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Biodiversity, CBD and IPBES: the global data problem

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GEO

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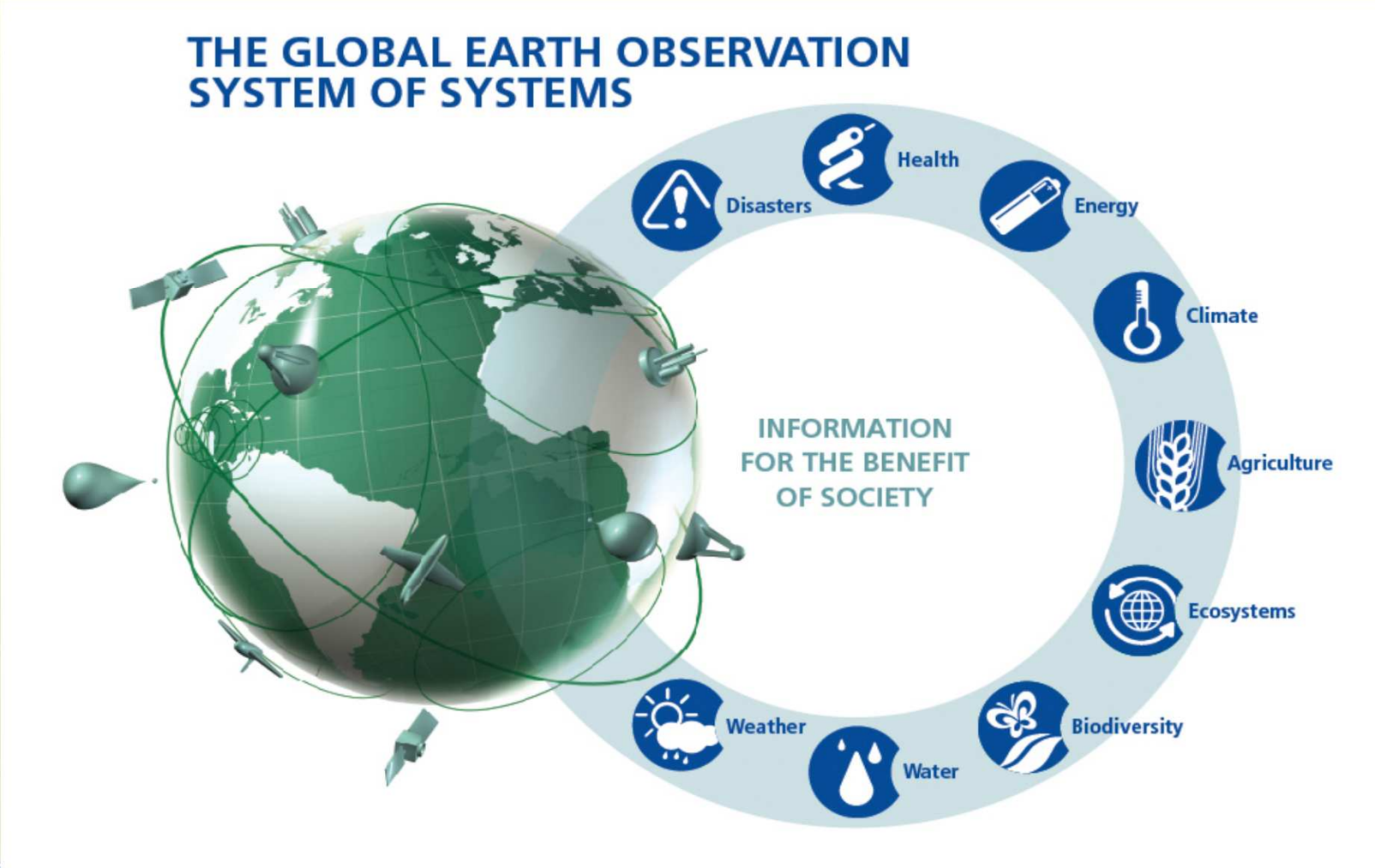
What is our biodiversity information need ?

Information needs revealed by MA (2005):

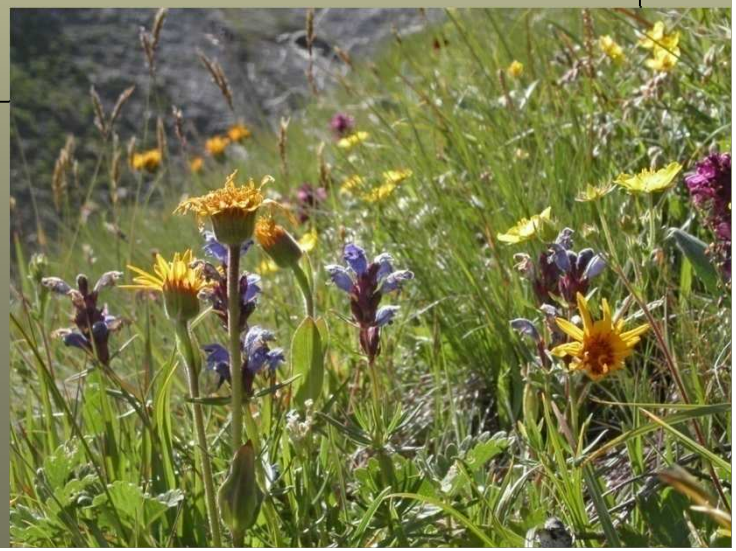
- Genuinely global databases
  - Consistent, reliable, all ecosystems
- Time series
- Information beyond richness
- Functional biodiversity
  - Ecosystem services: particularly support, regulation and spiritual/recreational services
- Linked, georeferenced social and economic data
- Present clients: CBD, IPBES, IPCC, EC

The opportunity: GEOSS



Why is GEOSS a unique opportunity?

- Intergovernmental/ multi-stakeholder process (long term commitment) ;
- Synergistic (Societal Benefit Areas; Integration across observing systems)



GEOSS

- Global Earth Observing System of Systems
  - Disasters
  - Health
  - Energy
  - Climate
  - Water
  - Weather
  - Agriculture
  - Ecosystems
  - Biodiversity

9 SBAs

GEOBON, EBONE

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What is GEO BON?

- GEO BON (GEO Biodiversity Observation Network) is a global partnership to help collect, manage, analyse & report data relating to the status of the world's biodiversity

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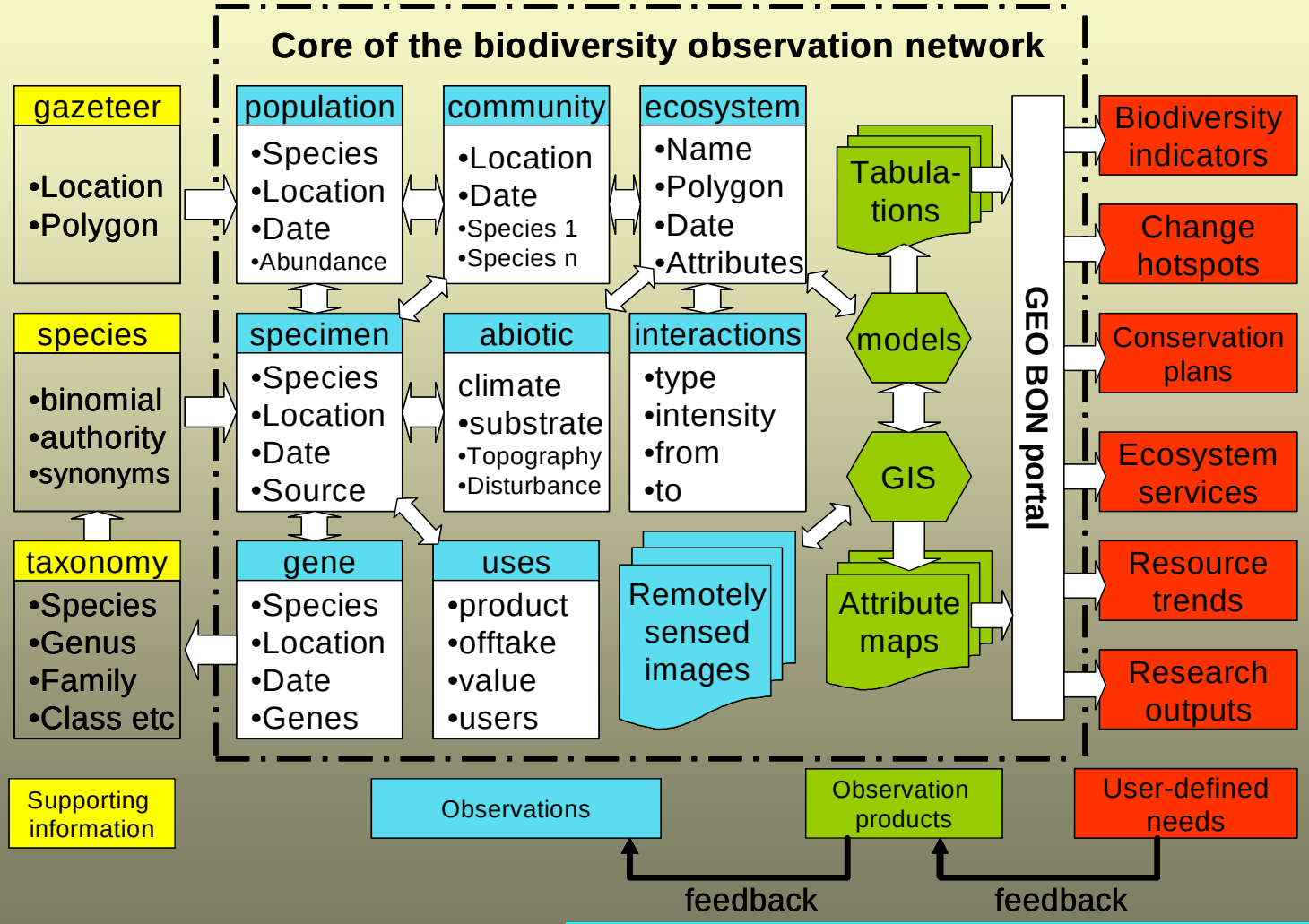
What is the GEO BON task?

