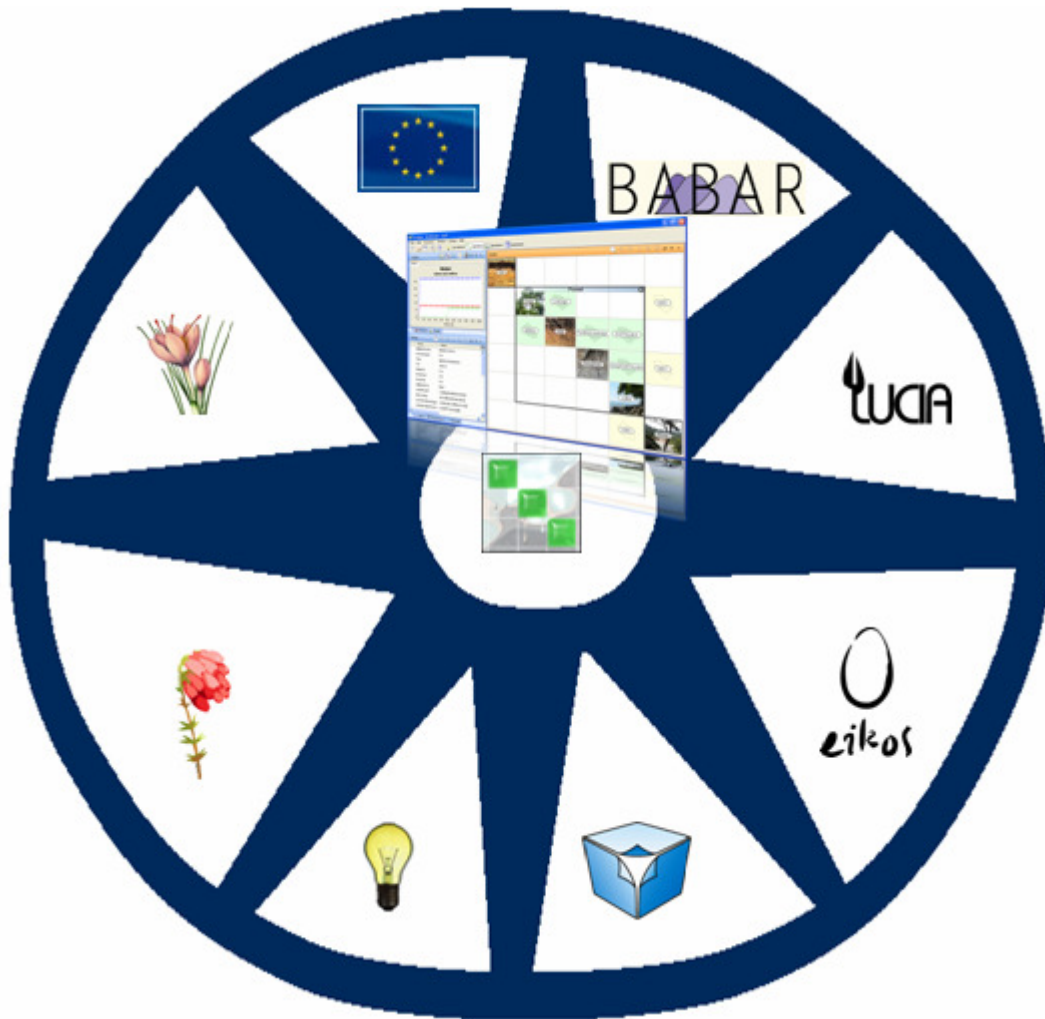


# ANNUAL TECHNICAL REPORT - 2008

FSR07 - December 2008



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## Foreword

In 2008, we have sustained our collaboration with many clients and formed partnerships to improve our competitiveness on the international scene. Our team has also increased thanks to the increasing number of projects we are carrying out.

We, who work at Facilia, continue to give a high value to the creative and friendly environment that we all have contributed to. In this report you will find a short description of our main projects in 2008, some of which are continuations from previous years and others will continue in 2008. For more details on our activities please consult our website: [www.facilia.se](http://www.facilia.se), phone us or why not visit us in our office in Alvik.



