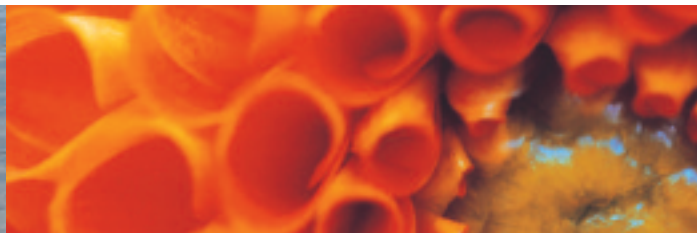





Institute of the Environment / **IMA-UdG**

Universitat de Girona

Institute of the Environment

The Institute of the Environment of the University of Girona (IMA-UdG)

The IMA-UdG is a university research institute whose goal is basic and applied research in the scientific and technical areas that are most relevant to the study and management of the environment. It is an institute with a deliberately interdisciplinary character, founded to contribute locally, regionally and internationally to the promotion of environmental conservation and improvements that are compatible with sustainable economic activities leading to social and territorial justice.
The Institute of the Environment is a permanent observatory of the local situation: the dynamics and the evolution of environmental parameters in the Girona region. It has established direct contacts beyond the university, in society, to facilitate the transfer of knowledge and to provide a solid scientific basis for the environmental education of citizens, including training for improved communication and awareness.

Academically, it organises master's and doctoral programmes in the environment that prepare students for professional careers and basic research work. It also organises ongoing retraining activities for professionals involved in making decisions that affect the environmental quality and the availability of resources. These programmes are complemented by the International Summer School on the Environment (ISSE), an annual seminar that acts as a forum for debate on key issues and the dissemination of conclusions. In recent years seminars have been dedicated to Responsible Consumption (2007), Global Environmental Change (2008) and Marine Biodiversity and Human Health (2009).

The Institute of the Environment also provides technical advice and assists in making environmental decisions. It has established itself as a scientific and technical interlocutor among many stakeholders, including those involved in environmental and regional management in the private and public sectors, and ordinary citizens.

Participating research groups and researchers

The following research groups are part of the Institute of the Environment:

- **Environmental and Territorial Analysis and Planning**
- **Laboratory of Landscape Analysis and Management. LAGP**
- **Chemical and Environmental Engineering Laboratory LEQUIA**
- **The Environment and Geographic Information Technologies. MATIC**

The Institute also collaborates with researchers in the fields of biology, physics, economics and education.

Areas of expertise

Water

Aims:
Research in this area treats water as a resource and a critical factor for life on Earth. These days management of the life cycle of water requires action on various levels and an interdisciplinary approach. Contributions made by IMA-UdG members and collaborators from different disciplines but with complementary perspectives and experiences provide wide-ranging support for the study and management of problems related to water in society.

Research areas:
– Analysis and management of the use of water resources
– Comprehensive management of river basins
– Floods and drought analysis and management
– Environmental decision support systems

Relevant experience
– Assessment of flood risk vulnerability in towns on the Costa Brava (1994-2005) using selected indicators (Ministry of Science and Technology)
– Participation in the creation of river area plans for the Muga, Fluvià and Ridaura rivers, as well as for the Calonge torrent (Catalan Water Agency)
– Study of historical flooding of riverside towns of the Ter River (AlbaTer Consortium)
– Analytical study of pollutants circulating through the network of collectors of the Besòs basin (Conca del Besòs)
– Research on the collection and use of greywater and rainwater for sports facilities and housing communities (ESPA pumps)
– Supervision and integrated control of the Besòs River basin using a system that includes a sewerage network, a wastewater treatment plant and the river (PETRI, Ministry of Science and Technology)

Environmental Technologies

Aims:

An important aspect of this field is the use of advanced technologies that are both effective and economically viable. Some of the specific aims of members of the IMA consist of optimising and improving processes to treat wastewater and gaseous effluents. To carry out these tasks, various lines of work are included in the applied research conducted and in the technology transferred to companies. These transfers are based on specific research into proposed problems and the management of the knowledge acquired.