GEO BON will:

- Provide a global, scientifically robust framework for observations on the detection of biodiversity change;
- Coordinate the data gathering and the delivery of information;
- Ensure long term continuity of data supply (operational observations);
- Provide a set of innovative and relevant - global- products (e.g. forecasts)

Integrated biodiversity observation system



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Scholes et al., **Science 22 Aug 08**,
Towards a Global Biodiversity Observing System

What is EBONE?

- A European project for…
  - Interoperating biodiversity observation systems in Europe
  - A pilot on global biodiversity monitoring (GEO BON)
- Improving systems to collect, manage, analyze, share data on biodiversity
- Stimulating the science-policy interface on biodiversity

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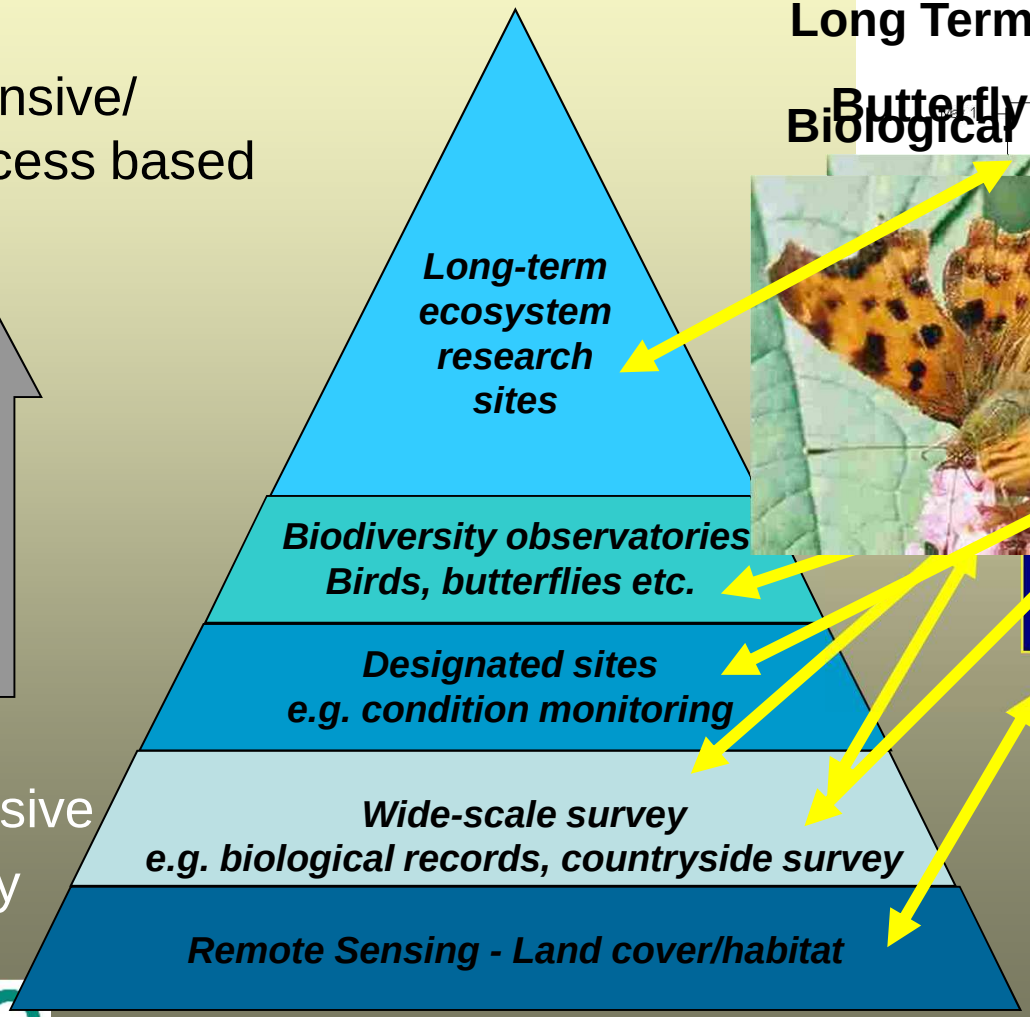
Intensive/
process based

Extensive
survey

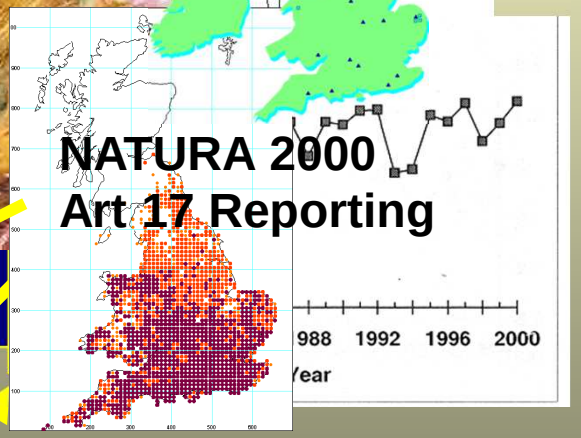


Long Term Ecosystem Research Sites (LTER)