*Rodolfo Avila*  
*Director*



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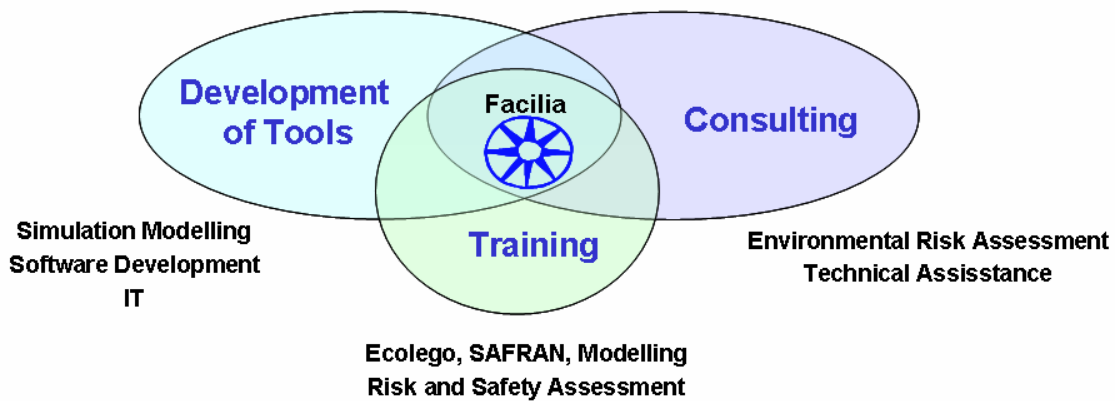
# 1. The Team at Facilia

The team expanded by three members this year. Facilia is now represented by:

- thirteen full-time employees, and
- two main associate consultants.

# 2. Work in 2008

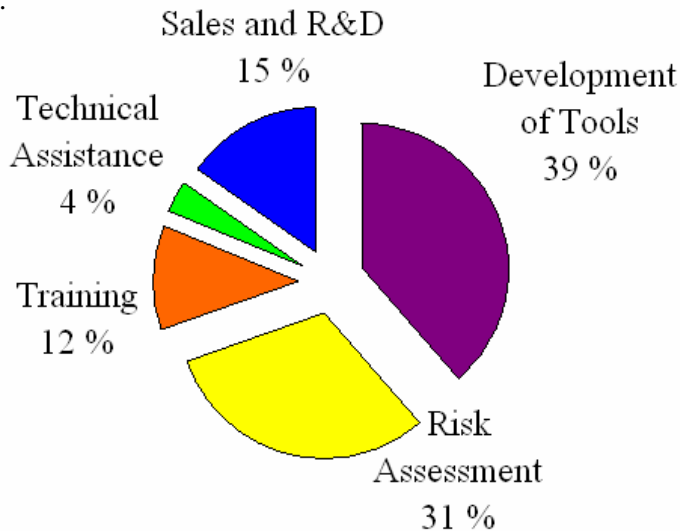
Facilia’s work is divided into into three technical areas, set within two teams:



Facilia also sponsor its own work in developing in-house tools and expertise within these three main categories. This area of work is summarised under “**other**” work.


Work planning was carried out at the beginning of the year and reviewed at regular intervals. Our staff workshop in Kiev in August 2009 provided us with an opportunity to share experience with our Ukrainian colleagues with whom we are forming a joint company, EcoMonitor.


Using the above division of work areas, the main Facilia projects are summarised below and described in detail within Chapter 2.



### 3. Development of Tools

#### 3.1. Assessments

	<b>Ecolego 4</b> <b>A toolbox for radioecological risk assessment</b>
<b>Objective</b> To finalise the Ecolego tool version 4 ( <a href="http://www.facilia.se/ecolego">www.facilia.se/ecolego</a> ) and make it ready to compete on the international market. Start translation into Russian.	
<b>Achievement in 2008</b> Finalisation of The stand-alone Ecolego version 4 that does not require Matlab to run was released in April, with a supporting user-guide.	
<b>For 2009</b> Increase sales of the software and interest in Ecolego has encouraged these latest developments. The new functionalities to be available for all our clients with support.	
<b>Sponsorship in 2008</b> Facilia AB	

	<b>PANDORA</b> <b>Biosphere Assessment Tool</b>
<b>Objective</b> Ecolego Concept is a new software, based on the layout of the Ecolego matrix, that enables a person to visualise simple and complex conceptual models, in an interactive way.	
<b>Achievement in 2008</b> Begin the development of the software.	
<b>For 2009</b> Develop a working prototype with supporting user guide.	
<b>Sponsorship in 2008</b> Posiva Oy, Facilia AB	

#### 2-FUN

#### Full-chain and UNcertainty approaches for assessing health risks in Future eNvironmental scenarios

##### Objective

To provide decision-makers with powerful mechanistic tools to support the analysis of current and future trends in environmental conditions and pressures that cause health problems, and to evaluate and rank the management options of their risk factors. See <http://www.2-fun.org>

##### Achievement in 2008

Facilia's input will FACILIA will take part in the development of the multi media exposure software by contributing with modelling and computer programming (WP2). For this, FACILIA will apply in-house developed tools for model making (e.g. Ecolego), and for uncertainty/sensitivity analysis (e.g. Eikos). FACILIA will also rely on its own library of software components. This Integrated project (contract FP6- 036976), coordinated by INERIS, brings together 13 partners.

