Introductory course on

Concepts and methods in spatial conservation prioritisation

An integrative overview of *Marxan, Zonation, MultyLink* and *iC4* software

Évora (Portugal), 28 September - 3 October 2015

Course director:
Dr. Diogo Alagador

Lecturers:
Dr. Diogo Alagador
Prof. Miguel B. Araújo
Prof. Jorge O. Cerdeira

Course administrator:
Natália Melo

Organised by:
Science Retreats, LDA

Introduction

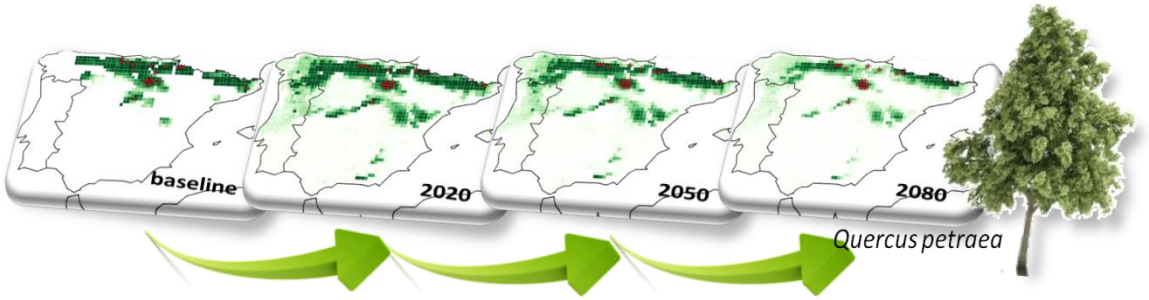
Spatial conservation prioritisation is a scientific-driven procedure to identify cost effective networks of areas capable of safeguard biodiversity persistence through time. This conceptually simple task accommodates sufficient complexity to justify the existence of an active research line with more than 20 years already. But, cost efficiency and representation of biodiversity is only part of the whole challenge of spatial conservation prioritisation. The recognition that nature operates dynamically has stimulated researchers to embrace the additional challenges of developing methods to make standard conservation approaches more dynamic and therefore increase the chances that biodiversity are preserved in the longer term.

The course "*Concepts and Methods in Spatial Conservation Prioritization*" aims to:

- ✓ introduce the fundamental concepts of spatial conservation prioritization;
- ✓ present, describe and operate methodological tools currently in use to solve spatial conservation problems (in particular *Marxan, Zonation, MulTyLink* and a new software at experimental phase *iC4*);
- ✓ discuss a wide range of possible conceptual applications that may be supported with such software machinery, given particular emphasis to studies developed under contexts of dynamic environments (e.g., climate change).

The course is structured and will be lectured by Dr. Diogo Alagador, and it will have the contribution of eminent experts in macroecological modelling biogeography conservation (Prof. Miguel B. Araújo) and reserve selection problems (Prof. Jorge O. Cerdeira). Both will present specialised seminars.

The course gives equal weight to theory and practice. The participants will have opportunity to learn how to run distinct software tools; to explore several conceptual avenues and to put in discussion their own views and ideas about spatial planning, giving special emphasis to conservation taking place under dynamic environments. Although an illustrative dataset will be available to run exercises and demonstrations, participants will be asked to bring their own data in order to work on their own case studies. During one day, participants will analyse these data and prepare a small report for discussion in the class.



Dispersal corridors for Quercus petraea in Iberian Peninsula from a baseline period to 2080 (red stars) and the species modeled climatic suitability (greens) under an optimised conservation plan.
Source: Alagador et al., 2014, J. Applied Ecol, 51:703-713.

Course objectives

In the end of the course, participants will:

- ✓ Have a broad overview of the spatial conservation problems that may be handled quantitatively;
- ✓ Understand the conceptual underpinnings of spatial conservation prioritisation problems;
- ✓ Understand the strengths, limitations and potential applicability of the proposed free-available software tools (*Marxan, Zonation, MulTyLink, iC4: Identifying Conservation Corridors for Climate Change*);
- ✓ Enhance their operative skills in spatial conservation planning software (in particular the above mentioned), for applications conducted under challenging contexts (e.g., climate change).

Course length and ECTS

48 hours on-site (8 hour a day), including: lectures, practical sessions on software use, working groups and discussions.
The course is equivalent to 5 ECTS (European Credit Transfer System). Participants who have completed the course will receive a certificate at the end of it.

