



# Wildlife Corridors: Connecting Protected Areas

Ana Luisa Gomes  
(IGP)



Wildlife Corridors:  
Connecting protected areas

**FCT** Fundação para a Ciência e a Tecnologia  
MINISTÉRIO DA CIÊNCIA, TECNOLOGIA E ENSINO SUPERIOR



INSTITUTO GEOGRÁFICO PORTUGUÊS

# Introduction

- Habitats Loss
- Habitats Degradation
- Habitats Fragmentation
- Habitats Isolation

**Biodiversity  
Reduction**

- Climate Change

**Protected  
Areas**

**Wildlife  
Corridors**

**Protected  
Areas**

**A new network of protected areas connected by ecological corridors**



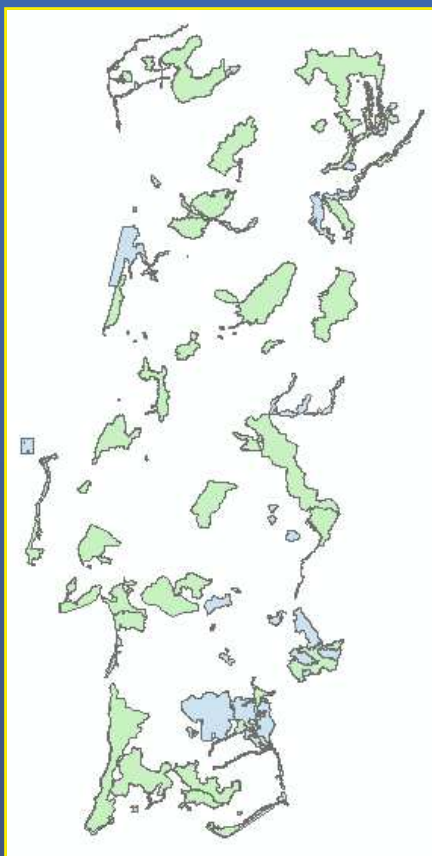
**Wildlife Corridors:  
Connecting protected areas**

**FCT** Fundação para a Ciência e a Tecnologia  
MINISTÉRIO DA CIÊNCIA, TECNOLOGIA E ENSINO SUPERIOR



# Protected Areas in Portugal

## Nature2000 Network



## Conservation in Portugal: Protected Areas

**Nature2000**  
• Birds Directive  
• Habitats Directive

**Internacional**  
- Ramsar Convention  
- Bona Convention  
- Berna Convention

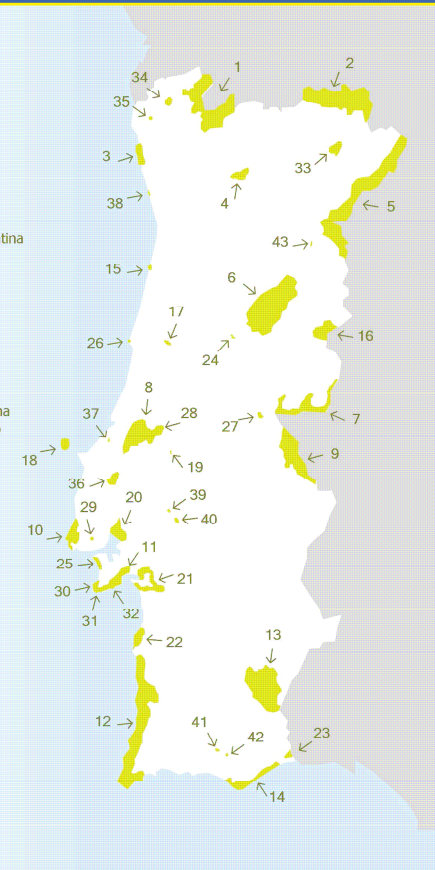
**National  
Designated  
Areas**

*The selection of protected areas is associated with the **Rarity** criteria.*

*Oriented for the conservation of natural habitats and wild fauna and flora which are considered threatened.*

## National Designated Areas

- 1 Peneda Gerês
- 2 Montesinho
- 3 Litoral Norte
- 4 Alvão
- 5 Douro Internacional
- 6 Serra da Estrela
- 7 Tejo Internacional
- 8 Serra de Aire e Candeeiros
- 9 Serra de São Mamede
- 10 Sintra-Cascais
- 11 Arrábida
- 12 Sudoeste Alentejano e Costa Vicentina
- 13 Vale do Guadiana
- 14 Ria Formosa
- 15 Dunas de São Jacinto
- 16 Serra da Malcata
- 17 Paul de Arzila
- 18 Berlengas
- 19 Paul do Boquilobo
- 20 Estuário do Tejo
- 21 Estuário do Sado
- 22 Lagoas de Santo André e da Sancha
- 23 Sapal C. Marim - Vila R. S. António
- 24 Serra do Açor
- 25 Arriba Fóssil da C. da Caparica
- 26 Cabo Mondego
- 27 Portas de Ródão
- 28 Pequenas de Dinossáurios de Ourém / Torres Novas
- 29 Carenque
- 30 Pedra da Mua
- 31 Lagosteiros
- 32 Pedreira do Avelino
- 33 Albufeira do Azibo
- 34 Corno do Bico
- 35 Lagoas de Benteados e São Pedro de Arcos
- 36 Serra de Montejunto
- 37 Paul de Tornada
- 38 Litoral de Vila do Conde e Reserva Ornitológica do Mindelo
- 39 Açude da Agolada
- 40 Açude do Monte da Barca
- 41 Rocha da Pena
- 42 Fonte Benémola
- 43 Fala Brava