##### Sponsorship

European Commission



## SAFRAN

### IAEA SADRWMS Software Tool

#### Objective

To develop a user-friendly tool, which allows the user to visibly, systematically and logically address pre-disposal radioactive waste management and decommissioning challenges in a structured way ([www.facilia.se/projects/sadrwms.asp](http://www.facilia.se/projects/sadrwms.asp)).

#### Achievement in 2008

SAFRAN was extended to decommissioning activities and translated in Russian. Test cases in Russia, Belarus, Chile, Croatia and Slovenia took place to test areas of the tool. A steering Committee was formed with new sponsorship to further develop the tool until March 2010 when it will be completed.

Independently sponsored by SSI, there has been an adaptation of SAFRAN to Russian for application of the tool in the the Leningrad Nuclear Power plant and at the Studsvik Waste Processing Facility for Solid and Liquid Intermediate Level Radioactive Waste (HM).

#### For 2009

The tool will be tested internationally on real case scenarios in UK and Sweden, and more work anticipated for the Leningrad Nuclear Power plant.

#### Sponsorship

International Atomic Energy Agency, UK Nuclear Decommissioning Authority, Swedish Radiation Protection/Safety Authority, French Institute for Radiological Protection and Nuclear Safety.

## CLIMB

### Ecolego Toolbox

#### Objective

Further development and adaptation of the Ecolego Toolbox for Performance Assessment using spatially scalable models

#### Achievement in 2008

Phase 1. Improvement of the Ecolego toolbox: improvement of the Simulink module for spatially scalable models and development of a prototype of an optimization tool


#### For 2009

Phase 2. Extension of the Ecolego toolbox: integration of the Simulink module with Ecolego; implementation of the optimization toolbox; benchmarking of the implemented tools


#### Sponsorship

Swedish Radiation Safety Authority


### 3.2. Reducing uncertainty

	<b>BABAR</b>
	<b>Bayesian methods for constructing and updating probability density functions for model parameters</b>
<b>Objective</b> Phase 2: Enhance the prototype that applies Bayesian methods for constructing and updating probability density functions for model parameters used in health risk assessment.	
<b>Achievement in 2008</b> A prototype was developed for constructing and updating probability distributions and implemented in Matlab.	
<b>For 2009</b> The software will be developed and later applied to test cases.	
<b>Sponsorship</b> Electricité de France, Norwegian Radiation Protection Authority (NRPA) and Posiva Oy	

### 3.3. Conceptualisation of models

	<b>Ecolego Concept</b>
	<b>Software for creation conceptual models</b>
<b>Objective</b> Adaptation of the Ecolego framework to address radionuclides transport in different conditions.	
<b>Achievement in 2008</b> Improvement and maintenance of Pandora software ( <a href="http://www.facilia.se/projects/pandora.asp">www.facilia.se/projects/pandora.asp</a> ).	
<b>Sponsorship</b> Swedish Nuclear Fuel and Waste Management Co., Posiva Oy	

### 3.4. Non-human biota

	<b>ERICA</b>
	<b>Environmental Risk from Ionising Contaminants: Assessment and Management</b>
<b>Objective</b> The objective of the project ERICA ( <a href="http://www.ericaproject.org">www.ericaproject.org</a> ) is to provide an integrated approach to scientific, managerial and societal issues concerned with the environmental effects of contaminants emitting ionising radiation, with emphasis on biota and ecosystems.	
<b>Achievement in 2008</b> Support and further development of the ERICA Tool and its databases was secured. All registered users will benefit from new updated versions, all available free of charge. <a href="http://www.ericaproject.org">www.ericaproject.org</a>	
<b>Sponsorship to Facilia</b> NRPA, Swedish Radiation Protection Authority, Environment Agency, IRSN.	