Requirements

Some basic experience with GIS (Quantum GIS) and R software are desired. Moreover, the elemental knowledge on the software in use (*Marxan, Zonation, MulTyLink* and the fundamentals of *iC4*) will provide more expedite practical sessions.

All participants must bring their own personal laptop.

Language

English.

Participation

The course accepts a minimum of 10 attendees and maximum of 25, selected according to their track record and the relevance of the course for their research and/or work.

Target audience

Although the main targets of the course are postgraduate students doing their *MSc* or *PhD* degrees, applications from candidates who have already completed their *PhD* or that work in course-related issues are encouraged (e.g., members of governmental agencies or NGOs with interest in spatial-based decision problems).

How to apply?

Send one PDF file including an explanation how the course will reinforce your research and/or work, and a short CV to the course administrator, Natália Melo (cibioue@uevora.pt), with the subject "SCP course application".
Applications must be received no later than the **30th of June 2015**.
Applications will be evaluated based on their relatedness to the course content. Successful candidates will be informed before the **20th of July 2015**.

The course fee is **€500** to be paid by the **31th of July**, ideally by bank transfer. The fee covers the lectures, course material and coffee-breaks.

Cancelation policy
If you wish to cancel your participation in this course, cancellations up to 20 days before the course start date will incur a 30% cancellation fee. For later cancellations, or non-attendance, the full course fee will be charged.

In the unlikely event that the course is cancelled due to unforeseen circumstances, accepted candidates will either be entitled to a full refund of the course fee, or the fee can be credited toward a future course. The organisation is not responsible for travel costs, or any other expenses incurred by the candidate as a result of such cancellation. Every effort will be made to avoid the cancellation of the planned course.

Funding
Unfortunately we do not provide internal grants for this course. However, 20% discounts are offered to students or researchers affiliated with the University of Évora, the CIBIO-InBIO, and the CSIC. If you would like to apply for such a discount please state the name of your organisation in your application (proof of affiliation will be requested). Unemployed scientists and self-funded Portuguese PhD students might also benefit from a 20% discount on the course fee, up to a maximum of two places.

Accommodation

Accommodation during the course should be arranged privately. Évora is a touristic destination, so there is a wide range of options. Some nearby possibilities include:

- ✓ **Seminário Maior de Évora - 20€**

Largo dos Colegiais, 6 | +351 266 758 320 or +351 963 897 674 – Email: seminarioevora@hotmail.com

- ✓ **Burgos Hostel – 35€**

R. de Burgos, 2 | +351 266 703 428 - Fax: +351 266 709 157 – Email: burgoshostel@gmail.com

- ✓ **Évora Inn Chiado Design – 38€**

Rua da República, 11 | +351 266 744 500 - Email: mail@evorainn.com

- ✓ **Ibis Hotel – 39€**

Rua de Viana 18, Quinta da Tapada Urbanização da Muralha | +351 266760700 - Fax : +351 266760799 – Email: h1708@accor.com

- ✓ **StayInn Ale-Hop – 45€**

Rua João de Deus, nº 86 | +351 910 852 255 – Email: stayinn.alehop@gmail.com

- ✓ **Hostel Namasté – 45€**

Largo Doutor Manuel Alves Branco, 12 | +351 266 743 014 – Email: welcome@hostelnamasteevora.pt

- ✓ **Moov Hotel – 45€**

Rua do Raimundo | +351 220 407 000 – Email: evora@hotelmoov.com

- ✓ **Hotel Solar de Monfalim – 50€**

Largo da Misericórdia, 1 | +351 266 703 529 – Email: info@solarmonfalim.com

- ✓ **Best Western Plus Hotel Santa Clara – 58€**

Travessa da Milheira, 19. 7000-545 Évora | +351 266 704 141 - Fax: +351 266 706 544 - Email: reservas@hotelsantaclara.pt

- ✓ **Hotel Riviera – 63€**

Rua 5 de Outubro, 49 7000-854 Évora | +351 266 737 210 - Fax: +351 266 737 212 – Email: reservas@riviera-evora.com

- ✓ **M'Ar de Ar Muralhas – 102€**

Travessa da Palmeira, 4/6 | + 351 266 739 300 - Fax: + 351 266 739 305 – Email: reservas@mardearhotels.com