Butterfly

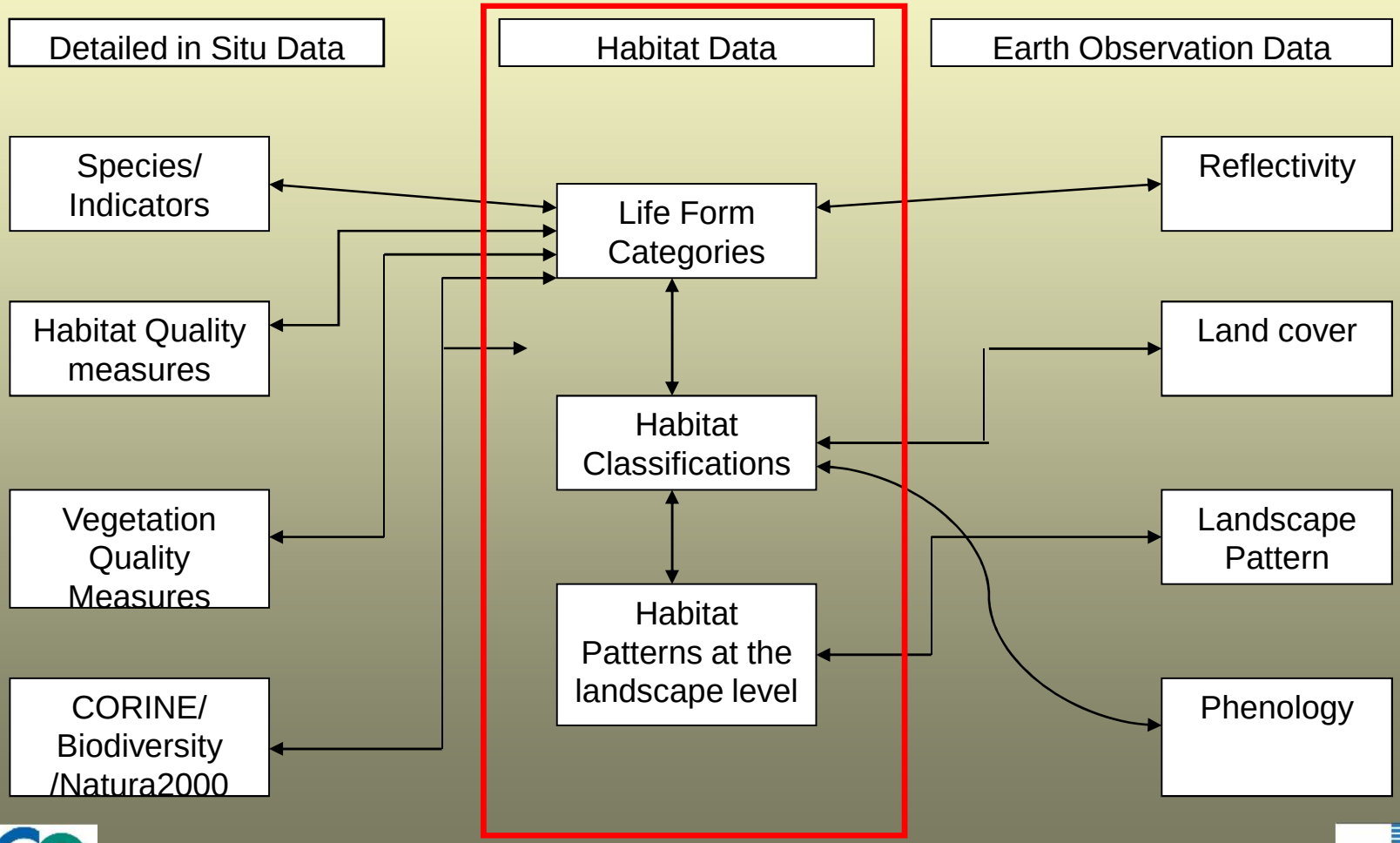
Biological

Scheme



NATURA 2000
Art 17 Reporting

Habitat Data: linking in Situ and RS

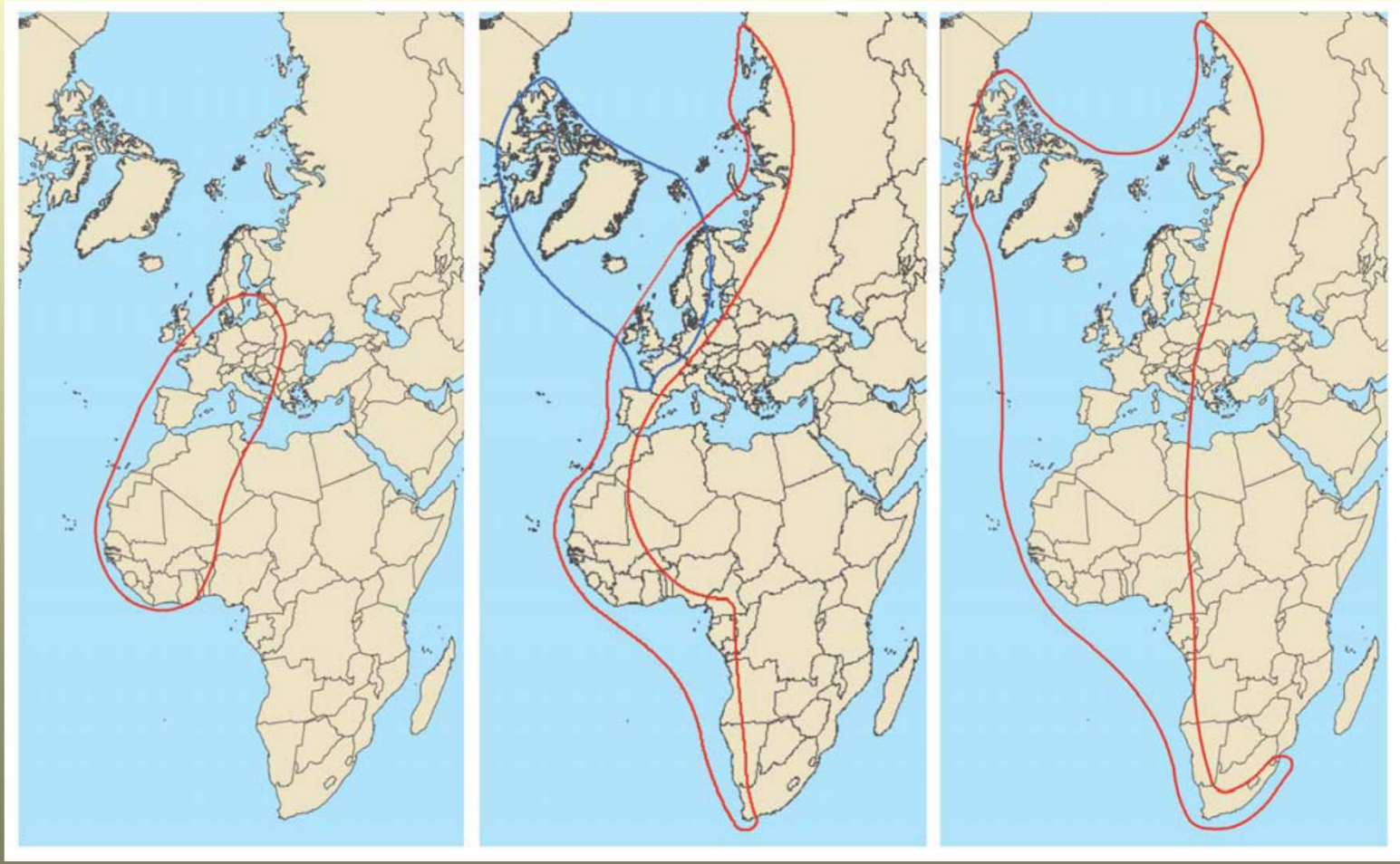


Newts are habitat related

Foto: Jeanne Soetens

Badgers are multiple habitat species

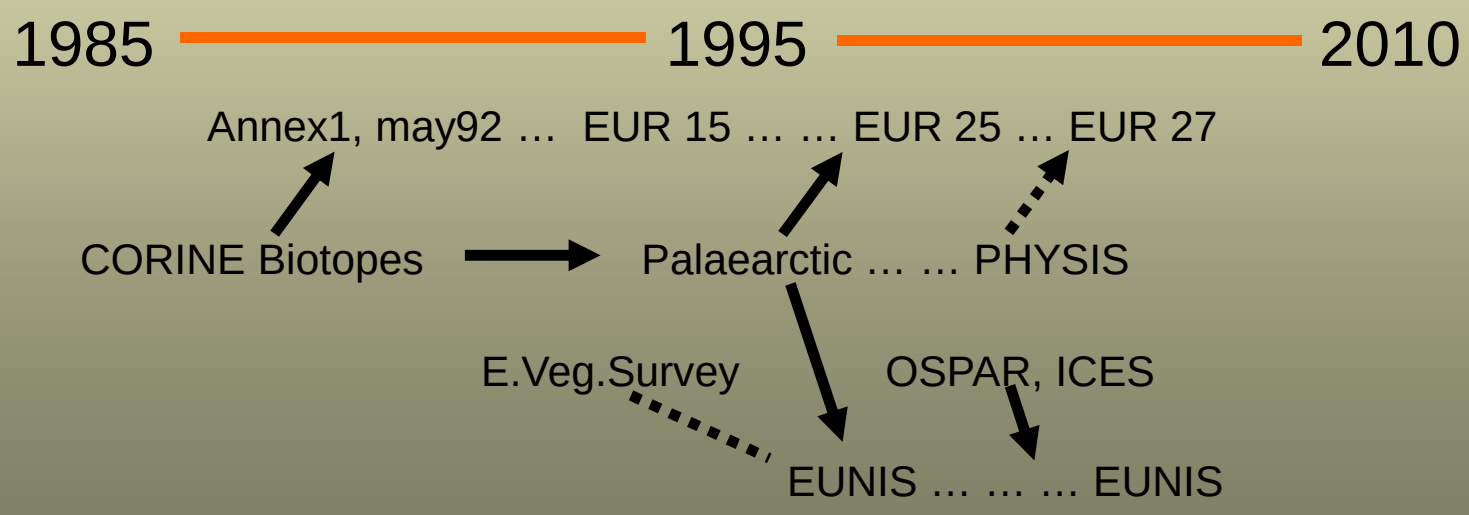
Wetland birds: global species



Pan-European habitat classifications

All based on expert judgement:

- CORINE Biotopes
- Palaearctic Habitat Classification
- EU Habitats Directive Annex 1
- EUNIS Habitat Classification



Conclusions on European classifications

- Hierarchical class lists are common;
- National classifications often relate to specific national contexts (histories, policies, environmental conditions);
- Use of terms based on the local value ranges;
- Linear and point features are under-represented;
- Many of the classifications are based on phytosociology, few on unvegetated habitats.

Conclusions of a EBONE-ENCA RS-meeting

- Knowledge sharing between science and conservation agencies is important, because it is cost-effective;
- Operational RS methods are being developed in some conservation agencies, but individual agencies are mostly insufficiently equipped for development;
- GMES and other EC programmes should facilitate the provision of earth observation information for biodiversity monitoring;
- Inclusion of nature conservation agencies in the development of Europe-wide biodiversity monitoring can facilitate the harmonisation of national systems into a common European framework.

What do we foresee?

- There is an increasing need for standardised data at the European level for policy development, evaluation and reporting;
- Global efforts such as IPCC, CBD and IPBES require a European cooperative approach
- INSPIRE will guide spatial data standardisation;
- Common methodologies will allow more realistic and reliable data; these will make work more cost-effective

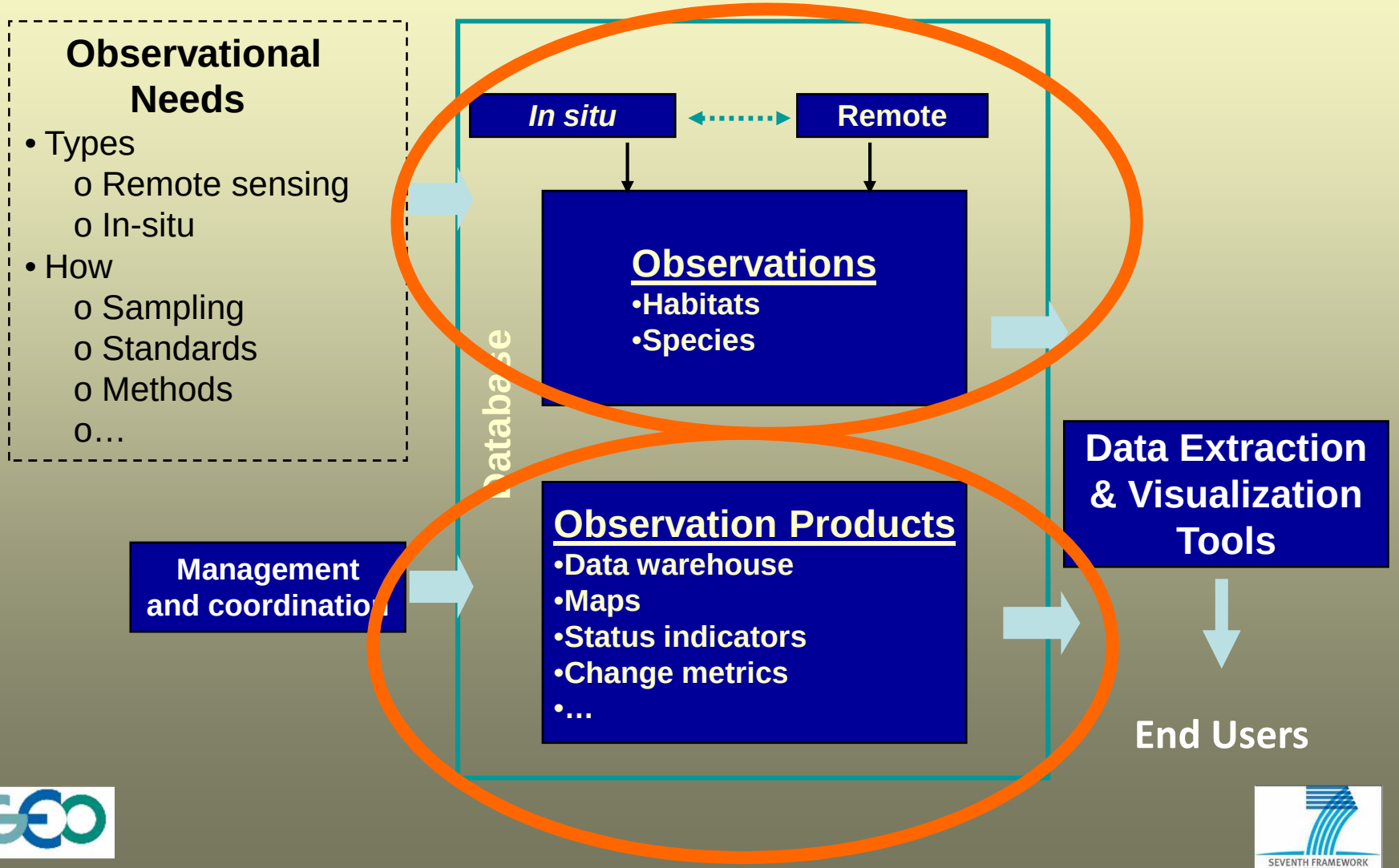
Biodiversity monitoring must be:

- Able to link to Annex 1 and EUNIS classifications and use European definitions
- Link biodiversity inside and outside protected areas
- Based on decentralised work by universities, institutes, national and regional agencies (EU+: >100) and NGO's
- Statistically interpretable for trends in habitats and species at the European level;
- Link in situ and RS approaches if possible
- Cost effective and exchangeable

The challenge for the future

- Harmonise communication between countries and regions;
- Develop a system to harmonise habitats at the European level;
- Translate regional environmental references into European references;
- Share tools and databases to be cost-effective;
- Develop data collection and data management according to INSPIRE.