## 4. Risk Assessment

### 4.1. Waste disposal

#### SR-SITE and SFR

##### Support activities for SR-Site and SFR assessments

###### Objective

Many contracts were carried out in support of SKB SR-Site and SFR assessments.

###### Achievement in 2008

Results included the development of a terrestrial model that can handle all radionuclides of interest for the SR-Site assessments (including C-14); making a comparison of modelling approaches for describing the transition between lakes and mires, in the context of landscape modelling; implementing the Laxemar model, used previously in SR-CAN, into the latest version of Pandora and calculate doses to critical groups from calculated releases of radionuclides from different types of repositories in SFR, etc.

###### For 2009

Objectives for 2009 include e.g. making a review and update the radionuclide dependent parameters used in the models, and implement a landscape model using improved models for the river, the lake and the mire including modelling the continuous transition between ecosystems

###### Sponsorship

SKB - Swedish Nuclear Fuel and Waste Management Co.

#### KSB-3H

##### Biosphere Assessment Development and Modelling

###### Objectives

Continued development of landscape models for the Olkiluoto region for 4 different time-points in the future and creation and maintenance of a Parameters and Dependencies Database.

###### Achievement in 2008

The project continued to perform calculation for horizontal version of the KSB repository concept. Activities included: Simulations for the paper to the Bergen conference (release cases); Process charts of the modelling workflow with QC points; QC criteria for the deliverables; Definition of parameters; Revision of module equations, quantities and units; Definition of parameters revisited and updated; Basic reporting of BSOs; Development of screening levels for releases.

###### For 2009

Continued activities for both the maintenance of the database and for KSB-3H assessments will follow, with the exact schedule being determined in December 2008.

###### Sponsorship

Posiva Oy



**PAMINA**

**Performance assessment methodologies in application to guide the development of the safety case**

**Objective**

To improve and harmonise integrated performance assessment (PA) methodologies and tools for various disposal concepts of long-lived radioactive waste and spent nuclear fuel in different deep geological environments.

**Achievement in 2008**

Facilia's input will relate to probabilistic assessments and the use of PANDORA ([www.ip-pamina.eu](http://www.ip-pamina.eu)). This Integrated Project (contract FP6-036404), coordinated by GRS Braunschweig, brings together 26.

**Sponsorship**

European Commission and Posiva Oy

**4.2. Radioecology**



**Saint-Petersburg**

**Development of Joint Services in the field of Environmental Risk Assessment**

**Objective**

To implement the Lucia model for the St-Petersburg sewage treatment plant to predict the impact of hospital discharges on to workers and the environment

**Achievement in 2008**

Initial investigation of the use of the model in St-Petersburg sewage treatment plant compared to NKS (Nordic Nuclear Safety Research) project results from 2007.

**Sponsorship**

Swedish Radiation Protection Authority



**FUTURAE**

**A future for radioecology in Europe**

**Objective**

To evaluate the feasibility of network(s) of excellence to maintain and enhance competence in a resource efficient manner and to enhance sustainable collaboration in the field of assessment and management of the impact of radionuclides on man and the environment. See [www.futurae.org](http://www.futurae.org)

**Achievement in 2008**

Participation in FUTURAE meetings in taking notes and as facilitator in exchanges between the consortium and the user group.

**Sponsorship**

European Commission, IRSN

### 4.3. Expansion into Ukraine

#### NUTEK

##### Development of Joint Services in the field of Environmental Risk Assessment

###### Objective

Develop joint consultant services in the field of environmental risk assessment by strengthening the cooperation and integration of EcoMonitor and Facilia.

###### Achievement in 2008

Harmonise procedures in project management and financial reporting; developing technical activities for 2009, including quality management issues.

###### Sponsorship

NUTEK

### 4.4. Dose to non-human biota

#### BIOPROTA

##### Non-human biota dose assessment: sensitivity analysis and knowledge quality assessment

###### Objective

Evaluate the robustness of (generic) biota dose assessment data in relation to the key long-lived radionuclides applicable to deep geological disposal facilities.

###### Achievement in 2008

Establish scope for the work. Facilia will create a database and carry out sensitivity analyses.

###### Sponsorship

Posiva, SKB, Andra

#### Dose to non-human biota

##### Derivation of radionuclides concentrations in air, soil, water and sediments that ensure protection of biota

###### Objective

Dosimetry. For all radionuclides of interest Dose Conversion Coefficients (DCC) will be calculated for different species of biota that are found in Forsmark and Laxemar.

###### Achievement in 2008

DCCs and background doses were estimated.