Research areas:

– Design, operation and control of advanced processes for the biological removal of organic matter and nutrients
– Decision-support systems for the management of WWTPs
– Adsorption/oxidation processes for the treatment of effluents

Relevant experience:

– GRASTAC project: Single-stage granular SBR for the biological removal of nutrients. Advanced control system design and operation (Ministry of Science and Innovation)
– Pilot plant development of hybrid adsorption/PAO processes for the treatment of odour-causing VOCs (2009)
– Operating cost reduction in a WWTP to decrease the production of biological sludge through anoxic/oxic digestion (Ministry of the Environment)
– NIMOX Project: Partial nitrification and anaerobic oxidation through anammox biomass of the ammonium originating in the digester effluent of an urban WWTP (TRACE, Ministry of Science and Innovation)
– Integrated use of solid waste from fertiliser companies. Obtaining activated carbon through thermochemical processes with efficient energy use in the stages (2008-2010) (TRACE, Ministry of Science and Technology)
– NOVEDAR project: comprehensive, 21st century concept of WWTPs including the development, implementation and evaluation of technologies for the treatment and recovery of wastewater (CONSOLIDER Programme, Ministry of Science and Innovation)
– PANAMMOX - Partial nitrification and anaerobic oxidation of the ammonia from landfill leachates through PANI-SBR and anammox processes (PETRI, Ministry of Science and Technology)
– Development of an intelligent control system in MBR processes, based on the evaluation of the behaviour of hollow fibre and flat sheet membranes in wastewater treatment processes (Ministry of Science and Technology)

Biodiversity and conservation biology

Aim:
Improve knowledge of biodiversity, analyse the most frequent anthropogenic disturbances, as well as their consequences and possible responses, and promote research related to the conservation of the natural marine and terrestrial heritage, with special emphasis on the use of the principles and methods developed in conservation biology and landscape ecology.

Research areas:
– Endangered species and conservation: vascular flora, wetland plants, benthic algae, freshwater and saltwater fish, birds
– Disturbances: forest fires, agriculture, invasive species
– Management and conservation: regeneration and reforestation, restoration of lagoon systems
– Population studies through genetic analysis and conservation criteria
– Effects of global warming on Mediterranean plant communities – Design of ecological networks and connection areas
– Fishing species biology and marine resource conservation

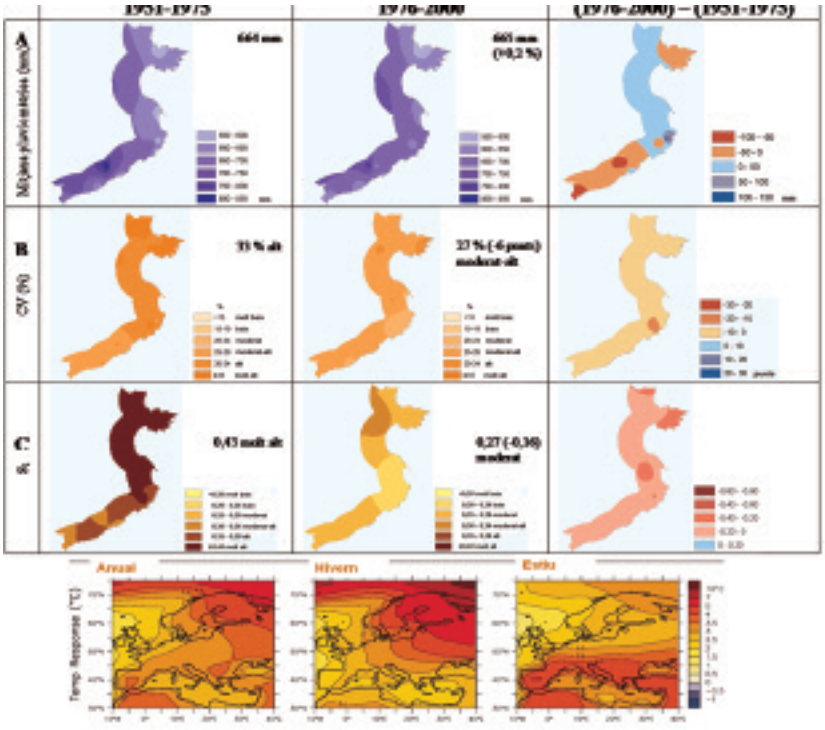
Relevant experience:
– Non-invasive methods of genetic analysis for the identification and conservation of endangered populations of the European otter, Lutra lutra, and the Pyrenean desman, Galemys pyrenaicus (Department of the Environment and Housing – Ministry of Education and Science)
– Development of a biotic integrity index (Ibicat) based on the use of fish to study the state, the dynamics and the impacts of the invasion of the Argentine ant (Linepithema humile) in Mediterranean ecosystems (Ministry of Science and Technology)
– Evaluation of the temporal stability of the population parameters and the genetic diversity in brown trout populations (Salmo trutta) under different management systems (Ministry of Science and Technology)
– Recovery and sustainable use of mowed meadows of the coastal wetlands as natural forage (Ministry of Science and Technology)
– Integration of geographic information technologies to analyse land use changes in Alt Empordà (Ministry of Science and Technology)
– Forest fire dynamics, forest management and spatial prediction of bird diversity (Ministry of Science and Technology)
– Cartography and the study of non-forest habitats of Alta Garrotxa (pastures and cropland) with special emphasis on the habitats of community interest (Alta Garrotxa Consortium – Department of the Environment and Housing)
– Study of the effect of increased UVB radiation and of droughts on different Mediterranean species (Ministry of Education and Science)

