European approach has been adopted to provide predictive emergence and spread models including global and regional preventive, early warning, surveillance, and monitoring **tools and scenarios**. Such tools will have a major impact on improved EU policy development and decision making.

Translation of the goal into project objectives

The general objectives of the EDEN project are related both to scientific innovations and knowledge improvement on the epidemiological processes involved in the emergence and spread of diseases in a changing environment, and to the methodological development of tools for risk assessment, early warning and policy making.

In chronological order this translates as follows:

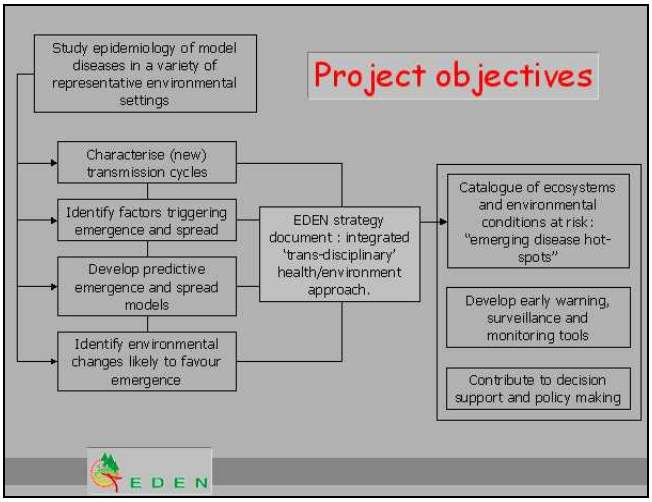
1- Health-environment research objectives. To describe the epidemiological cycles of selected candidate diseases (see below) in a variety of representative environmental settings through an integrated and multidisciplinary approach.

a) To characterise the infectious agents most likely to emerge in Europe, and the competence and capacity of potential vectors, hosts and reservoirs likely to integrate, perpetuate or spread new functioning disease cycles.

b) To identify intrinsic and extrinsic factors triggering or modulating emergence and spread in Europe and the endemic disease areas: i.e change indicators and risk factors, further referred to as 'indicators'.

c) To develop and implement methodologies for Pan-European predictive emergence and spread models.

d) To examine current and (expected) future changes in the European environment likely to favour the emergence or re-emergence of vector-borne diseases.



2- EDEN strategy for integration. To develop and apply an EDEN strategy proposing an innovative integrated 'trans-disciplinary' health/environment approach for the unified analysis and exploitation of the various EDEN health-environment research outputs. This strategy aims at the development of generic tools based on the description and follow up of the set of change indicators and risk factors extracted from the study of disease patterns and processes. A major expected output is to define new methodologies combining statistical approaches and biological models in the definition of these indicators. A particular effort will be put on the involvement of environmental sciences.

3- Tools and policies. To develop as stated in the Strategy description and make available to the EDEN and international community a set of generic tools for risk assessment and decision making (maps, risk indicators,

scenarios) enabling improved public health decision making at the EU and country level, and more specifically:

a) To catalogue ecosystems and environmental conditions considered, or predicted, to be at risk ("emerging disease hot-spots").

b) To develop preventive, early warning, surveillance and mitigation tools and to examine future 'what if' scenarios at different spatial and temporal scales (local to global).

c) To contribute to decision support and policy making through collaborative initiatives with relevant groups.

4-Dissemination. To promote, through a co-ordinated European approach, the dissemination of information through awareness-raising and communication in line with social demand from the general public, user groups and the scientific community through: website, leaflet, newsletter, workshops and international meetings, articles and papers, collaborative initiatives, etc.

To achieve these objectives the EDEN Scientific Committee has selected a series of 'indicator diseases' (i) with a strong link with the environment, (ii) currently (at risk) of (re-) emerging or spreading due to environmental and other changes, (iii) representative as a group of a wide geographical range of (changing) eco-systems (iv) representative of the main epidemiological processes involved in emergence.

Selected pathogen groups

Tick-borne pathogens – causing diseases already present in Europe that have shown significant recent increases in incidence, at least partly due to changes in human behaviour in relation to the environment.

Rodent-borne viruses (hanta, arena, cowpox) – widespread but under-reported diseases within Europe, with strong links with habitat and landscape structures.

Leishmaniasis – persistent on the southern fringes of Europe and beyond (southern Mediterranean basin), with the potential to expand as environments change.