- ✓ **Pousada dos Loios – 126€**

Largo Conde Vila-Flor | +351 266 730 070/+351 266 707 248 – Email: guest@pousadas.pt

- ✓ **M'Ar de Ar Aqueduto – 153€**

Rua Cândido dos Reis, 72 | + 351 266 740 700 - Fax: + 351 266 740 735 – Email: reservas@mardearhotels.com

Location

The course will take place in the Researcher's Residence ("Residência de Investigadores") in the old district of Évora (Rua Dona Isabel, No 6, corner with Travessa das Casas Pintadas, 7000-780 Évora, see map below but note that red tag should be moved northwards slightly – error from Google map!!). The Residence is set within a 15th century manor house next to what was then Vasco da Gama's home. The residence is ca. 100 m to the famous Roman Temple of Diana and about two minutes walk to Évora's main square "Praça do Giraldo".

Course programme

Day 1 – 28th of September (Monday)

09.00-09.30:	Introduction to the course
09.30-10.00:	Presentation of participants
10.30-11.00:	Coffee break
11.00-13.00:	Key concepts on spatial conservation of planning (**Lecture 1**)
13.00-14.30:	Lunch
14.30-16.30:	Performance of conservation planning spatial investments (**Lecture 2**)
16.30-17.00:	Coffee break
17.00-18.30:	Quantifying protected area representativeness: gap analysis (**Practical 1**)

Day 2 – 29th of September (Tuesday)

09.00-10.30:	The mathematics behind spatial conservation problems I (**Lecture 3**)
10.30-11.00:	Coffee break
11.00-13.00:	The mathematics behind spatial conservation problems II (**Lecture 4**)
13.00-14.30:	Lunch
14.30-16.30:	Operating software. Marxan (**Practical 2)**
16.30-17.00:	Coffee break
17.00-18.30:	Operating software: Marxan (**Practical 3**)

Day 3 – 30th of September (Wednesday)

09.00-10.30:	Spatial conservation prioritization: past, present (**Lecture 5**)
10.30-11.00:	Coffee break
11.00-13.00:	Challenges of spatial conservation prioritization: the future (**Lecture 6**)
13.00-14.30:	Lunch
14.30-16.30:	Operating software: Zonation (**Practical 4**)
16.30-17.00:	Coffee break
17.00-18.30:	Operating software: Zonation (**Practical 5**)

Day 4 – 1st of October (Thursday)

09.00-10.30:	Biodiversity value, costs, threats and societal conflicts (**Lecture 7**)
10.30-11.00:	Coffee break
11.00-13.00:	Dealing with dynamic environments and uncertainty (**Lecture 8**)
13.00-14.30:	Lunch
14.30-16.30:	Operating software: MultyLink (**Practical 6**)
16.30-17.00:	Coffee break
17.00-18.30:	Operating software: iC4 (**Practical 7**)

Day 5 – 2nd of October (Friday)

09.00-10.30:	Integrative overview of spatial conservation prioritization in policy-making (**Lecture 9**)
10.30-11.00:	Coffee break
11.00-13.00:	**Working groups 1**
13.00-14.30:	Lunch
14.30-16.30:	**Working groups 2**
16.30-17.00:	Coffee break
17.00-18.30:	**Working groups 3**

Day 6 – 3rd of October (Saturday)

09.00-10.30:	**Working groups 4**
10.30-11.00:	Coffee break
11.00-13.00:	**Project discussions1**
13.00-14.30:	Lunch
14.30-16.30:	**Project discussions 2**
16.30-17.00:	Coffee break
17.00-18.30:	Feedback, conclusions and wrap up

Key references

General textbook

Moilanen, A., Wilson, K., Possingham, H., 2009. Spatial Conservation Prioritization: Quantitative Methods and Computational Tools. Oxford University Press, Oxford, UK.