EBONE is carrying out a pilot



What is available now?

- EBONE General Habitat Classification (based on Life forms) for field monitoring;
- Annex 1 Habitats field key;
- Software for field computers (handheld and Access);
- SynBioSys vegetation database;
- EBONE database for habitat and vegetation monitoring data (INSPIRE based) is being tested.

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General Habitat Categories

- General Habitat Categories (GHC) are based on the regression of Life Forms on the environment;
- They are based on classic science as defined by Raunkiaer (1908) and transcend species;
- No biogeographical terms or local names;
- Explicit rules for definition and determination in the field of GHC's and its qualifiers;
- GHC's allow integration between national approaches on habitat monitoring.

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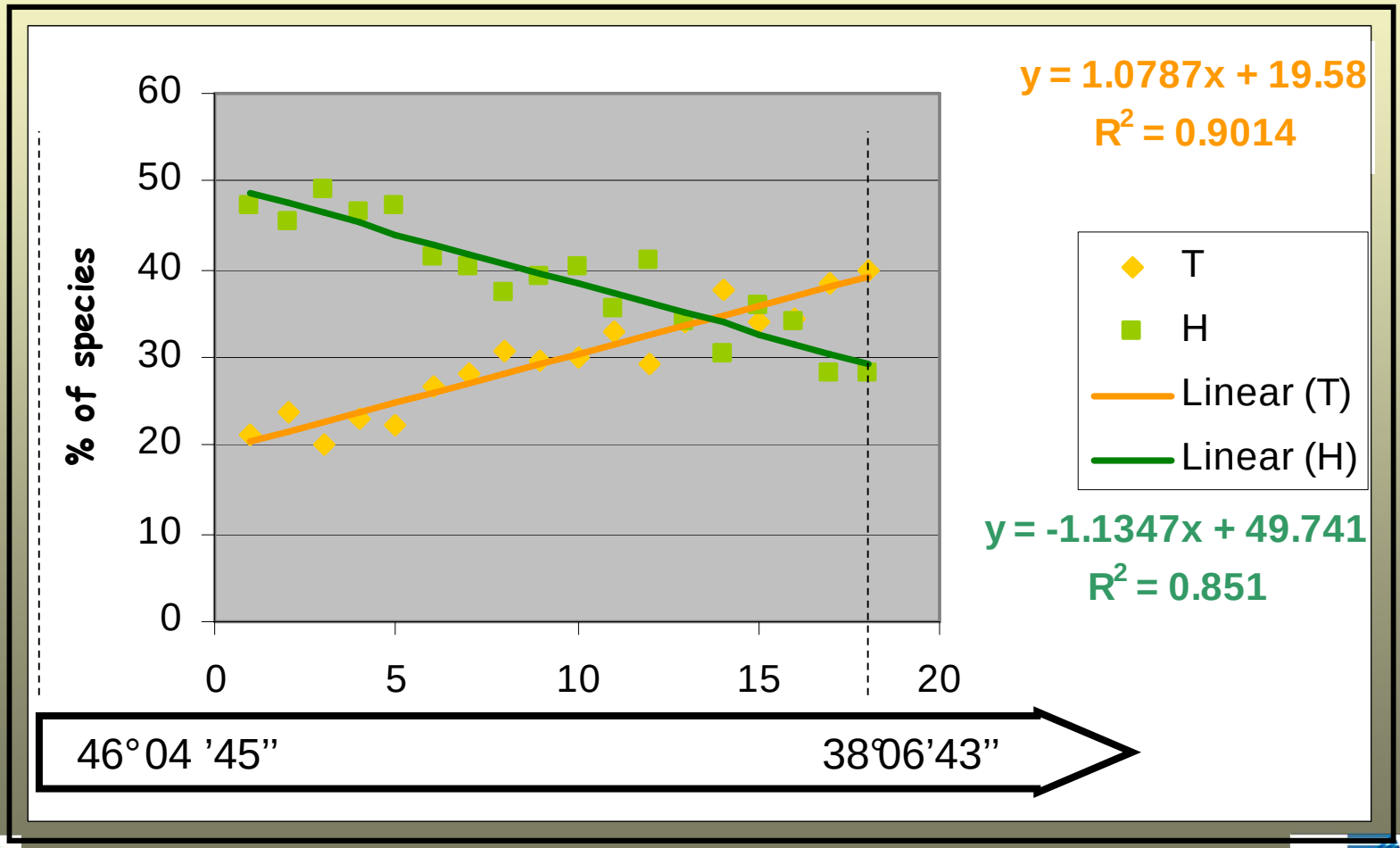
Life forms can be integrators, such as for the Italian flora



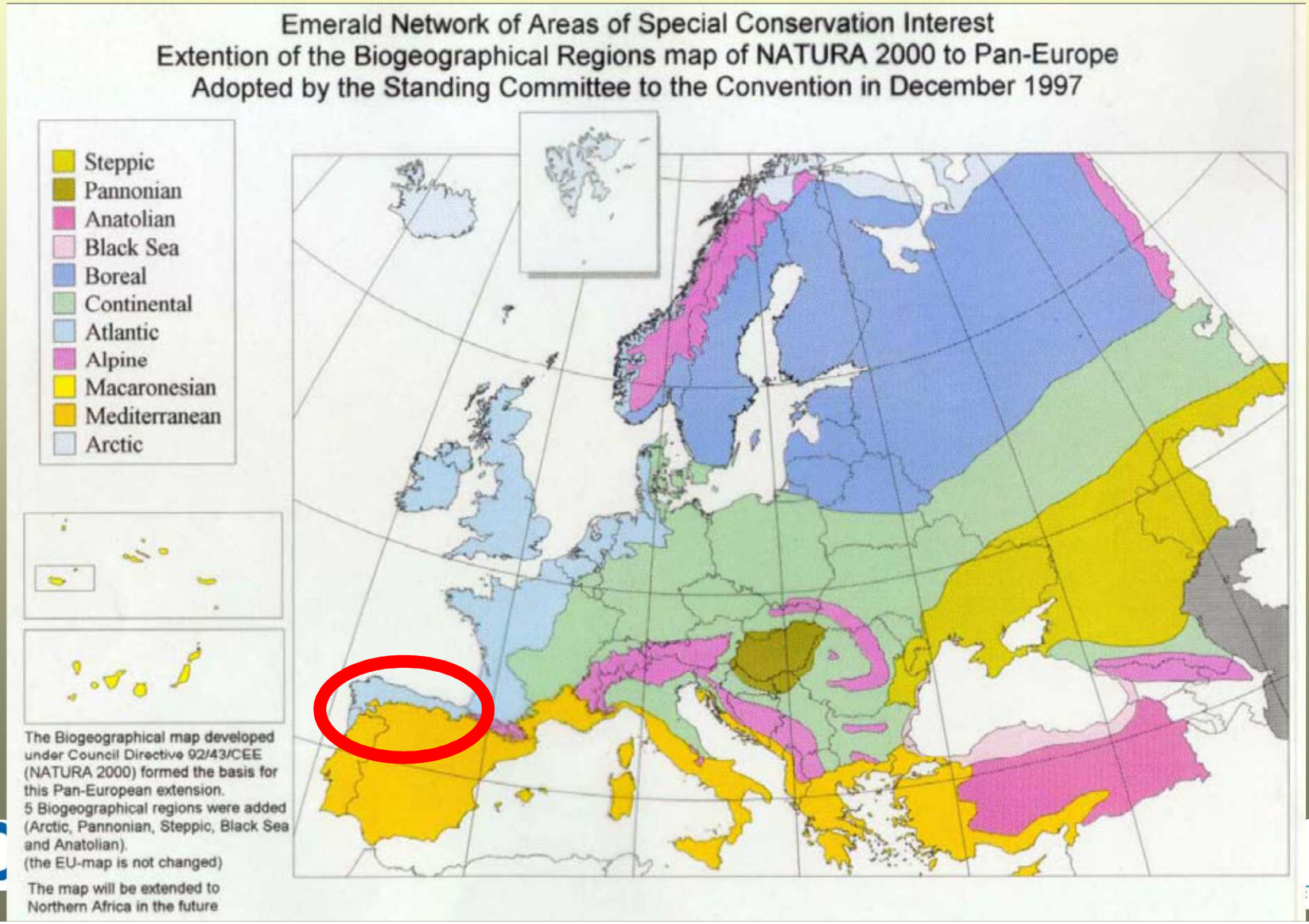
Emilo Padoa Schioppa, data from Pignatti, 1994

Interpretation of forest change

Stratification for monitoring the wider landscape

- Biogeographical regions do not deliver a proper basis for monitoring as they are too generalised;
- The European Environmental Stratification (EnS) can form an appropriate stratification;
- At present it is used to provide basis for sample allocation and analysis is made to see in which regions EnS performs well and where subdivision may be needed.