Climate change and energy resources

Aim:
This area responds to concerns about the impact of human activities on the global environment, and includes both research on anthropogenic climate change and related matters, such as energy resources. The aims include improving future climate predictions on the global and, especially, the regional scale; improving past and present understanding of climate; supporting more extensive use of renewable sources of energy; and describing the impact of climate change on our environment.

Research areas:
– Use of biomass energy
– Cloud climatology, atmospheric radiation and the interaction of clouds and aerosols
– Regional predictions of climate change (the Mediterranean or Catalonia)
– Impact studies of the electromagnetic waves emitted by high-tension power lines
– Evaluation of solar and wind resources using meteorological data and simulation models

Relevant experience:
– Evaluation of the effects of climate change on the Costa Brava (University of Girona)
– Biomass as a source of raw material and energy: viability study (Abertis Foundation)
– Impact studies of electromagnetic waves (various municipal governments and associations for the defence of the territory)
– Cloud climatology in Catalonia, the Iberian Peninsula and Europe (Ministry of Science and Innovation)
– The transfer of radiation in the atmosphere, effects of aerosols and clouds – the case of UV and IR radiation (Ministry of Science and Innovation)
– Regional climate projections (Catalonia) (Catalan Water Agency, Advisory Council for Sustainable Development)
– Instrumentation to measure solar radiation (Meteorological Service of Catalonia)
– Wind resource assessment using numerical simulation tools of fluid dynamics (Ecotècnia, Vòrtex)
– Temperature changes in Europe based on the average of multiple models for the period 2080-2099 in relation to the period 1980¬-1999 (maps taken from the 2007 assessment report of the IPCC)



Eco-production

Aim:
The optimal use of resources and the introduction of preventative measures in industries (source reduction, reuse, recycling, valorisation) as preferable to methods to correct existing problems. This can be achieved through cleaner production (CP), promoted by UNEP and UNIDO, and by following the best available techniques (BAT) included in European Union directives. In addition, professional training and collaboration in specific activities are designed to improve competitiveness and environmental conditions in companies.

Research areas:
– Formulation and dissemination of the principles of prevention and minimisation
– Linking environmentally compatible technologies and their in-company management
– Life cycle analysis, industrial ecology and other business/environmental management tools
– Introducing eco-production in companies and specific cases of eco-efficiency
– Suport for the use of environmental management systems ISO 14000 and EMAS
– aterial and energy recovery from waste in the resource life cycle

Relevant experience:
– Study to reduce the residual stream (Medichem S.A.)
– Preventing pollution when using solvents (Eco-management manual 22, Department of the Environment and Housing)
– Application of a tool to analyse decision-making processes with environmental criteria in an R+D project: production of activated carbon from biological sludge (Ministry of Science and Technology)
– Development of optimal synthesis and integrated design techniques for processes – Applying wastewater treatment processes (Ministry of Science and Technology)
– Paperex Project: Study of economic and social development alternatives for paper industry regions: an application of multicriteria decision-making methods (Ministry of Science and Technology)
– International courses in collaboration with the Regional Activity Centre for Cleaner Production (RAC/CP) of the UNEP Mediterranean Action Programme (UNEP-MAP)
– Renewable energies: biomass (Ministry of Science and Technology)
– Promotion of source prevention and cleaner production in university instruction in Mediterranean countries (Centre for Business and the Environment)

Land use planning

Aim:
Propose and apply specific methods of territorial analysis and diagnosis in new approaches to land use planning that strike a suitable balance between human activities and the conservation of the natural and cul¬tural heritage. These new planning and management approaches must also promote development (integrated and sustainable) of local territorial systems defined as supramunicipal areas.