Articles on software applications (mostly issued on spatial conservation challenges coming from climate change and species' ranges shuffling using Marxan or Zonation)

- ✓ Allnutt, T.F., McClanahan, T.R., Andréfouët, S., Baker, M., Lagabrielle, E., McClennen, C., Rakotomanjaka, A.J.M., Tianarisoa, T.F., Watson, R. & Kremen, C. (2012) Comparison of Marine Spatial Planning Methods in Madagascar Demonstrates Value of Alternative Approaches. PLoS ONE, 7, e28969.
- ✓ Amorim, F., Carvalho, S.B., Honrado, J. & Rebelo, H. (2014) Designing Optimized Multi-Species Monitoring Networks to Detect Range Shifts Driven by Climate Change: A Case Study with Bats in the North of Portugal. PLoS ONE, 9, e87291.
- ✓ Bond, N.R., Thomson, J.R. & Reich, P. (2014) Incorporating climate change in conservation planning for freshwater fishes. Diversity and Distributions, 20, 931-942.
- ✓ Carroll, C., Dunk, J.R. & Moilanen, A. (2010) Optimizing resiliency of reserve networks to climate change: multispecies conservation planning in the Pacific Northwest, USA. Global Change Biology, 16, 891-904.
- ✓ Carvalho, S.B., Brito, J.C., Crespo, E.G., Watts, M.E. & Possingham, H.P. (2011) Conservation planning under climate change: Toward accounting for uncertainty in predicted species distributions to increase confidence in conservation investments in space and time. Biological Conservation, 144, 2020-2030.
- ✓ Faleiro, F.V., Machado, R.B. & Loyola, R.D. (2013) Defining spatial conservation priorities in the face of land-use and climate change. Biological Conservation, 158, 248-257.
- ✓ Game, E.T., Lipsett-Moore, G., Saxon, E., Peterson, N. & Sheppard, S. (2011) Incorporating climate change adaptation into national conservation assessments. Global Change Biology, 17, 3150-3160.
- ✓ Game, E.T., Watts, M.E., Wooldridge, S. & Possingham, H.P. (2008) Planning for persistence in marine reserves: a question of catastrophic importance. Ecological Applications, 18, 670-680.
- ✓ Hermoso, V., Ward, D.P. & Kennard, M.J. (2012) Using water residency time to enhance spatio-temporal connectivity for conservation planning in seasonally dynamic freshwater ecosystems. Journal of Applied Ecology, n/a-n/a.
- ✓ Hermoso, V., Ward, D.P. & Kennard, M.J. (2013) Prioritizing refugia for freshwater biodiversity conservation in highly seasonal ecosystems. Diversity and Distributions, n/a-n/a.
- ✓ Klein, C.J., Tulloch, V.J., Halpern, B.S., Selkoe, K.A., Watts, M.E., Steinback, C., Scholz, A. & Possingham, H.P. (2013) Tradeoffs in marine reserve design: habitat condition, representation, and socioeconomic costs. Conservation Letters, 6, 324-332.
- ✓ Klorvuttimontara, S., McClean, C.J. & Hill, J.K. (2011) Evaluating the effectiveness of Protected Areas for conserving tropical forest butterflies of Thailand. Biological Conservation, 144, 2534-2540.
- ✓ Kujala, H., Moilanen, A., Araújo, M.B. & Cabeza, M. (2013) Conservation planning with uncertain climate change projections. PLoS ONE, 8, e53315.
- ✓ Leach, K., Zalat, S. & Gilbert, F. (2013) Egypt's protected area network under future climate change. Biological Conservation, 159, 490-500.
- ✓ Lemes, P. & Loyola, R.D. (2013) Accommodating species climate-forced dispersal and uncertainties in spatial conservation planning. PLoS ONE, 8, e54323.

- ✓ Levy, J.S. & Ban, N.C. (2013) A method for incorporating climate change modelling into marine conservation planning: An Indo-west Pacific example. Marine Policy, 38, 16-24.
- ✓ Loyola, R., Lemes, P., Nabout, J., Trindade-Filho, J., Sagnori, M., Dobrovolski, R. & Diniz-Filho, J. (2013) A straightforward conceptual approach for evaluating spatial conservation priorities under climate change. Biodiversity and Conservation, 22, 483-495.
- ✓ Makino, A., Yamano, H., Beger, M., Klein, C.J., Yara, Y. & Possingham, H.P. (2014) Spatio-temporal marine conservation planning to support high-latitude coral range expansion under climate change. Diversity and Distributions, 20, 859-871.
- ✓ Rayfield, B., James, P.M.A., Fall, A. & Fortin, M.-J. (2008) Comparing static versus dynamic protected areasin the Québec boreal forest. Biological Conservation, 131, 438-449.
- ✓ Runting, R.K., Wilson, K.A. & Rhodes, J.R. (2012) Does more mean less? The value of information for conservation planning under sea level rise. Global Change Biology, n/a-n/a.
- ✓ Shaw, M.R., Klausmeyer, K., Cameron, D.R., Mackenzie, J. & Roehrdanz, P. (2012) Economic costs of achieving current conservation goals in the future as climate changes. Conservation Biology, 26, 385-396.
- ✓ Summers, D.M., Bryan, B.A., Crossman, N.D. & Meyer, W.S. (2012) Species vulnerability to climate change: impacts on spatial conservation priorities and species representation. Global Change Biology, 18, 2335–2348.
- ✓ Wan, J., Wang, C., Yu, J., Nie, S., Han, S., Zu, Y., Chen, C., Yuan, S. & Wang, Q. (2014) Model-based conservation planning of the genetic diversity of Phellodendron amurense Rupr due to climate change. Ecology and Evolution, 4, 2884-2900.
- ✓ Williams, J.W., Kharouba, H.M., Veloz, S., Vellend, M., McLachlan, J., Liu, Z., Otto-Bliesner, B. & He, F. (2013) The ice age ecologist: testing methods for reserve prioritization during the last global warming. Global Ecology and Biogeography, 22, 289-301.