EU Biogeographical regions



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Environmental Strata Europe

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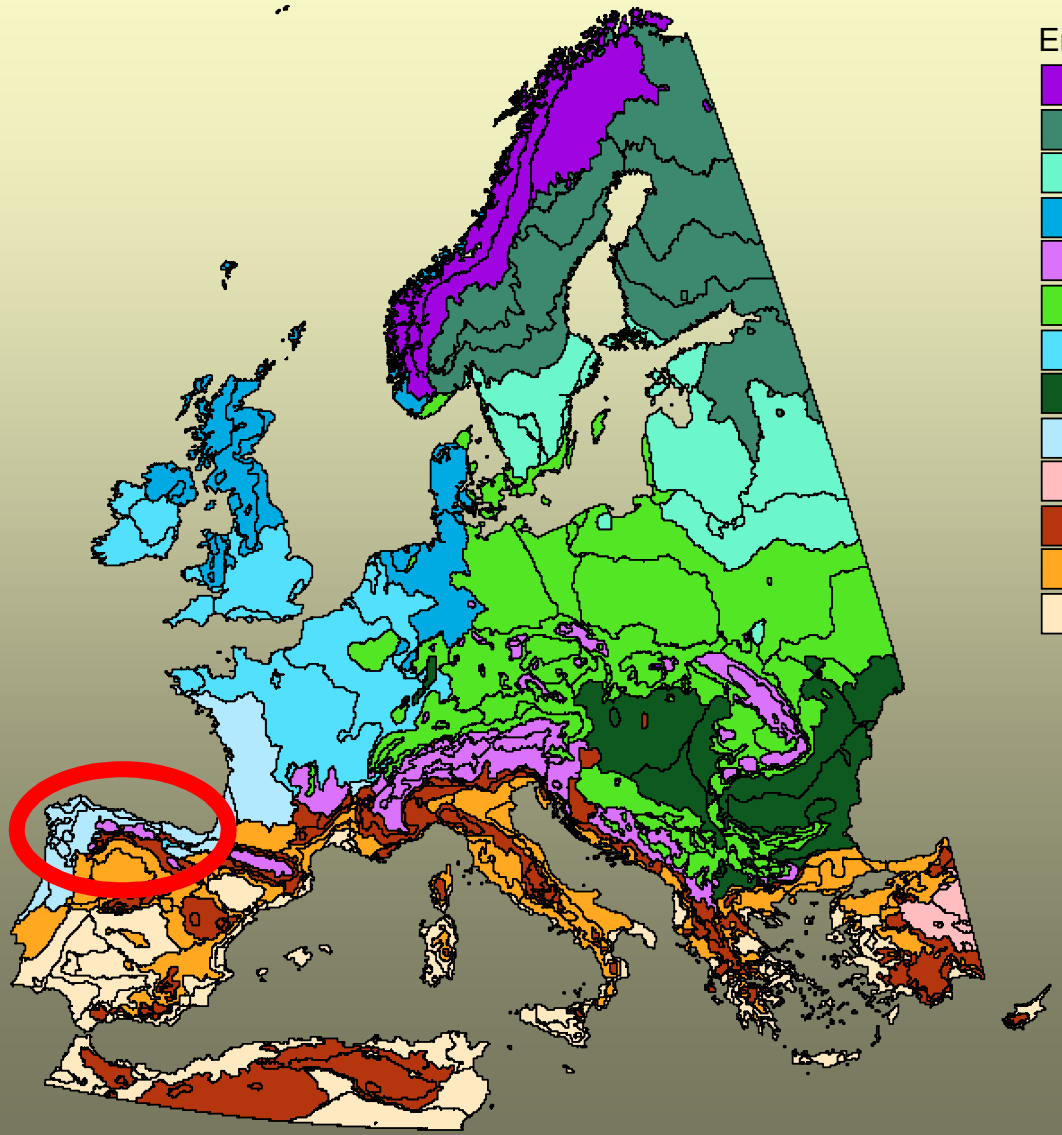

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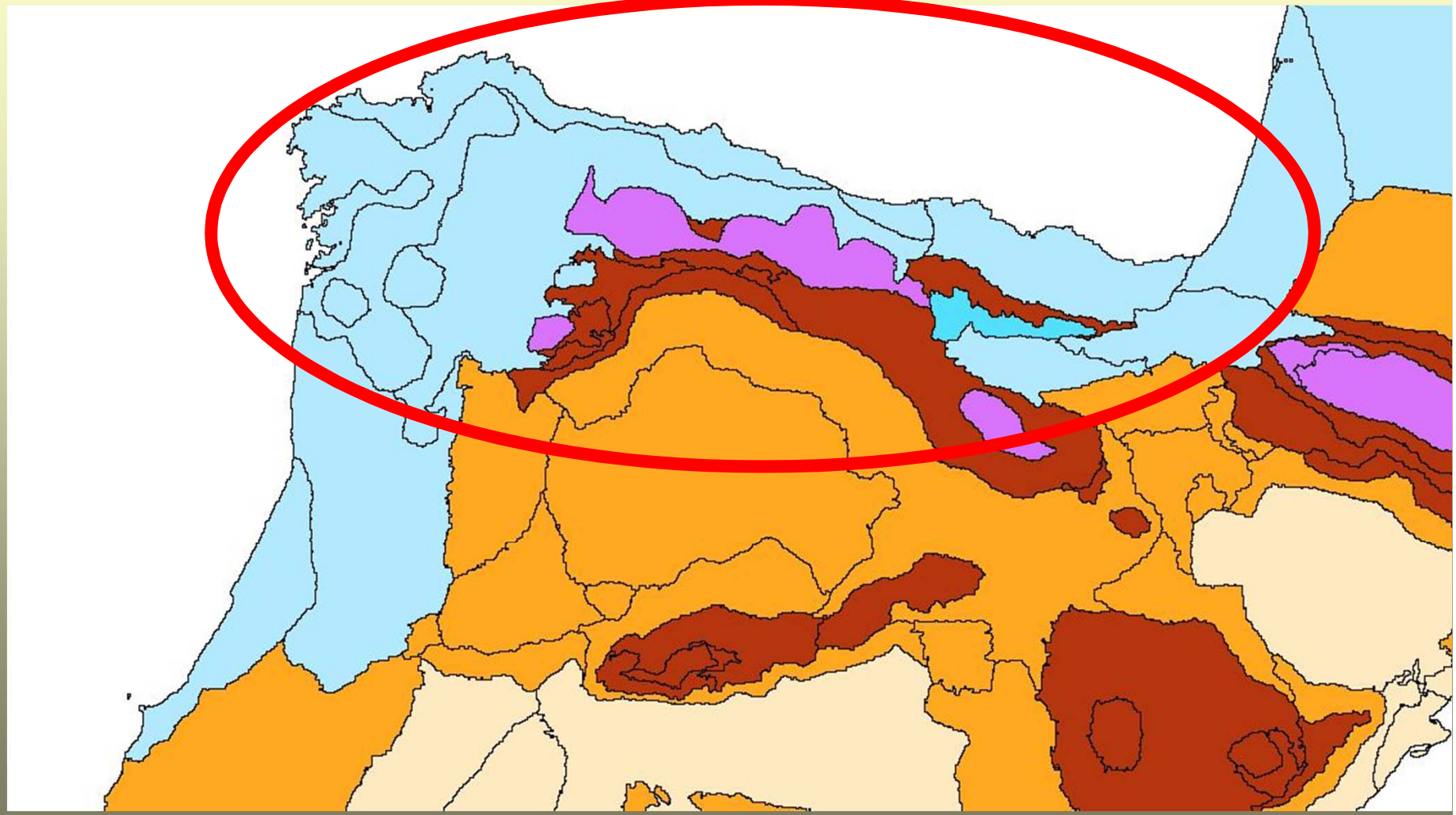
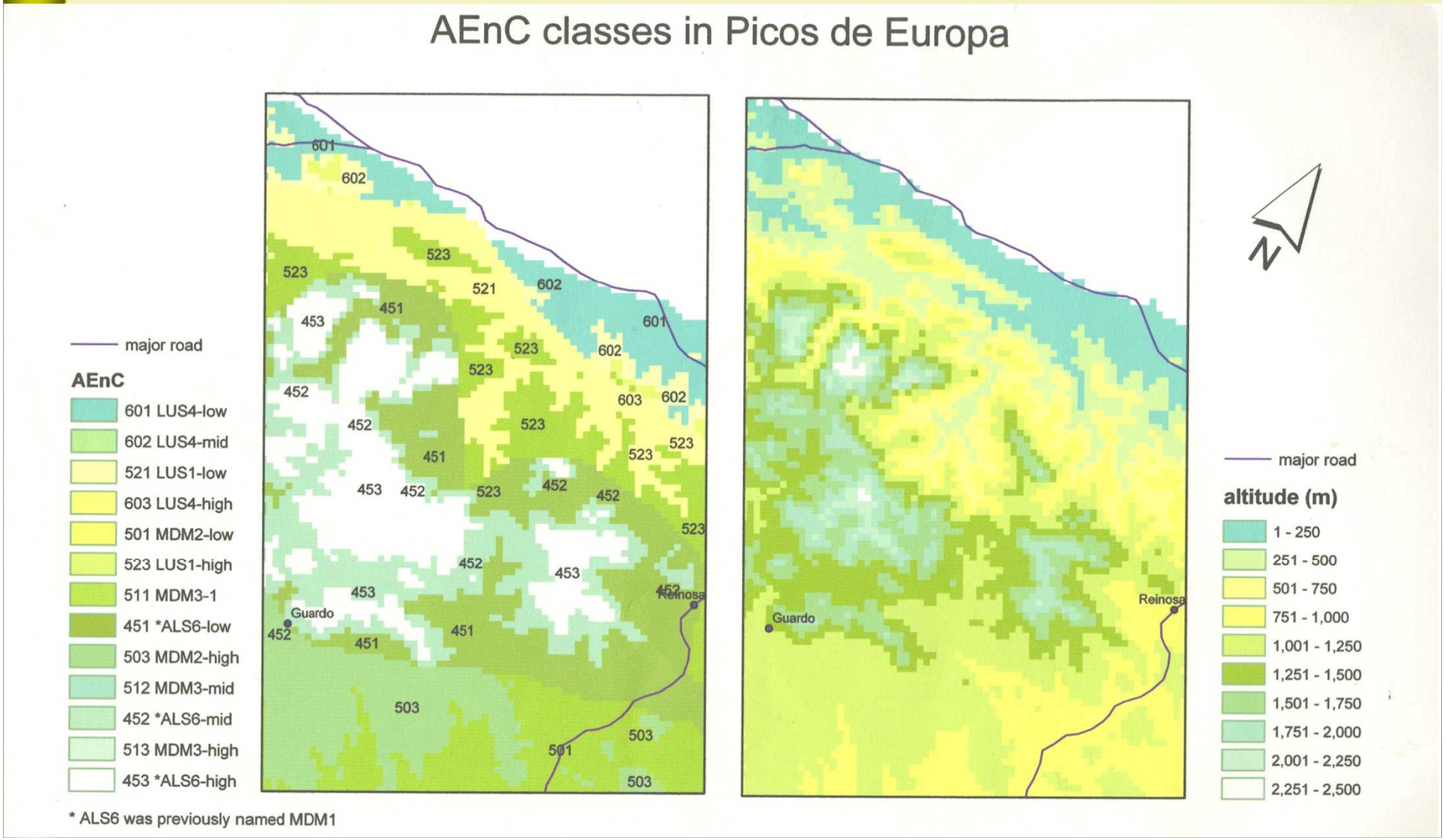
Gradients: important and tricky