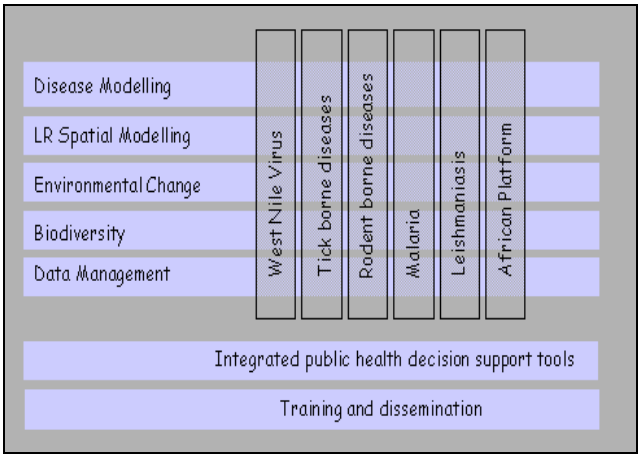
West Nile Virus – periodic and occasionally severe local outbreaks, especially on the eastern fringes of Europe, currently showing strong associations with landscape patterns but also (the USA experience) potential for explosive spread.

Malaria – an ancient scourge of Europe, currently now on her southern and eastern fringes, with the potential for re-emergence following environmental changes.

African source diseases –new strains of West Nile Virus and new diseases such as Rift Valley Fever may be introduced to Europe from tropical regions linked by bird and other (e.g. traded livestock) migratory routes to Europe.

Integration of pathogen studies through the development and application of generic tools will be achieved through a series of horizontal activities managed by 'Horizontal Integration Teams (HIT)'. These include: (i) Data-management and information systems, (ii) Remote sensing tools, both High resolution environmental change and Low Resolution spatial modelling (iii) Disease transmission modelling, and (iv) Biodiversity monitoring and assessment.

The selected diseases will be used as applications and horizontal activities will bring forward the development of new methodologies for an integrated health-environment approach and innovative indicator driven policy tools. An EDEN strategy document is elaborated during year 1 by the EDEN Steering Committee (SP and HIT leaders) with back-up from the Advisory Group (International experts and specialists). The document will include and link up with other international global change and health approaches such as developed by WHO and will serve as a methodological blueprint to be implemented in the subsequent project years.



Impact

The EDEN objectives will then emphasise improved Public Health policy making. For the selected diseases EDEN will (i) contribute to the area-wide understanding of past and present epidemiological events, (ii) enable the development of spatial and temporal prediction models of amplification and spreading risk, and (iii) contribute to the establishment of improved public health policies at the sub-national, national and regional level. A major expected output is the extension of the EDEN approach to other "similar" diseases.

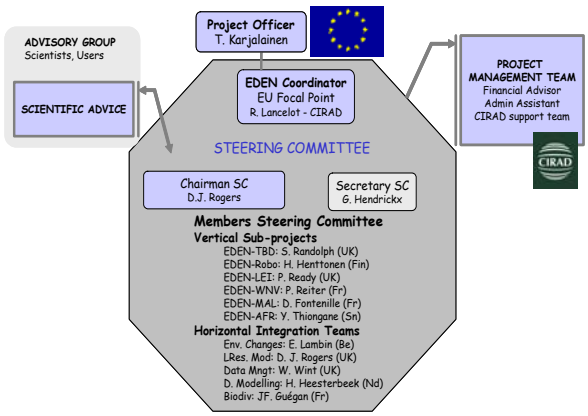
Through the integration and dissemination of this information EDEN will trigger the development of more generally applicable scenarios enabling (i) the delimitation of quantified disease risk areas, i.e. ecosystems at risk, (ii) the monitoring of temporal risk windows linked to eco-climatic events, (iii) the quantification of exposure to key epidemiological factors, and (iv) the identification of population groups at risk (behavioural, professional).

Furthermore EDEN outputs will significantly contribute to the development of new decision support tools which will enable the implementation of adapted monitoring and control strategies at the local level, the more efficient allocation of efforts and resources at a larger scale and the improved analysis of the impact of land-use planning and reallocation strategies resulting from changes in the agriculture policies and urban/peri-urban demography.

Finally through its dissemination network EDEN will improve public awareness of emerging disease risks and the rational management.

Structure of the project

The Scientific Management of EDEN will be conducted by the EDEN Steering Committee (SC). This Committee will include the chairman of SC, the EDEN general Coordinator, the secretary of the SC and representatives of the Vertical Sub-Projects and the Horizontal Integration Teams. Sub-project Co-ordinators are all senior scientists with a proven international record of excellence in their domain and experience with the execution of research projects of which the size is comparable to the EDEN Sub-projects. The EDEN management rules and regulations are part of a Consortium Agreement signed by all the partners.