**ENCNB - Estratégia Nacional da Conservação da Natureza e da Biodiversidade**



**Wildlife Corridors:**  
**Connecting protected areas**

**FCT** Fundação para a Ciência e a Tecnologia

MINISTÉRIO DA CIÊNCIA, TECNOLOGIA E ENSINO SUPERIOR



# *Wildlife corridors: Spatial modelling of human pressure and its usefulness for Iberian-wolf conservation*

FCT (PTDC/AAC-AMB/111457/2009)



## Team:



IGP - Instituto Geográfico Português (Portuguese Geographic Institute)

- Ana Luisa Gomes (Coordenadora)
- Alexandra Fonseca



CBA - Centro de Biologia Ambiental - FFC/FC/UL (Centre for Environmental Biology)

- Francisco Petrucci-Fonseca
- Clara Grilo



GL - Grupo Lobo (Association for the Wolf Conservation and its Ecosystem)

- Gonçalo Costa
- Ana Margarida Guerra



Wildlife Corridors:  
Connecting protected areas

**FCT** Fundação para a Ciência e a Tecnologia

MINISTÉRIO DA CIÊNCIA, TECNOLOGIA E ENSINO SUPERIOR





# Project main goals

- developed and implemented an innovative methodology based on spatial modelling of environmental disturbances resulting from human activities.
- identify preferred paths for wildlife linking the protected areas, on a gradient representative of the human presence and influence in the territory.
- intent to validate this new strategy for the identification of ecological corridors through the study of the location and movement of the Iberian-wolf, a species considered sensitive to human presence and activities.

**Create scenarios to support the identification of  
Wildlife Corridors Connecting Protected Areas**



**Wildlife Corridors:  
Connecting protected areas**

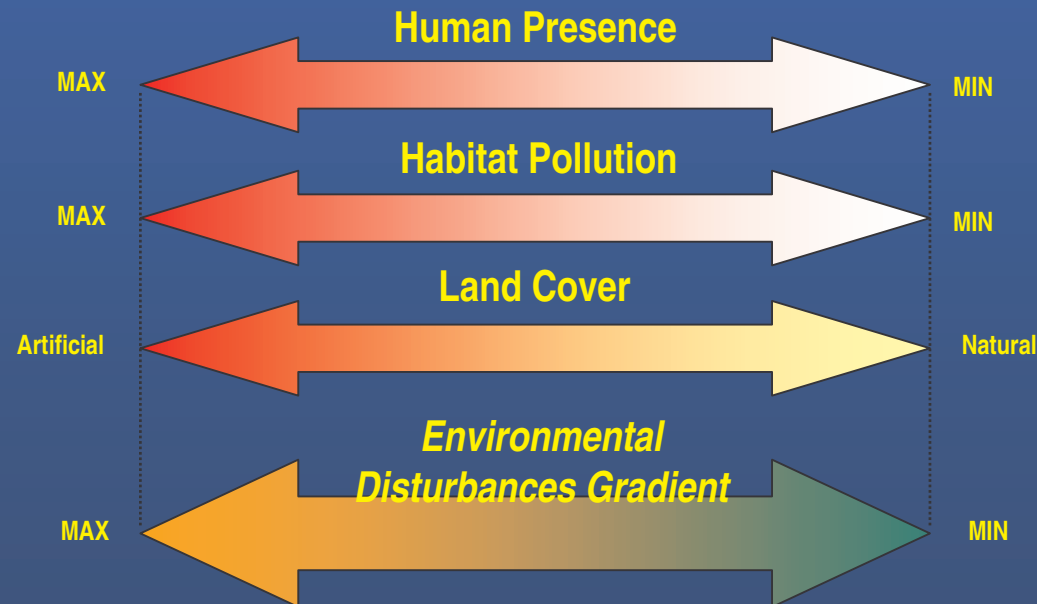
**FCT** Fundação para a Ciência e a Tecnologia  
MINISTÉRIO DA CIÊNCIA, TECNOLOGIA E ENSINO SUPERIOR



# Environmental Disturbances Gradient

It is considered that the spatial modeling of human influence is based on three themes, considered representative of the main environmental disturbances: human presence, habitat pollution and land cover.

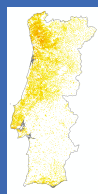
1. **Human Presence** - aims to quantify the environmental disturbance as a direct consequence of the individual's dispersion in the landscape.
2. **Habitat Pollution** - aims to quantify the disturbance from environmental degradation, as a result of the linear and point pollution sources.
3. **Land Cover** - aims to quantify the artificiality of the landscape, as a measure of the human intervention.