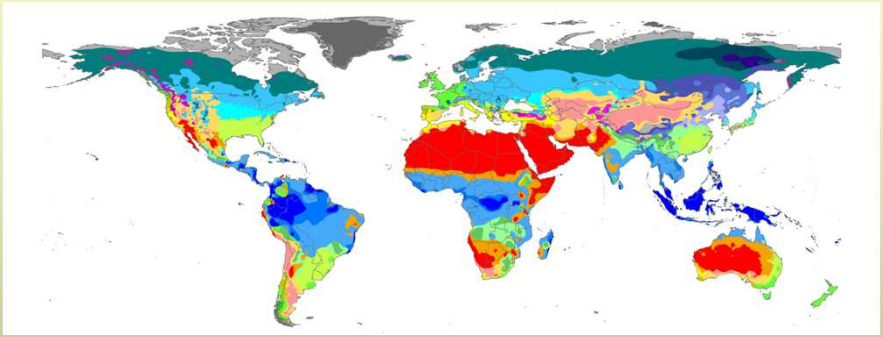
White/green: Alpine, blue: S. Atlantic, yellow: Mediterranean Mountains



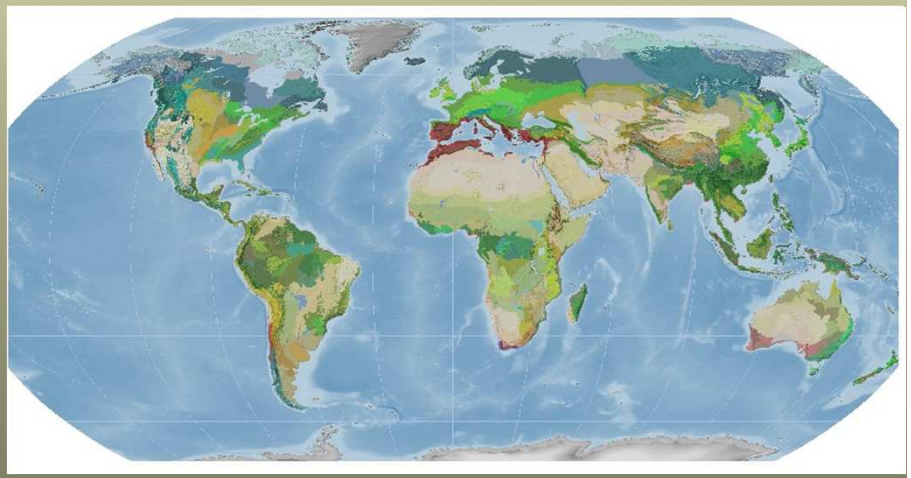
Global Environmental Stratification

- Many global ecoregion classifications exist, but
  - they are mostly based on personal judgment
  - they often have a low spatial resolution
  - they distinguish relatively few classes globally

Köppen climate zones



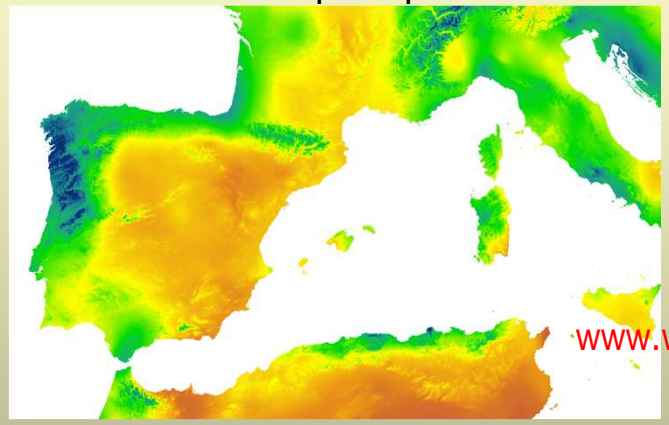
WWF ecoregions



Objectives

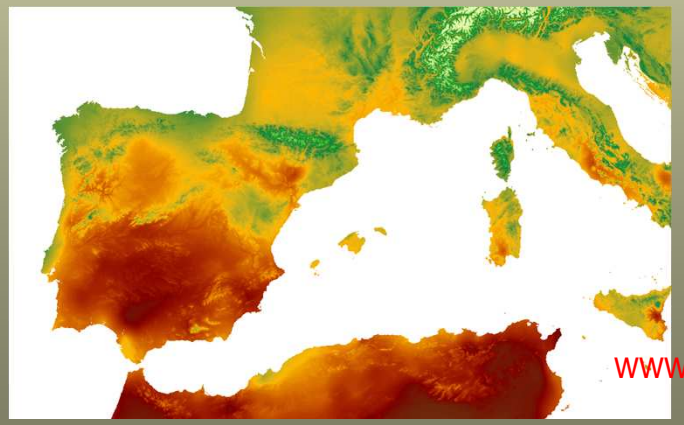
1. To develop a global bioclimatic stratification depicting 125 relatively homogeneous environments
2. To use quantitative methods and high resolution data

Mean November precipitation



www.worldclim.org

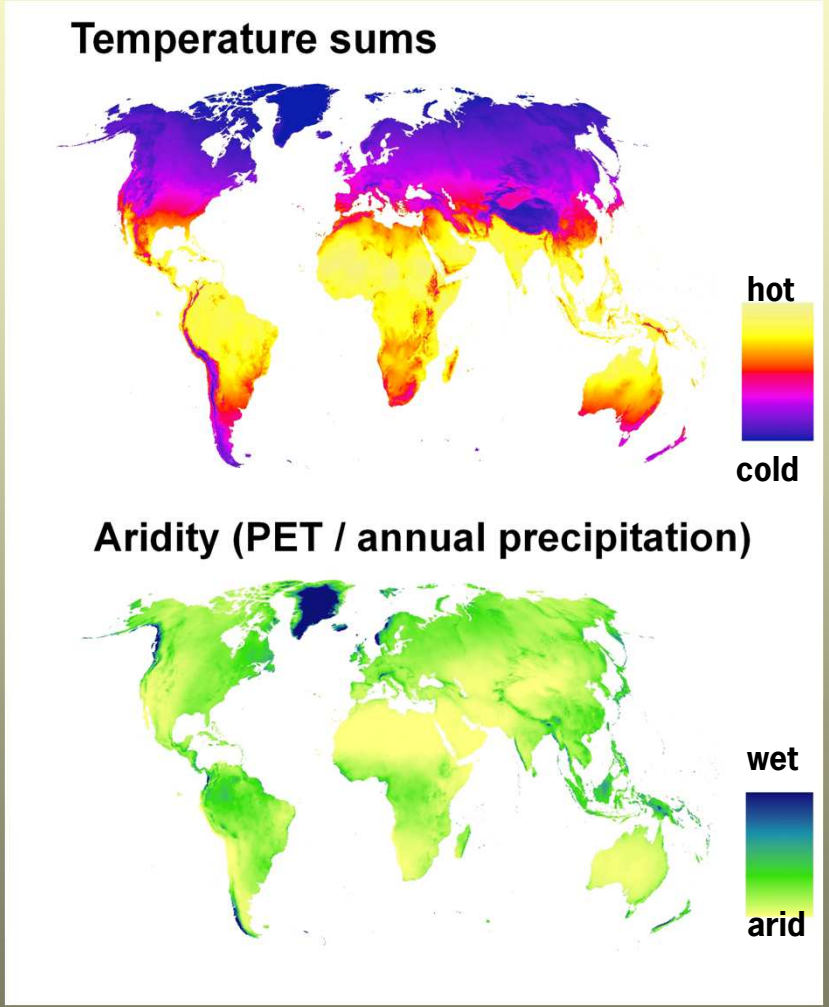
Mean annual potential evapotranspiration



www.csi.cgiar.org

Variable selection

- Screening of 43 potential bioclimatic variables
- high resolution (~1km^2) climate data
- 4 variables determined principal gradients:
  - Temperature sums
  - Aridity
  - Temperature seasonality
  - Potential Evapotranspiration seasonality