Research areas:
– Defining methods to establish, analyse and characterise urban areas
– Impact studies of large infrastructures on local development
– Analysis of socioeconomic and regional information on various levels
– Studies to elaborate land use development plans
– Studies to elaborate strategic local development plans

Relevant experience:
– Demographic analysis and definition of urban areas for strategic land use planning in Figueres in the 21st century (City of Figueres)
– Local action plan for the sustainability of Torroella de Montgrí-l'Estartit (City of Torroella de Montgrí)
– Mobility study in la Garrotxa (Regional Council of la Garrotxa)
– Socioeconomic and territorial diagnosis of the Catalan coastline – Report of the Master Plan for the Coast (Department of Territorial Policy and Public Works)
– Completing a framework study of the effects of high speed trains on intermediate cities (City of Figueres)
– Regional socioeconomic diagnosis of the province of Girona for the partial territorial plan of the districts in it
– Study of urban area planning and governance (Ministry of Education and Science)

Landscape

Aim:
This area of research responds to the need to integrate landscape analyses in regional planning. According to the European Landscape Convention, approved by the Council of Europe in 2000, landscape is an essential part of the quality of life of people, an expression of the diversity of their cultural and natural heritage, and the basis of their collective identity. Landscape research aims to develop new methods for landscape analysis, identification and description, in addition to proposals for landscape management from the perspective of landscape ecology, especially on the coast and in the mountains of the Mediterranean region.

Research areas:
– Landscape analysis and management
– Landscape ecology
– Cultural landscape studies
– Design of wildlife corridors and green routes
– Coastal landscape transformation
– Mountain landscape transformation

Relevant experience:
– Cartography and study of non-forest habitats of Alta Garrotxa (pastures and cropland) with special emphasis on habitats of community interest (Alta Garrotxa Consortium – Department of the Environment and Housing)
– Landscape dynamics, erosion and sustainable development in Mediterranean mountains (Ministry of the Ecology and Sustainable Development, France)
– Proposals for action to promote and restore the multifunctional connectivity between the Guilleries, the Gavarres and the Ardenya massifs (Girona Regional Council)
– Proposals for action to promote and restore the multifunctional connectivity between the Montseny, the Montnegre and the Ardenya massifs (Girona Regional Council)
– Design of a green belt for the urban area of Girona
– Development and validation of a method to evaluate beach resources to assist in the integrated management of coastal tourist areas (MeVaPlaya) (Ministry of Science and Technology)
– Creating landscape catalogues for the Camp de Tarragona (Landscape Observatory of Catalonia)
– Creating landscape catalogues for districts in the province of Girona (Landscape Observatory of Catalonia)