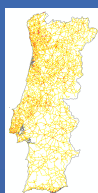
## Human Presence



Dispersion of  
resident  
population



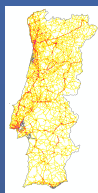
Dispersion of  
individuals  
from roads



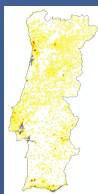
## Habitat Pollution



Environmental  
disturbances from  
linear pollution  
sources



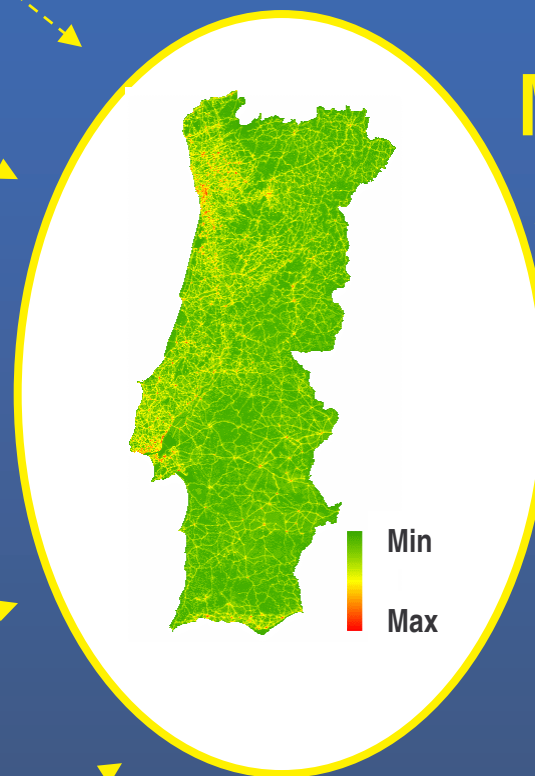
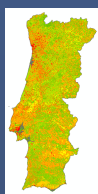
Environmental  
disturbances from  
point pollution  
sources



## Land Cover



Artificiality of  
Land Cover  
classes



Environmental  
Disturbances Gradient

Methodological  
scheme for the  
spatial  
modeling of  
environmental  
disturbances



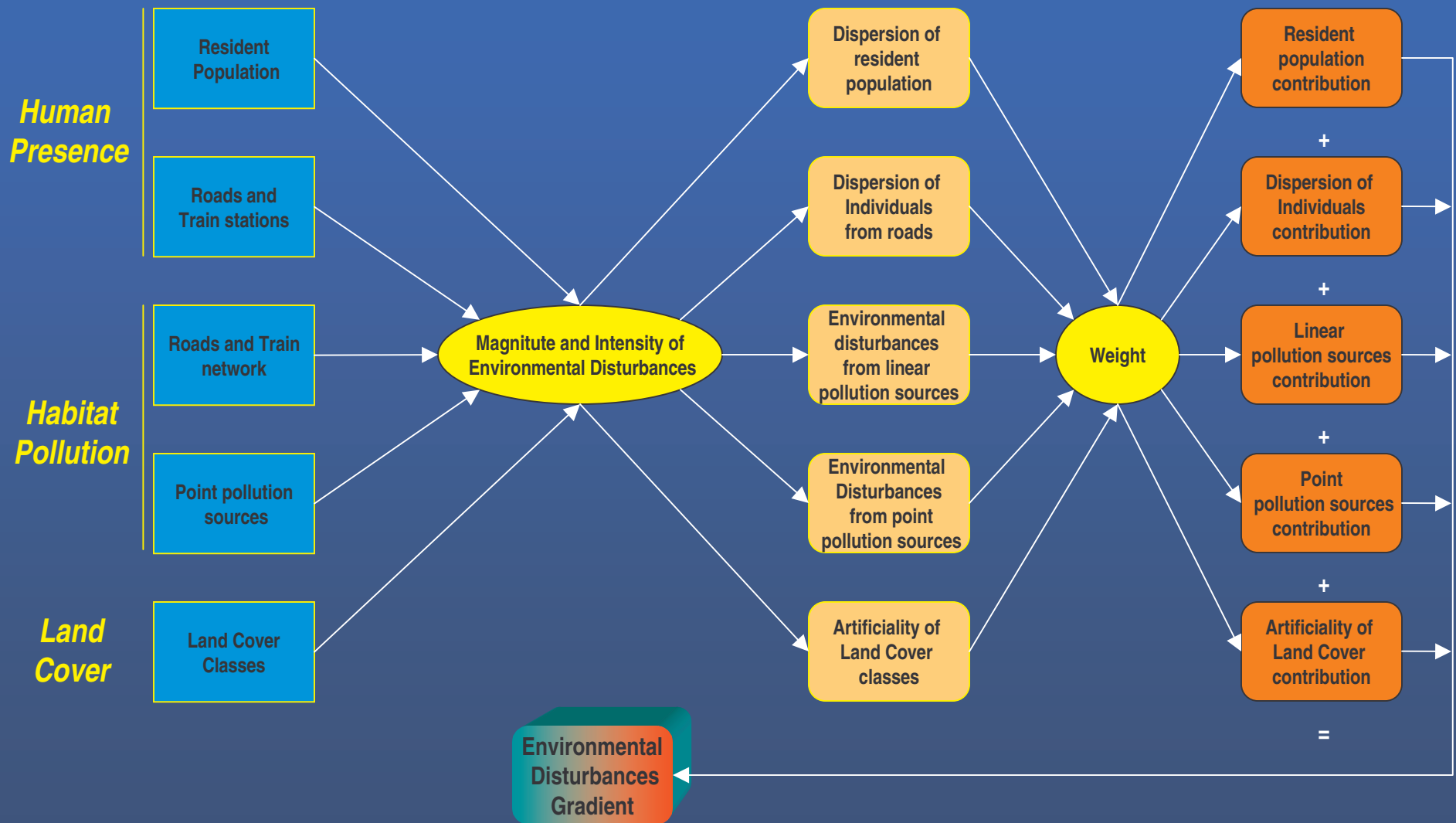
Wildlife Corridors:  
Connecting protected areas