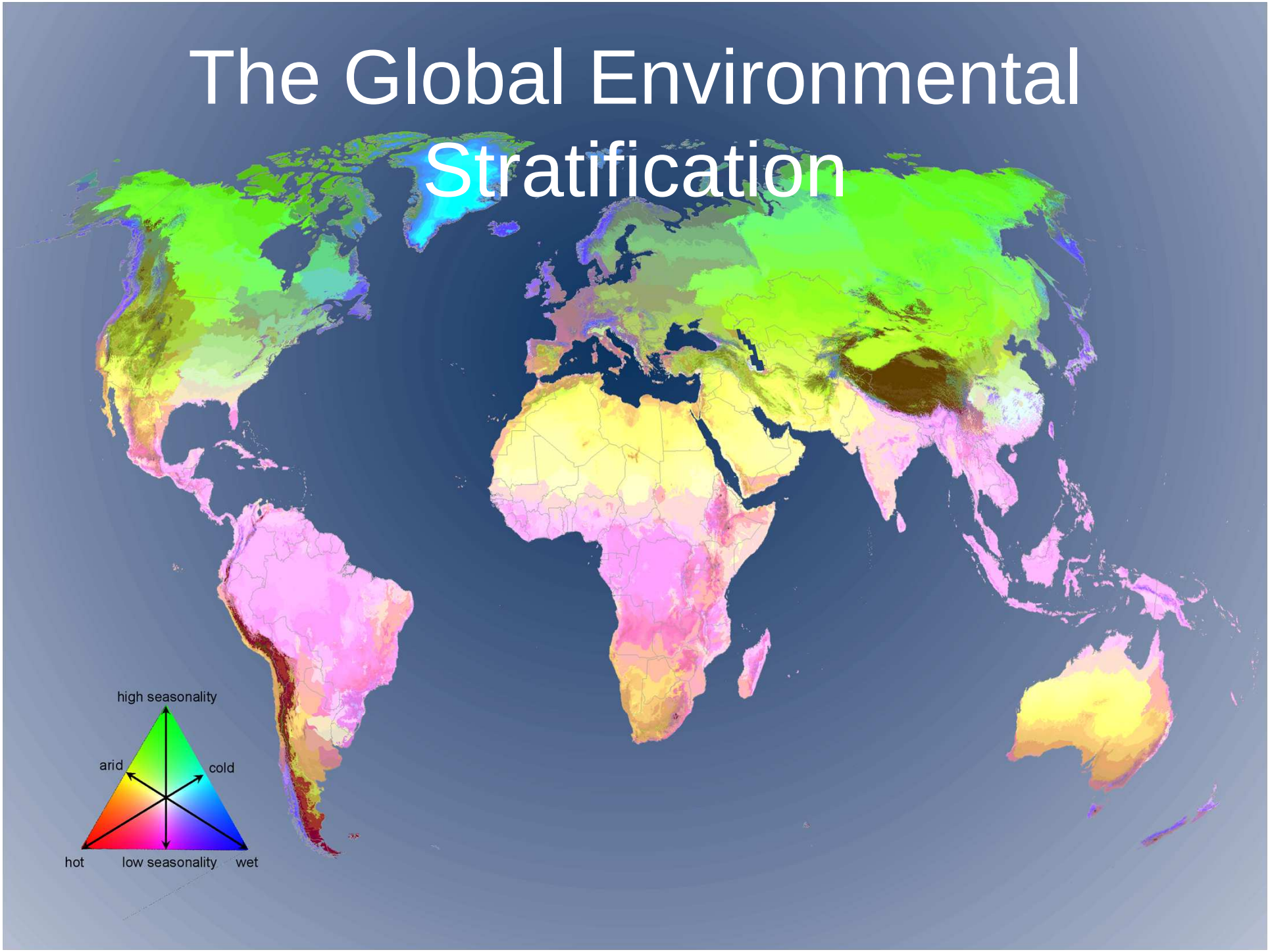
Extracting environmental gradients

- Principal Components Analysis (PCA) was used to extract non-correlated gradients
- 3 components explained 99.9% of the variation

Eigenmatrix

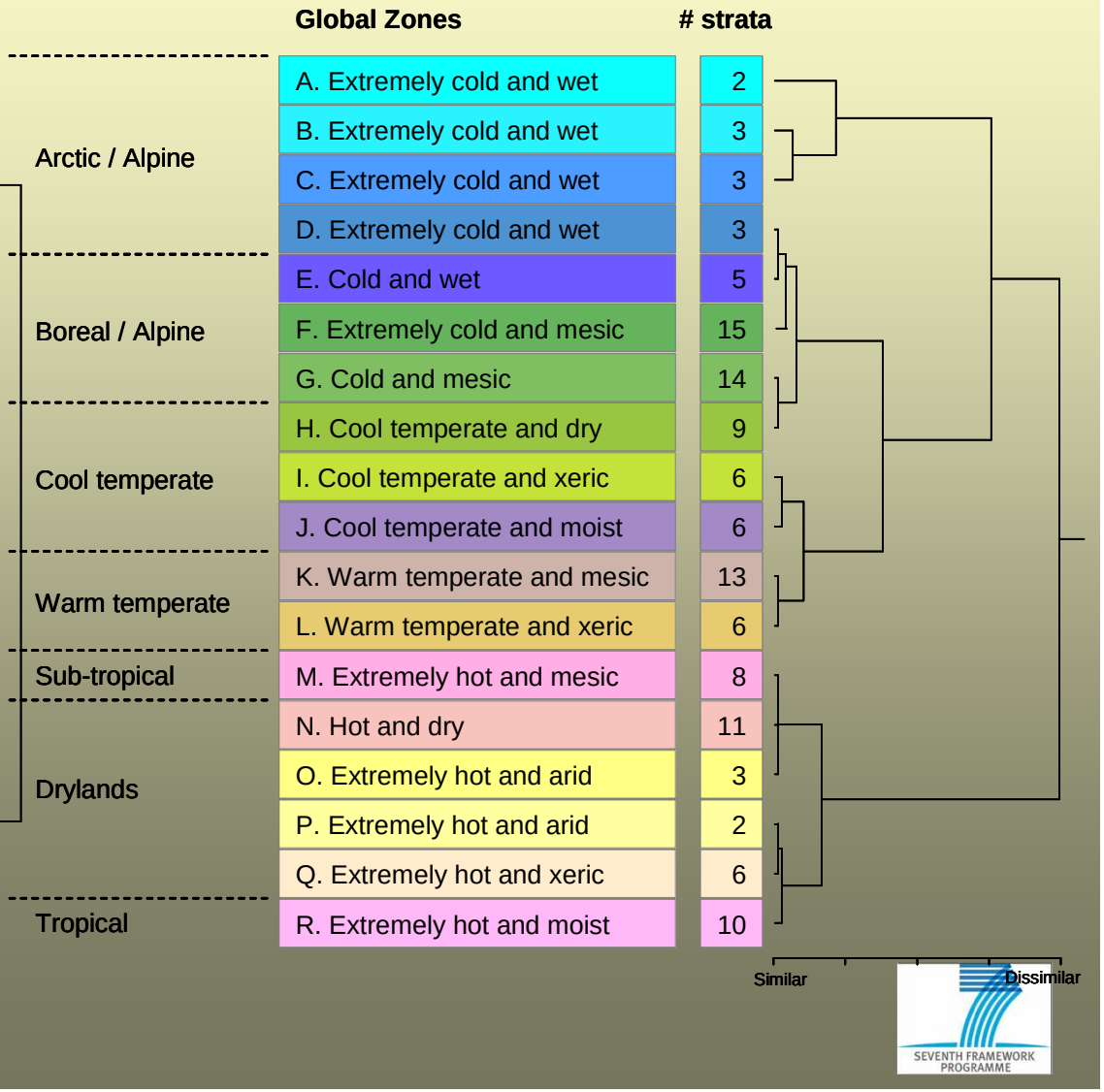
Component	1	2	3	4
T sums	**0.98**	0.18	0.13	-0.02
Aridity	-0.19	**0.98**	0.07	0.02
T seasonality	-0.11	-0.09	**0.95**	-0.28
PET seasonality	-0.01	-0.05	0.27	**0.96**
% explained	80.1	99.3	99.9	100.0

The Global Environmental Stratification



Statistical clustering: Legend

- ISODATA clustering into 125 strata
- Aggregation to 18 zones based on dendrogram



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Stratum K5 corresponds with several wine producing regions

Global Env. Stratification – details

J4 (cool temperate and moist)

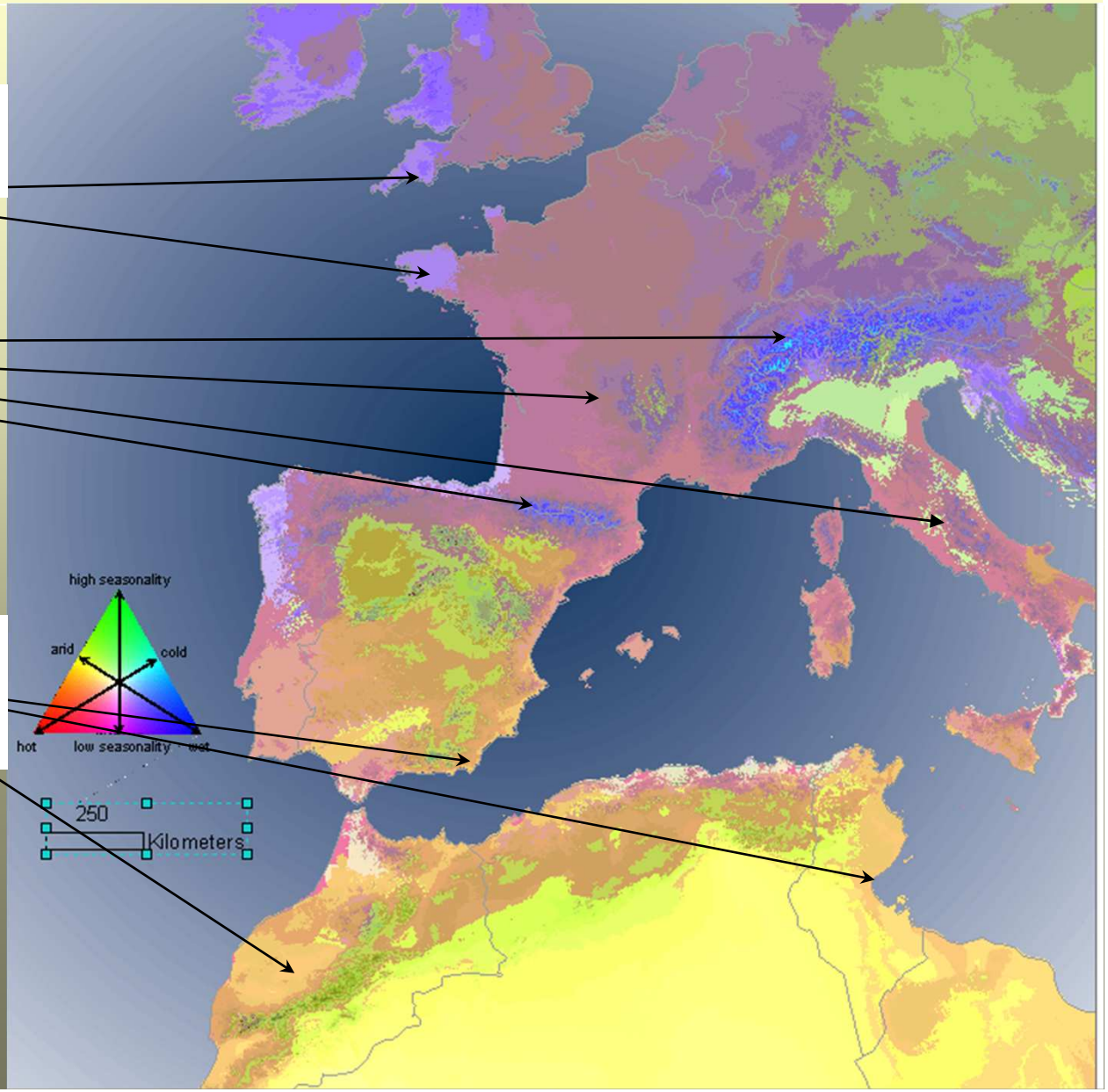
Links Brittany and Cornwall

G8 (cold mesic)

Links Apenines with other mountain regions

L6 (warm temperate and xeric)

Links the hottest parts of Spain with Africa



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R9 (extremely hot and moist)