Marxan

The concept

- ✓ Ball, I.R., H.P. Possingham, and M. Watts. 2009. Marxan and relatives: Software for spatial conservation prioritisation. Chapter 14: Pages 185-195 in Spatial conservation prioritisation: Quantitative methods and computational tools. Eds Moilanen, A., K.A. Wilson, and H.P. Possingham. Oxford University Press, Oxford, UK.

Website with download instructions, manuals and good-practices handbook

- ✓ http://www.uq.edu.au/marxan/

Zonation

The concept

- ✓ Moilanen, A., Kujala, H. and J. Leathwick. 2009. The Zonation framework and software for conservation prioritization. Pp. 196-210 in Moilanen, Wilson and Possingham (Eds.), Spatial Conservation Prioritization, Oxford University Press.
- ✓ Moilanen, A. and I. Ball. 2009. Heuristic and approximate optimization methods for spatial conservation prioritization. Pp. 58-69 in Moilanen, Wilson and Possingham (Eds.), Spatial Conservation Prioritization, Oxford University Press.

Website with download instructions and manuals

- ✓ http://cbig.it.helsinki.fi/software/zonation/

MulTyLink

The concept

- ✓ Alagador, D., Triviño, M., Cerdeira, J., Brás, R., Cabeza, M., Araújo, M., 2012. Linking like with like: optimising connectivity between environmentally-similar habitats. Landscape Ecology 27, 291-301.
- ✓ Brás, R., Cerdeira, J.O., Alagador, D., Araújo, M.B., 2013. Linking habitats for multiple species. Environmental Modelling & Software 40, 336-339.

Website with download instructions and manuals

- ✓ http://pascal.iseg.utl.pt/~rbras/MulTyLink/

iC4

The concept

- ✓ Alagador, D., Cerdeira, J.O. & Araújo, M.B. (2014) Shifting protected areas: scheduling spatial priorities under climate change. Journal of Applied Ecology, 51, 703-713.
- ✓ Phillips, S., Williams, P., Midgley, G. & Aaron, A. (2008) Optimizing dispersal corridors for the Cape Proteaceae using network flow. Ecological Applications, 18, 1200-1211.
- ✓ Williams, P., Hannah, L., Andelman, S., Midgley, G., Araujo, M., Hughes, G., Manne, L., Martinez-Meyer, E. & Pearson, R. (2005) Planning for climate change: Identifying minimum-dispersal corridors for the Cape Proteaceae. Conservation Biology, 19, 1063-1074.

Website with download instructions and manuals

The software will be firstly presented in the course and instructions for download and installation will be given in the upcoming months.

R software

Website with download instructions and manuals

- ✓ http://cran.r-project.org/

Quantum GIS

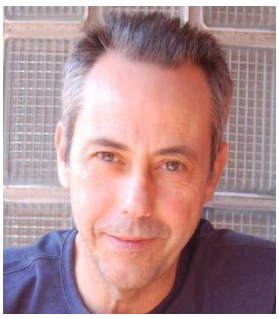
Website with download instructions and manuals

- ✓ http://www.qgis.org/en/site/

About us

Diogo Alagador is a postdoctoral researcher in CIBIO, University of Évora where he works around conceptual and software development for spatial conservation problems especially integrating dynamic environmental factors. He has a Biology grade and a Master on Applied Mathematics. More recently his PhD studies were centered on methodological advances for spatial conservation planning under climate change where he had the opportunity to collaborate in development of a freely available software tool (*MultyLink*) and in lecturing a 25 hour module on Systematic Conservation Planning for Biology graduation students. He is currently involved in preparing a dedicate software (stand alone and R package) for the identification of Conservation Corridors for Climate Change – *iC4*.