FCT Fundação para a Ciência e a Tecnologia

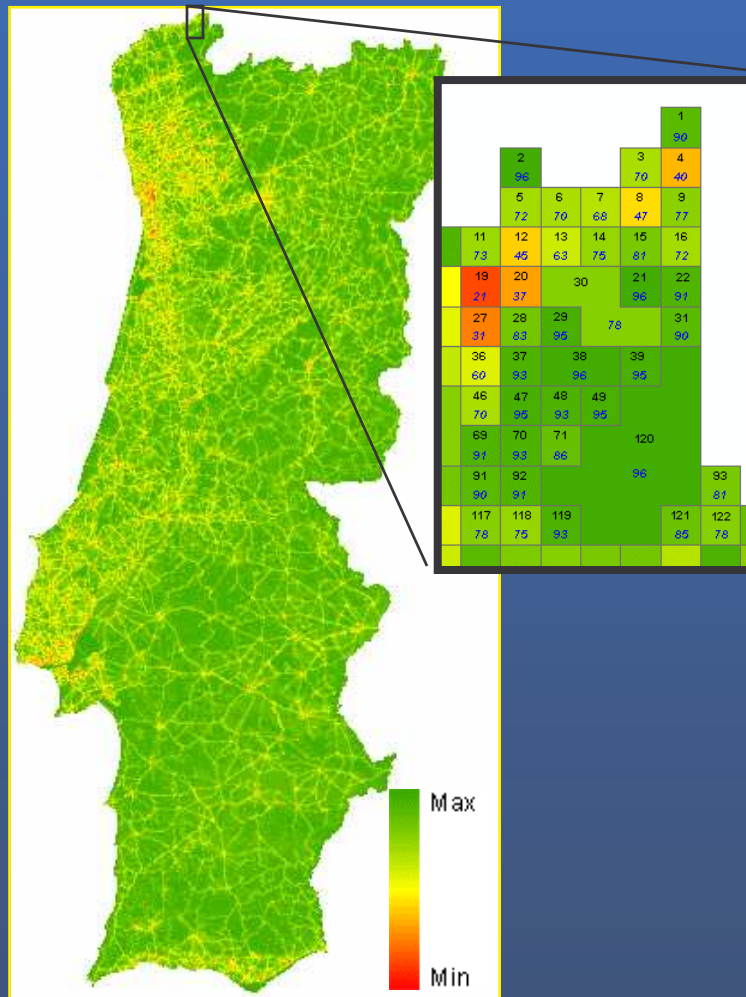
MINISTÉRIO DA CIÊNCIA, TECNOLOGIA E ENSINO SUPERIOR



# Expert System: spatial modeling of environmental disturbances

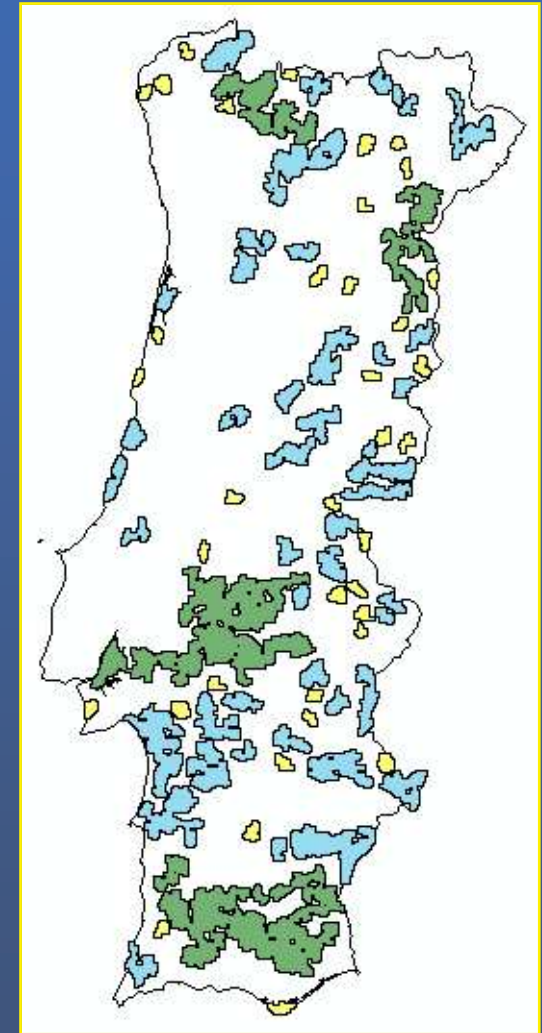
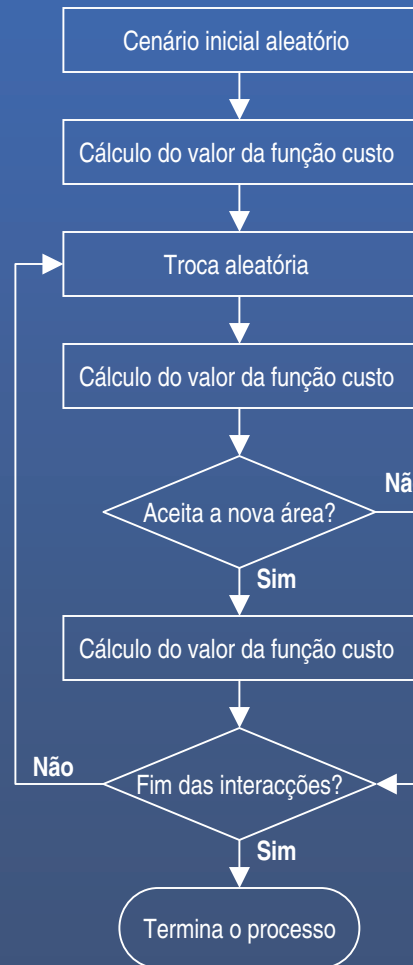