Training and dissemination activities

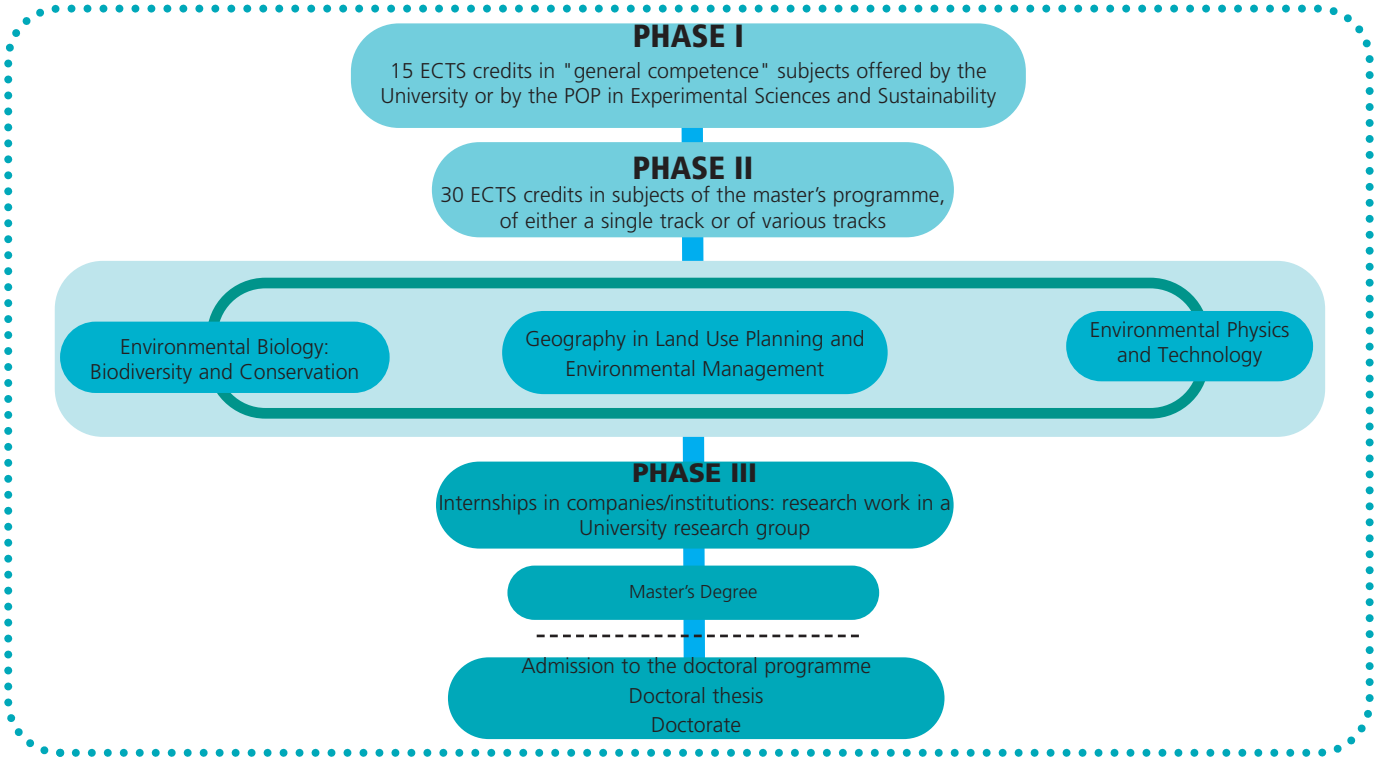
Master's and doctoral degree programmes

The environment inhabited by the human species is complex, not only because of the biodiversity of species in it and the processes that determine its dynamism and evolution, but also because anthropogenic pressure often modifies that development in remarkable ways. Only deep knowledge of our environment, the processes taking place in it and the influence of humans on it will give us a better understand of it and allow us to act coherently to preserve its quality.

Within the Official Postgraduate Programme (POP) in Experimental Sciences and Sustainability, the University of Girona offers an Official Master's Programme in the Environment, which allows students to specialise in the areas of Environmental Biology; Geography in Land Use Planning and Environmental Management; or Environmental Physics and Technology; and to explore in depth relevant topics such as biodiversity, animal and plant community responses to disturbances, climate change, studies of the management and better use of natural resources, and town and country planning. In the master's programme these topics are dealt with from an interdisciplinary perspective, which is essential to environmental studies, and that is why some of the subjects are shared with the Master's in Water Science and Technology, which is part of the same POP. In fact, various members of the Institute of the Environment are instructors in both programmes. Efforts made to use teaching resources as efficiently as possible and to comply with new regulations of postgraduate study adapted to the European Higher Education Area means that both master's programmes can lead to doctoral studies, culminated by a doctoral thesis and the awarding of a UdG doctorate.

The Official Master's Programme in the Environment is an offshoot of the Doctoral Programme in the Environment, organised for the last eight years by the Institute and evaluated positively again and again by external entities. It obtained a Quality Mention from the Ministry of Education and Sciences and the International Graduate School of Catalonia (IGSOC) and internationalisation grants from the Government of Catalonia (IQUC).

Organisation of postgraduate studies in the environment



More information: http://www.udg.edu/mastermediambient

Activities of the Institute

The Institute of the Environment (IMA-UdG) is a forum for training, dissemination and debate about environmental issues and a facilitator of the transition towards a model of a sustainable society characterised by a respectful relationship with the natural heritage, promoting its conservation and improvement a society that is socially just. With these objectives IMA-UdG organises and actively participates in projects, conferences, courses, seminars and expositions. In addition to participating in such a diversity of activities, the Institute has a permanent forum for debate, the International Summer School on the Environment (ISSE), which hosts an annual international seminar that brings together renowned participants to address a particular key environmental issue. Moreover, these seminars have led to the publication of a collection of books promoted by the Institute of the Environment, with the support of other institutions, entitled Quaderns de Medi Ambient. The titles of recent editions of the ISSE provide examples of these topics:

– 7th edition (2007): Sustainable Consumption and Production

– 8th edition (2008): Global Environmental Change

– 9th edition (2009): Marine Biodiversity and Human Health (http://www.udg.edu/portals/87/mediambient/curs/index.html).

Research groups of the Institute

Chemical and Environmental Engineering Laboratory

Director: Dr. Manel Poch Espallargas

http://lequia.udg.edu

The Environment and Geographic Information Technologies

Director: Dr. Anna Ribas Palom

http://web2.udg.edu/aigua/

Environmental and Territorial Analysis and Planning

Director: Dr.Margarida Castañer Vivas

www.udg.edu/apta

Laboratory of Landscape Analysis and Management

Director: Dr. Josep Pintó Fusalba

www.udg.edu/paisatge

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