An Advisory Group (AG) includes about 10 prominent scientists and representatives of EDEN output users (international organisations such as OMS, FAO, OIE etc.) which may be individually requested by the Steering Committee to evaluate EDEN advances and give recommendations for EDEN scientific management to reach expected outputs.

EDEN – Advisory Group

Dr Duane GUBLER	Asia-Pacific Institute for Tropical Medicine and Infectious Diseases, John A. Burns School of Medicine, Hawaii, USA
Dr Antonio PETRINI	World Organisation for Animal Health (OIE), Paris, France
Prof. Rainer SAUERBORN	Medical Director of the Department of Tropical Hygiene and Public Health of the University of Heidelberg, Germany
Prof. Dr Santiago MAS COMAS	President of the European Federation of Parasitologists (EFP), University of Valencia, Spain
Dr Graham WHITE	Mosquito & Fly Research Unit, Center for Medical, Agricultural & Veterinary Entomology, Gainesville, Florida, USA
Dr Jan SLINGENBERGH	Senior officer, Insect Pest Management, Food and Agriculture Organisation of the United Nations (FAO), Rome, Italy
Dr Bettina MENNE	Senior officer, Global Change and Health Program, World Health Organisation of the United Nations (WHO), Rome, Italy
Dr Philippe MARTIN	Principal Administrator, European Commission,Directorate-General for Health and Consumer Protection, Risk assessment, Brussels, Belgium

Measures of success

EDEN is the first ever European large scale research project which will investigate diseases from an environmentally driven perspective. Little information at such a scale currently exists. Therefore it is anticipated that EDEN outputs will set the baseline for future similar efforts.

EDEN's success will be evaluated in terms of scientific outputs, innovation, applications and dissemination of research procedures including:

- The capacity of EDEN to develop, implement, validate and disseminate an innovative health-environment integration strategy translating knowledge obtained from individual disease risk models developed within EDEN and health-environment outputs from other published sources into more general health-environment risk assessment tools to improve public health and environment management decision making.

- The result of the research process should be a contribution to European policies (including regional policy). The structure of the research process will include risk area identification (patterns and trend analysis), policy impact assessments and tool development (indicators, integration strategies). The success of EDEN will be measured through its real involvement in EU decision chains.

- The number of national and international public health decision making bodies and environmental departments/agencies/initiatives who are willing to test and include the EDEN approach and generic tools into their own strategies.

- EDEN's capacity to connect with other projects and similar initiatives such as the Global Changes and Health program of the WHO or the European Platform for biodiversity network.

Partners

Algeria: *Institut Pasteur d'Algérie.* Belgium: AVIA-Gis, Euro-AEGIS EEIG, *Université catholique de Louvain, University of Antwerp, Agroveterinary Information and Analysis.* Czech Republik: *Academy of Sciences of the Czech Republic.* Estonia: *National Health Development Institute.* Finland: *Finnish Forest Research Institute, University of Helsinki.* France: *Université de Montpellier I, Entente Inter-Départementale pour la Démoustication du littoral méditerranéen, Institut National de Recherche Agronomique, Institut de Recherche pour le Développement, Centre de Coopération Internationale en Recherche Agronomique pour le Développement.* Germany: *Ludwig-Maximilians-Universitaet Muenchen.* Greece: *University of Crete.* Hungary: *"Johan Béla" National Centre for Epidemiology, Faculty of Veterinary Science, MTA Állatorvos-todományi Kutató Intézete.* Italy: *Instituto Superiore di Sanità, IZS dell'Abruzzo e del Molise "G. Caporale", University of Rome "La Sapienza", Centro di Ecologia Alpina.* Latvia: *Public Health Agency.* Lithuania: *Centre for Communicable Diseases Prevention and Control .* Morocco: *Institut Agro-Vétérinaire Hassan II, Institut National d'Hygiène.* Netherlands: *University of Utrecht.* Poland: *Medical Academy, Bialystok.* Portugal: *Universidade Nova de Lisboa.* Romania: *Danube Delta National Institute for Research, The National Institute of Research and Development for Microbiology and Immunology "Cantacuzino.* Senegal: *Institut Sénégalais de Recherches Agricoles, Institut Pasteur de Dakar.* Slovakia: *Slovak Academy of Sciences, Medical Faculty of Ljubljana.* Spain: *University of Barcelona, Instituto de Salud Carlos III, Instituto Vasco de Investigation y Desarrolo Agrario, Universitat de Valencia, Consejo Superior de Investigaciones cientificas.* Sweden: *Swedish Institute for Infectious Disease Control.* Turkey: *Ege University Medical School, Hacettepe University Faculty of Science.* United Kingdom: *London School of Hygien & Tropical Medicine, Natural History Museum, University of Liverpool, University of Oxford.*