# Environmental Disturbance Gradient: Selection Areas for Nature Conservation



Environmental Disturbances Gradient

## Algorithm: "Simulated annealing"





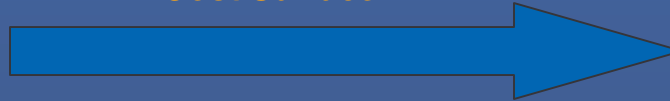
# Environmental Disturbance Gradient: Connecting Protected Areas



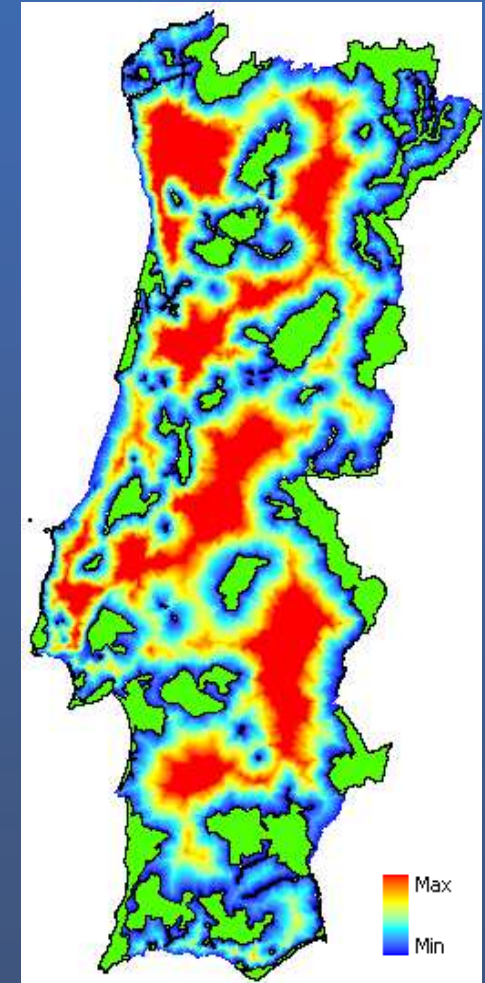
*Environmental Disturbances Gradient*

The use of the gradient of environmental disturbances for identifying the connectivity between protected areas

*Cost Surface*



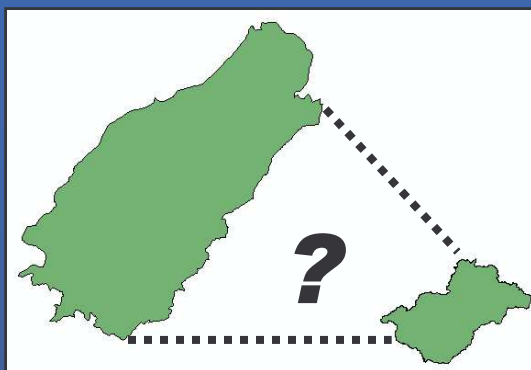
This cost surface intends to represent, in quantitative terms, the accumulated difficulty that species have in getting far from the protected areas.



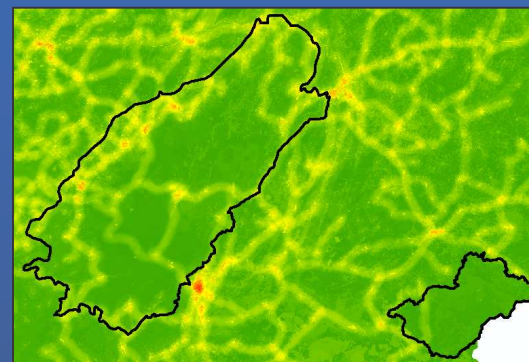
*Cost surface between protected areas*



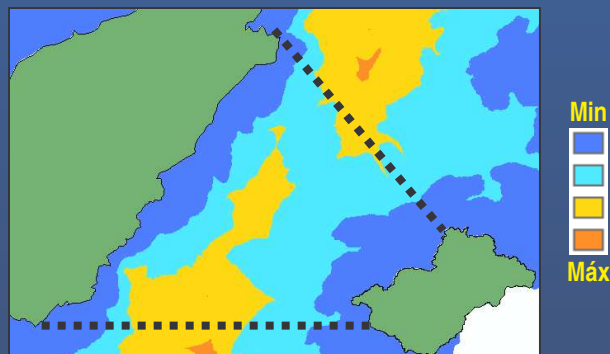
# Proposals of corridors connecting two protected areas: PNSE and RNSM