Miguel B. Araújo is a Research Professor of the Spanish National Research Council (CSIC) and visiting Professor at the Universities of Évora and Copenhagen. Previously, he held faculty or research positions at the Imperial College London, the University of Oxford, the CNRS, and the Natural History Museum in London. He was recently elected Editor-in-Chief of Ecography. Miguel Araújo has a wide range of interests in biogeography, conservation planning, global change biology, and macroecology. Earlier work included the development of reserve- selection techniques that minimise species extinctions within reserves. More recently, a variety of types of species distributions models have been used to investigate impacts of climate change on species distributions. The goal is to better understand the sources of uncertainty in models and to propose alternative approaches to reduce them. He was lead author for section on the biodiversity and climate change in Europe in the Fourth Assessment Report of the Intergovernmental Panel on Climate Change (IPCC) for which the IPCC shared the Nobel Peace Prize. Miguel Araújo is a highly cited author and recipient of the Royal Society Wolfson Research Merit Award (2014). He received the IBS (International Biogeography Society) MacArthur & Wilson Award (2013), given to an individual 'for notable, innovative contributions to biogeography at an early stage in their career', and the GIBIF (Global Information Biodiversity Facility) 2013 Ebbe Nielsen Prize awarded to researchers that "combine biosystematics and biodiversity informatics in an exciting and novel way".



Jorge Orestes Cerdeira obtained his Habilitation in Mathematics from the Technical University of Lisbon in 2003, and his PhD in Algebra and Logic from the University of Lisbon in 1990. His research interests include graphs, combinatorial optimization, conservation biology, and macroecology. Part of his research has been directed to the development of models and algorithms to handle connectivity in priority area selection and in assessing species distributions. He is currently Full Professor at the Department of Mathematics of the Faculty of Sciences and Technology of the New University of Lisbon. He coordinates the Center for Applied Mathematics (Unidade I&D Matemática Aplicada/IISA), the Research Area ''Mathematical Modeling'' of the R&D Forest Research Centre, of the Fundação para a Ciência e Tecnologia (FCT), and was Principal Investigator of the 40 months FCT Project ''Species Performance Modeling Algorithm''.

The introductory course on "Concepts and methods in spatial conservation prioritisation - An integrative overview of Marxan, Zonation, MultyLink and iC4 software" is organised by Science Retreats LDA on behalf of the Évora branch of InBIO-CIBIO.

InBIO

InBIO (RESEARCH NETWORK IN BIODIVERSITY AND EVOLUTIONARY BIOLOGY) is an Associate Laboratory that results from a collaborative partnership between CIBIO – RESEARCH CENTER IN BIODIVERSITY AND GENETIC RESOURCES and CEABN - CENTRE FOR APPLIED ECOLOGY "PROF. BAETA NEVES" with the mission of conducting top-level basic and applied research on biodiversity and evolution. The Centre carries out scientific and educational activities for public and private institutions and the general public in the areas of biodiversity conservation and use of biological resources.

InBIO's general objectives are:

- ✓ Promote scientific advancement in the field of biodiversity and evolutionary biology, with a special emphasis on understanding the processes that lead to present-day patterns of biological diversity and the principles governing the spatial partitioning of genotypic and phenotypic variation;
- ✓ Improve and integrate ecologic, taxonomic, and biogeographic knowledge at different scales, particularly focusing in the Iberian and Mediterranean biological heritage;
- ✓ Apply scientific knowledge to help guiding the establishment of conservation priorities and management tools by national and international conservation authorities;
- ✓ Use scientific data from wild and domestic breeds to improve species management through collaborations with local authorities;
- ✓ Provide top level education programmes in evolutionary and conservation biology;
- ✓ Foster public awareness, understanding and appreciation of biodiversity by communicating scientific results and promoting outreach.

Science retreats, LDA

Is a SME (Small and Medium-sized Entreprise) established with the purpose of organising scientific meetings and workshops as well as promoting the dissemination of knowledge in sciences, humanities and arts. Its headquarters are in the historical district of Évora (Portugal), within a recently restored 15th century manor house originally owned by the 'Morgado do Esporão'.