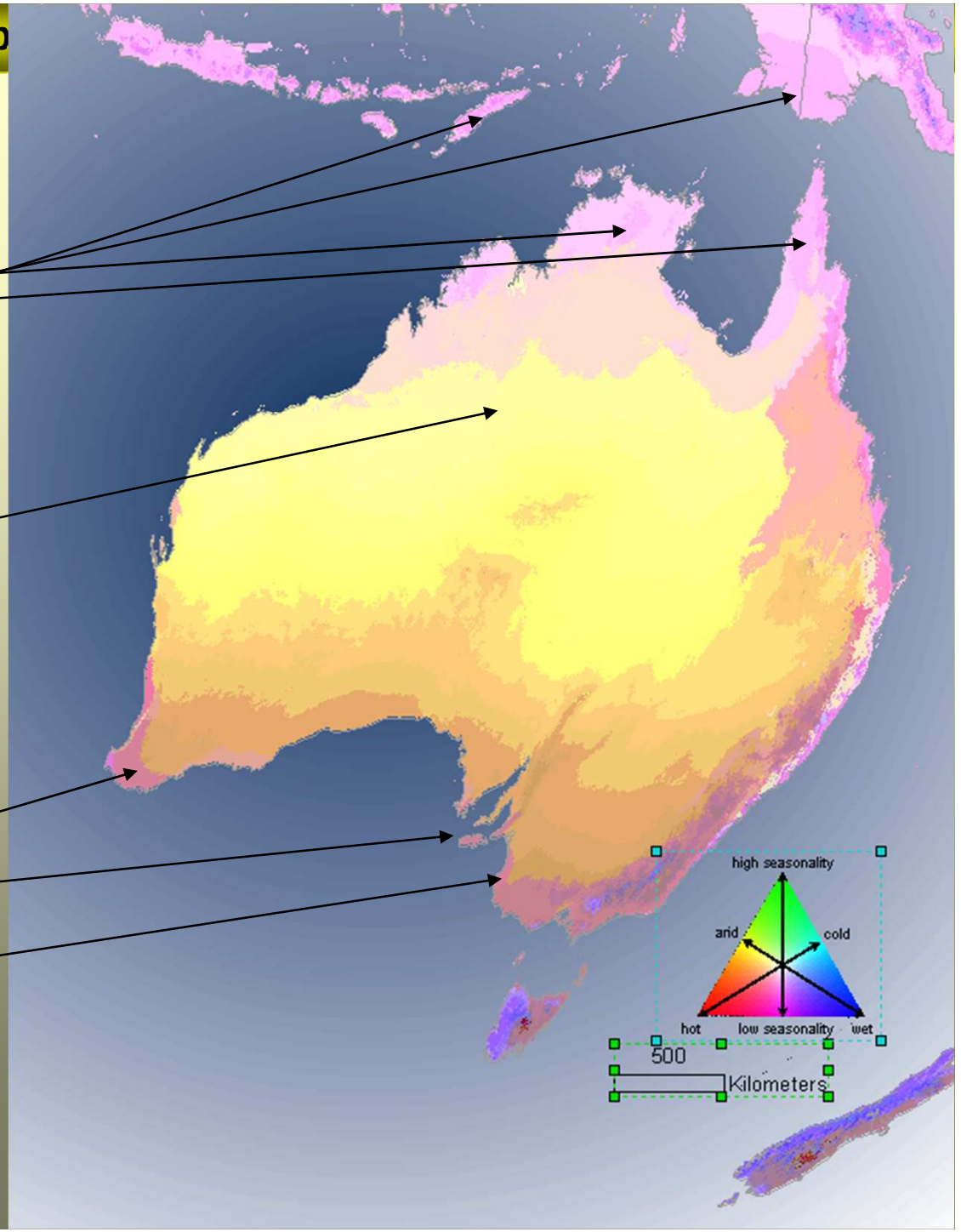
Links Australian tropics to SE Asia and beyond

P2 (extremely hot and arid)

Links the Gibson with the deserts of Arabia, the Sahel and the Thar desert.

K10 (warm temperate and mesic)

Links Mediterranean regions in Australia with those in Chile, South Africa, California and Europe.



http://www.ebone.wur.nl

Applications

- Aggregation framework for local observations to the global context
- Coordination global biodiversity observation
  - Identifying data gaps
  - Targeting future monitoring effort and research
- Supporting other global assessment
  - Systems modelling
  - Agro-ecological and sustainable development studies

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Upscaling of habitat data from national to European level:

- Countryside Survey Great Britain (CS-GB);
- National Inventory of landscapes (NILS) in Sweden;
- Spanish Rural Landscape Monitoring Systems (SISPARES) in Spain;
- Spatial Indices for land-use sustainability (SINUS) in Austria;
- Northern Ireland Countryside Survey (NICS);
- Step-less models for regional environmental variation in Norway will be started, but is tested to be exchangeable.

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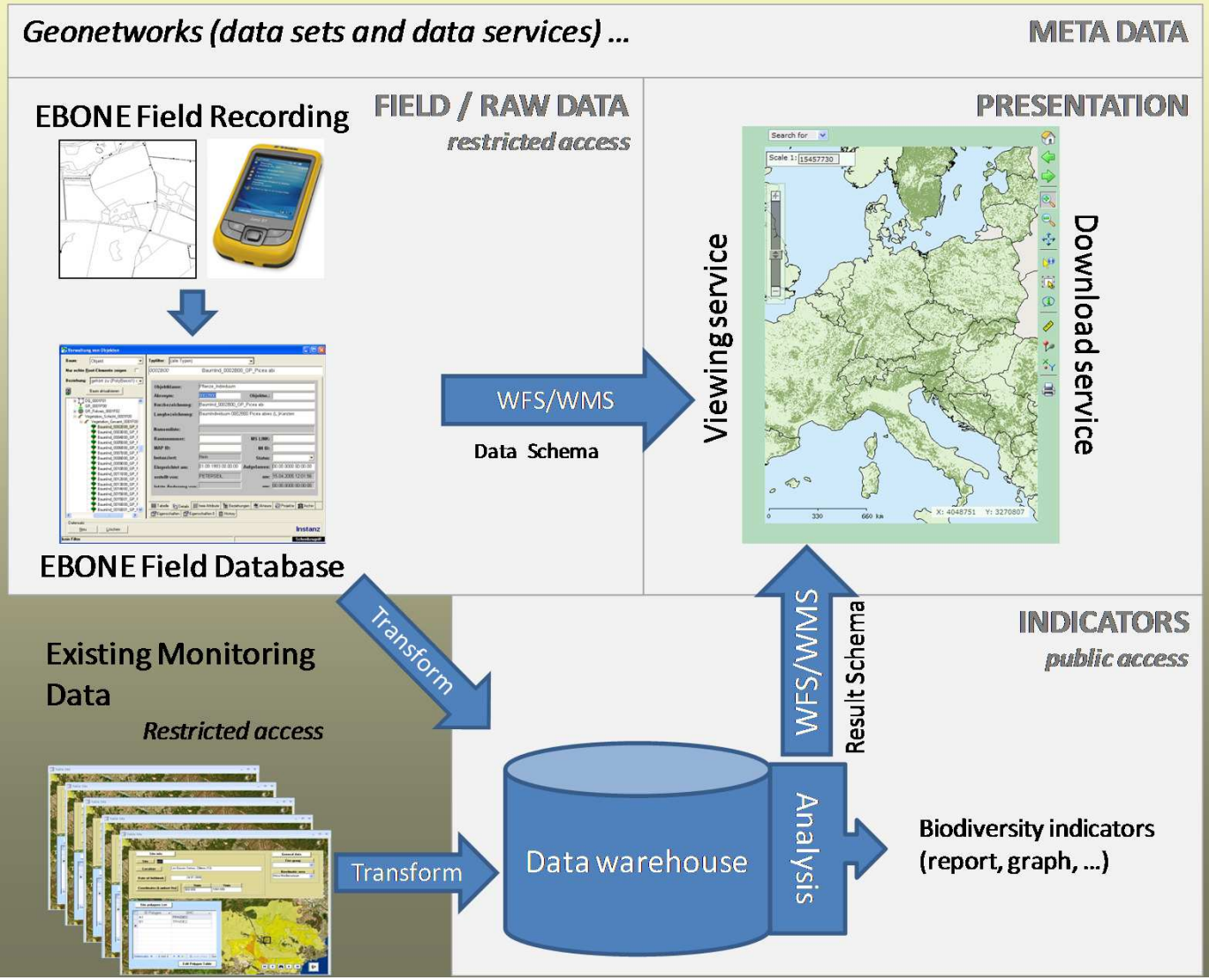
EBONE data Architecture



Data levels to be integrated

- Raw field data
- Aggregated data on the level of the landscape square.
- Aggregated data on the level of the reporting unit
- Remote sensed data, hyperspectral and LiDAR

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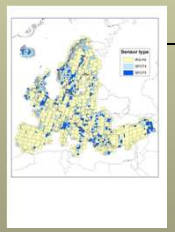
Raw Data

Forest non – forest mask

CORINE land cover



Processing

Mathematical morphology based software GUIDOS

Conefor Sensinode Software

Geographic Information System techniques

Forest Focus database Level 1

EFDAC Map Viewer

ORACLE database

Raster maps (Geotiff)

Vector maps (shape files)

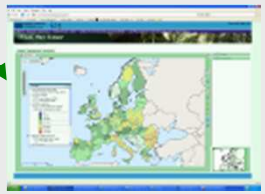
Aggregation

Query options, selection criteria

Forest spatial pattern maps

Landscape patterns maps

Forest condition maps



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Conclusions from EBONE:

- Proper estimates of biodiversity at national and EU/EnZ level is required for European and global tasks;
- It is feasible to design a European biodiversity information system;
- It is possible to design a European monitoring system using European environmental references;
- Collaboration between countries and regions will be important for designing cost effective sampling;
- The issue of data sharing and confidentiality has to be solved;

The European Challenge:

- To harmonise the European biodiversity monitoring system (Natura 2000 + wider countryside);
- To get the willingness of institutes, regions and countries to cooperate;
- Improve cost-effectiveness by sharing efforts, knowledge and database systems;
- Improve the international reporting mechanism and the science-policy interface.

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Thank you

www.ebone.wur.nl

http://www.earthobservations.org/geobon.shtml

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