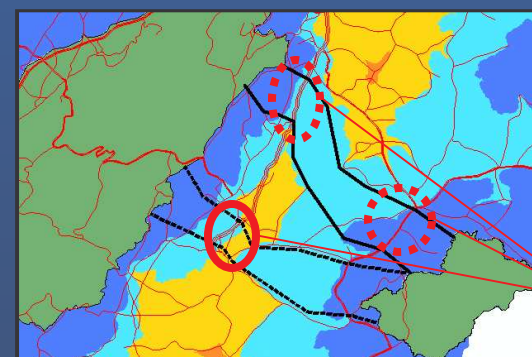
a) PNSE and RNSM



b) Environmental Disturbance Gradient



c) Cost distance



d) Proposals of corridors connecting the protected areas PNSE and RNSM



Wildlife Corridors:  
Connecting protected areas

FCT Fundação para a Ciência e a Tecnologia

MINISTÉRIO DA CIÊNCIA, TECNOLOGIA E ENSINO SUPERIOR



# Evaluate the corridors between protected areas based on the distribution of the Iberian-wolf

In this project, the Iberian-wolf will be used to evaluate the corridors between protected areas, as this wild species is considered sensitive to environmental perturbations and to human activities.

Distribution of the Iberian-wolf in Portugal, observed and potential:

- Modeling the Iberian-wolf habitat
- Collect and Update data of the Iberian-wolf distribution
- Public attitudes towards the wolf



# Modeling the Iberian-wolf habitat

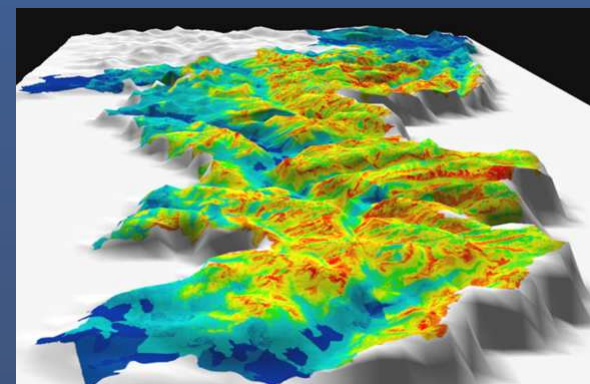
## Main Factors

Topography	Land Cover	Human Disturbance
Elevation	Land Cover Classes	Human density
Slope	Distance to streams	Distance to urban areas
Topographic position	Trees Density	Distance to roads

## Habitat suitability

The result is a map of habitat suitability for wolf divided into classes, ranging from inadequate to best:

- best habitat and reproductive success
- consistent use
- occasional use for non-breeding activities
- avoided



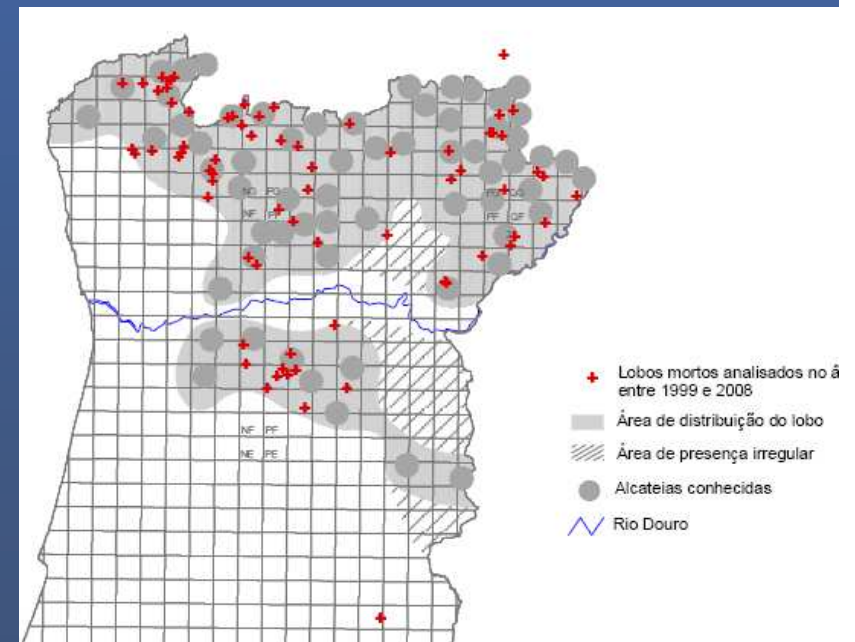
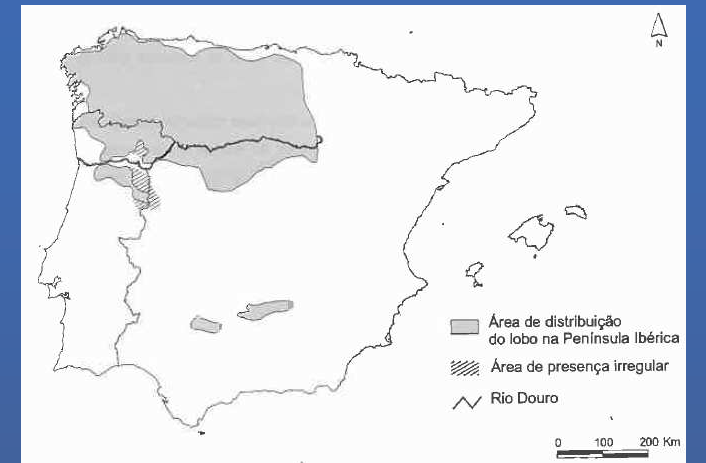
# Iberian-wolf distribution in Portugal