Évora (Portugal)

Évora is the finest example of a city of the golden age of Portugal after the destruction of Lisbon by the earthquake of 1755. The cityscape of Évora demonstrates the influence exerted by Portuguese architecture in Brazil, in sites such as Salvador de Bahia.

It is the capital of Alentejo Province and one of the tourist attractions of the south. In spite of sharp population growth which has led to the construction of new quarters to the west, south and east, this museum city has retained all of its traditional charm inside the Vauban-style wall built in the 17th century according to the plans of Nicolas de Langres, a French engineer. The rural landscape to the north has remained virtually unchanged.

Évora has been shaped by some 20 centuries of history, going as far back as Celtic times. It fell under Roman domination, when it was called Liberalitas Julia and, among other ruins, still retains those of the Temple of Diana. During the Visigothic period, the Christian city occupied the surface area surrounded by the Roman wall, which was then reworked. Under Moorish domination, which came to an end in 1165, further improvements were made to the original defensive system as shown by a fortified gate and the remains of the ancient Kasbah. Moreover, the toponymy is indicative of the Maghreb population, which remained after the reconquest in the La Mouraria quarter of the north-east.

The Roman Temple of Diana

There are a number of buildings from the medieval period, the best known of which is unquestionably the cathedral, begun in 1186 and essentially completed in the 13th-14th centuries. It was in the 15th century, however, when the Portuguese kings began living there on an increasingly regular basis, that Évora 's golden age began. At that time, convents and royal palaces sprang up everywhere: St Claire Convent, the royal church and convent of São Francisco, not far from the royal palace of the same name, Os Lóios Convent with the São João Evangelista Church. These splendid monuments, which were either entirely new buildings or else constructed within already existing establishments, are

characterized by the Manueline style which survived in the major creations of the 16th century: Palace of the Counts of Basto, built on the site of the Alcazar, and the Church of the Knights of Calatrava, the convents of Carmo and da Graça, Santo Antão, Santa Helena do Monte Calvario, etc.

Bones Chapel

The 16th century was a time of major urban planning as demonstrated by the ancient style: Agua da Prata aqueduct built in 1537 by Francisco de Arruda and the many fountains that remain (la Praça do Geraldo is the best known). It also marked the beginning of Évora's intellectual and religious influence. The University of the Holy Spirit, where the Jesuits taught from 1553, played a role in the south which was comparable to that of Coimbra in the north of the kingdom. Moreover, Évora began a rapid decline following the expulsion of the Company of Jesus by the Minister, Pombal, in 1759. Évora is also interesting for reasons other than its monumental heritage related to significant historic events and royal orders. This interest also goes beyond the many 16th-century patrician houses (Cordovil house, the house of Garcia de Resende). In fact, the unique quality of the city arises from the coherence of the minor architecture of the 16th, 17th and 18th centuries, which finds its overall expression in the form of myriad low whitewashed houses, covered with tile roofs or of terraces which line narrow streets whose layout is of medieval configuration in the old city centre and which in other areas bears witness to the concentric growth of the town until the 17th century.

University of Évora – Claustro Espírito Santo

Wrought iron and azulejo decoration, which is splendid in the convents and palaces and very charming in the most humble dwellings, serves to strengthen the fundamental unity of a type of architecture which is perfectly adapted to the climate and the site.

Source: UNESCO/CLT/WHC

How to arrive to Évora

Évora is about 130 km from Lisbon city center and there are two equal priced means to travel there: bus (more options) and train (less options).

From** Lisbon Airport. **to Lisbon transport interface

You will find the airport's tube station where you can take the metro downtown. You will need to purchase a 50 cents travel card (Lisboa viva viagem) plus a single trip ticket (1.40 euro).

- ***If you chose to reach Évora by bus*** (Rede Expresso): you have to take the metro towards Jardim Zoológico station. The journey goes as follows: the Metro takes you to **S. Sebastião; there change** to the blue line (direction Amadora Leste), and exit at **Jardim Zoológico station**. In the Jardim Zoológico station you have direct access to the Sete Rios train station. You may find the bus station next to it. One way trip is approx 12.50 euro and lasts 1h30.
- ***If you chose to reach Évora by train*** (CP): you have to take the metro towards **Oriente** station. This is a big interface that also links to the train station. One way trip to Évora is approx 12.20 euro and lasts 1h30.