###### For 2009

The work will be incorporated into the major SR-Site contract with transfer factors and EMCLs being determined. Performance of assessments of impact on non-human biota to be ultimately performed.

###### Sponsorship

SKB

## 5. Technical Assistance

### 5.1. Legacy sites

#### ENSURE

##### Assessment of Risks to Human Health and the Environment from Uranium Tailings in Ukraine

###### Objective

To provide: an overview of the current Ukrainian regulatory framework and criteria to adequately address protection of the population and the environment against hazards arising from inactive and active uranium processing facilities; identify gaps with international requirements; train Ukrainian specialists in methodologies and tools to assess radiation exposures and risks arising from uranium mining residues in Ukraine; and propose screening models to derive doses within the PChP territory.

###### Achievement in 2008

The current legislative framework was reviewed and screening models were applied to worker scenarios. A study visit to the legacy site was also carried out.

###### For 2009

Once sponsorship is secured, a more detailed programme will be established to cover 2009-2013.

###### Sponsorship

Swedish Radiation Protection Authority

#### Approach to Safety Assessment of Remedial Actions under Liquidating the Belarus "Military" Repositories of Radioactive Waste (Test-case)

###### Objective

Evaluating real and potential risk and developing recommendations to further work in this area

###### Achievement in 2008

Training Belarusian organisations into risk assessment and the use of assessment tools.

###### For 2009

The proposed work plan aims at developing national recommendations in Belarus for *developing the concept for a safety case* for management and disposal of radioactive waste

###### Sponsorship

Swedish Radiation Safety Authority

### 5.2. Regulations

#### Monitoring in Ukraine

###### Objective

Review of legislation and regulations in Ukraine with regard to radiation monitoring

###### Achievement in 2008

Evaluation of currently existing monitoring provisions and approaches in terms of their agreement and compliance with the regulatory basis. Identifications of shortcomings and possibilities to improvements based on the IAEA and EU requirements.

###### Sponsorship

Swedish Radiation Safety Authority

### 5.3. Expert missions

#### Achievements in 2008

**Philippines:** Establishment of limitations and controls on effluent discharges and associated regulatory review and control. Training and appraisal of the situation in the countries of the Asian Nuclear Safety Network: China, Vietnam, Thailand, Indonesia, Philippines and Malaysia

**Tajikistan and Uzbekistan:** Assessment of doses from exposures to elevated levels of natural radionuclides in areas close to uranium tailings

**Ukraine:** Supply of software and training to Ukrainian Institutions

#### Sponsorship:

International Atomic Energy Agency

### 5.4. Other smaller contracts

- Preliminary risk assessment of the use of samarium minerals in the technological processes associated with Ericsson's facility in Kista;
- Support to carry out ERICA assessments for Westinghouse;
- Performance of EHS compliance assessment services for the handling of incoming scrap metal.

## 6. Other areas

Facilia also provides other services, which draws on its staff own expertise. Examples of such work include: hiring out its programmers to firms, e.g. Felicia Finans; translations of technical documents in Swedish, English, Spanish, French, Ukrainian and Russian.

In 2008 increases in training courses in the use of Ecolego and in risk assessment as well as selling of Facilia's software have been noted, with a similar trend expected to continue in 2009. Courses are already scheduled in France and Kazakhstan.

## 7. Sponsors and Collaborators

In 2008 Facilia began close collaboration with Monitor Scientific LLC (USA) and EcoMonitor (Ukraine) (Germany) in complementing expertise in a number of projects.

Facilia collaborates and is sponsored by a number of clients, both in Sweden and abroad (almost 50 %). These organisations can be grouped into a number of categories.

- Governmental**
  - Swedish Radiation Protection Authority (SSI) now changed to Swedish Radiation Safety Authority (SSM, Sweden)
  - SSM Department of International Affairs (renamed from SIUS, Sweden)
  - Norwegian Radiation Protection Authority (NRPA, Norway)
  - Institute of Radioprotection and Nuclear Safety (IRSN, France)
- International Organisations**
  - European Commission
  - International Atomic Energy Agency
- Industrial**
  - Swedish Nuclear Waste Management Company (SKB, Sweden)
  - SWECO, Westinghouse, Ericsson (Sweden)
  - Posiva Oy (Finland)
  - Electricité de France (France)

## 8. Reports and Publications until 2008

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De la Cruz, Zinger, I and Avila, R (2008) Radiation Doses to Biota in Sweden, report: TR/SSI/01 for the Swedish Radiation Protection Authority, Sweden.

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