The Iberian-wolf is the largest predator in Portugal and is also one of the most endangered species in our country.

According to the last national Iberian-wolf census, in 2003

The Portuguese Iberian-wolf population is about 300 individuals, 90% of them reside in the area north of Douro River, and are in connection with the Spanish population.

The remaining individuals (~30) are concentrated in south of Douro River and isolated from the Iberian-wolf population from the north or Spain.



**Wildlife Corridors:**  
Connecting protected areas

**FCT** Fundação para a Ciência e a Tecnologia

MINISTÉRIO DA CIÊNCIA, TECNOLOGIA E ENSINO SUPERIOR



INSTITUTO GEOGRÁFICO PORTUGUÊS



# Update Iberian-wolf distribution

The surveys for assessing the presence and distribution of Iberian-wolf will be conducted during the project in order to update information within the proposed corridors.

The assessment of the Iberian-wolf presence include direct and indirect methods:

- interviews to local people
- detection of signs of presence such as scats or tracks
- wolf howling
- field cameras



**Wildlife Corridors:**  
Connecting protected areas

**FCT** Fundação para a Ciência e a Tecnologia

MINISTÉRIO DA CIÊNCIA, TECNOLOGIA E ENSINO SUPERIOR



# Public attitudes towards the wolf

As with many other large carnivores the coexistence of the wolf and man is very complex.

Understanding this conflict is a prerequisite for a successful conservation of the Iberian-wolf.

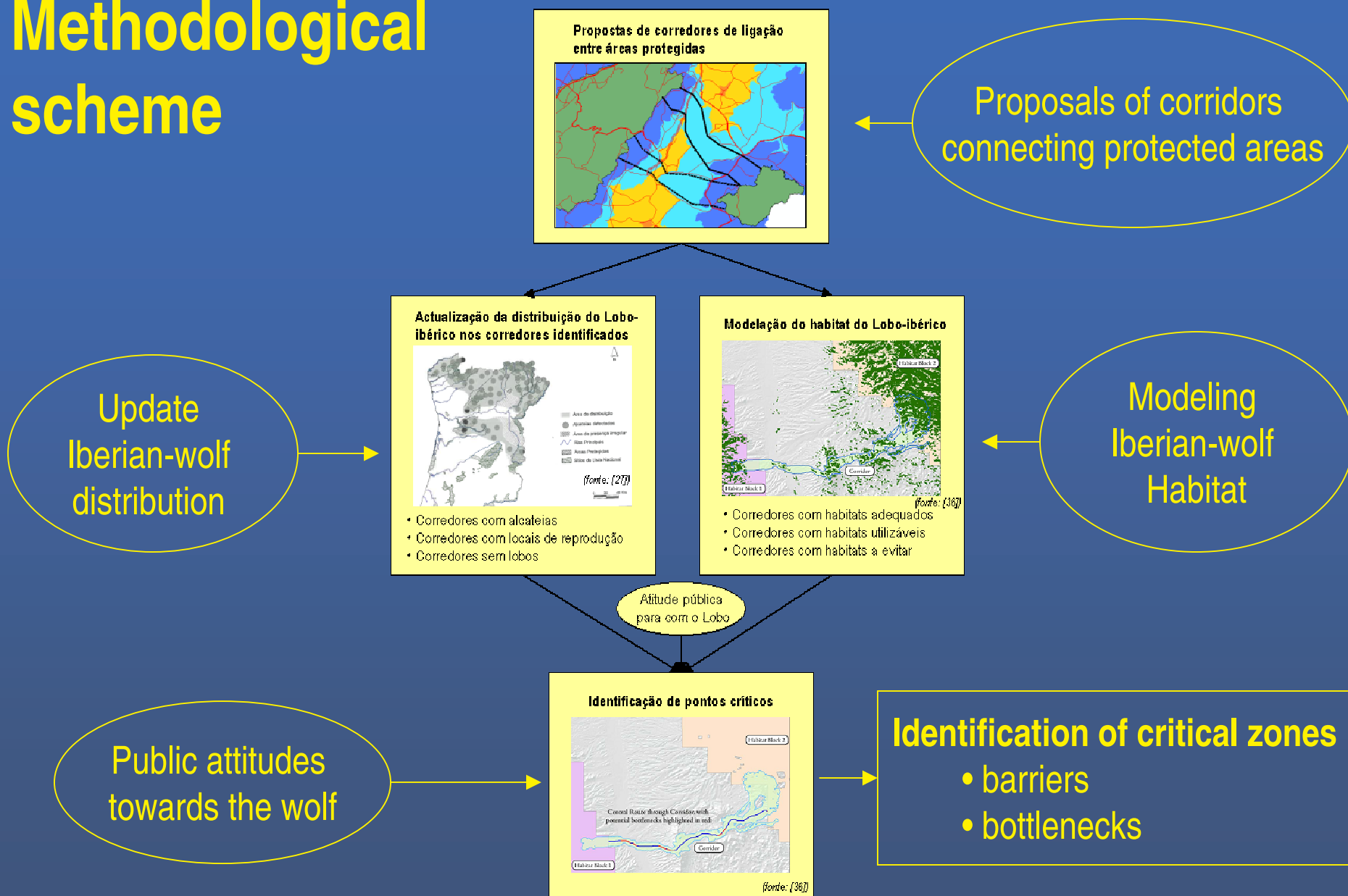


Large Guard Dogs (LDG)



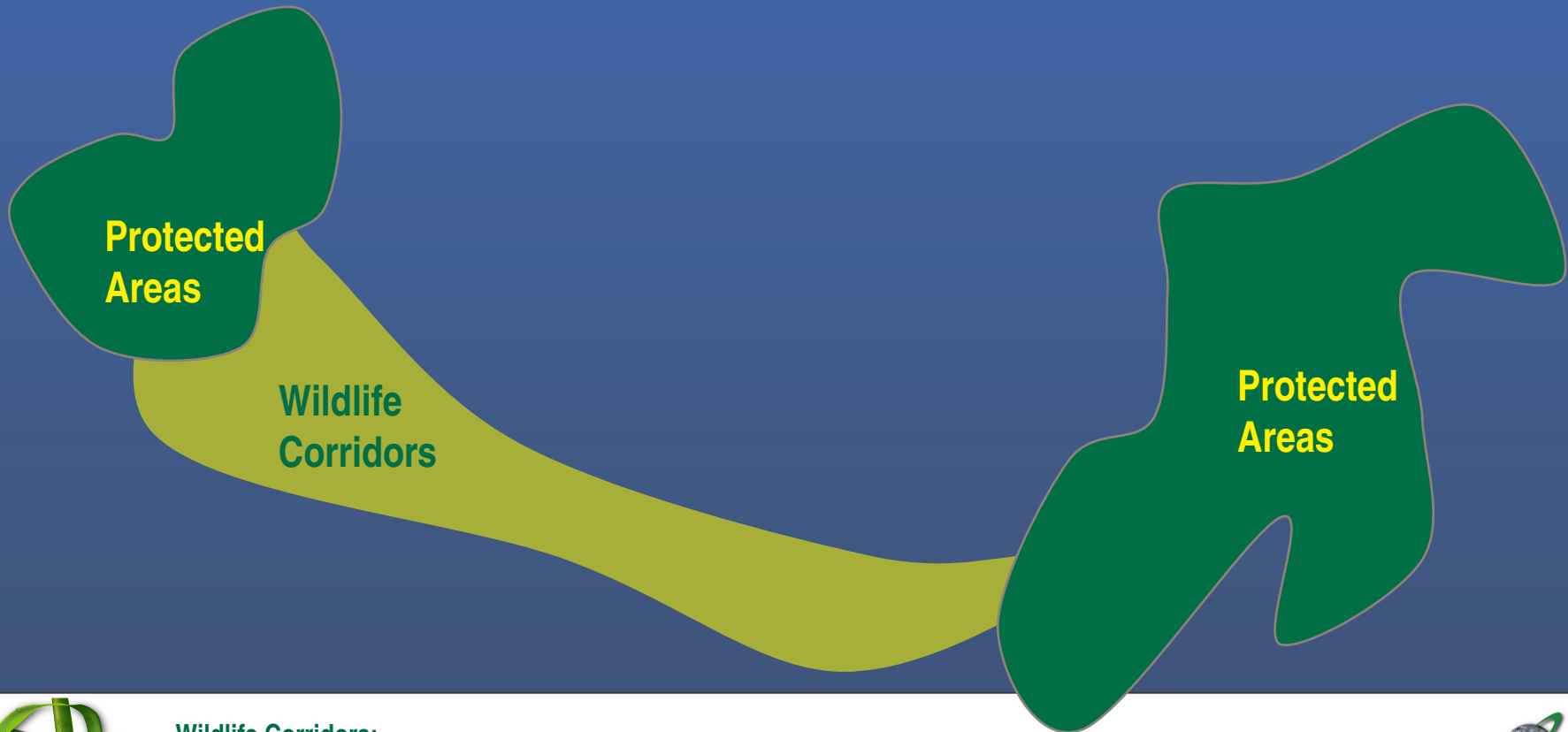


# Methodological scheme



# Summary

In summary, the project intent to increase the mobility of wildlife between protected areas, therefore, aims to promote biodiversity within and outside the protected areas.





# Thank you for your attention

Ana Luisa Gomes  
([luisa.gomes@igeo.pt](mailto:luisa.gomes@igeo.pt))



**Wildlife Corridors:**  
Connecting protected areas

**FCT** Fundação para a Ciência e a Tecnologia  
MINISTÉRIO DA CIÊNCIA, TECNOLOGIA E ENSINO SUPERIOR

