



LANDSCAPE ARCHITECTURE AND THE STUDY OF RURAL LANDSCAPES

- Bringing perception and preference into the game -



INSTITUTO
SUPERIOR DE
AGRONOMIA
Universidade de Lisboa

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LEAF - Linking Landscape, Environment, Agriculture and Food

Instituto Superior de Agronomia / UNIVERSIDADE DE LISBOA

Program

- 1 - Discussing the “Landscape” concept;
- 2 - Landscape perception and its use in rural landscape studies - some examples

Landscape monitoring:

- Baixo Vouga Lagunar
- Parque Natural da Arrábida

Landscape visual quality:

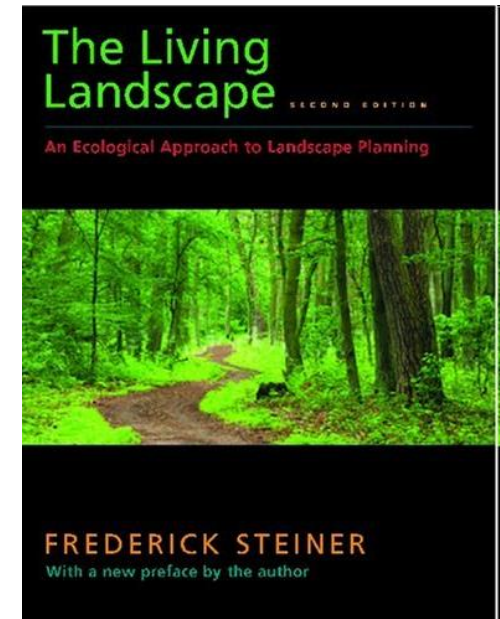
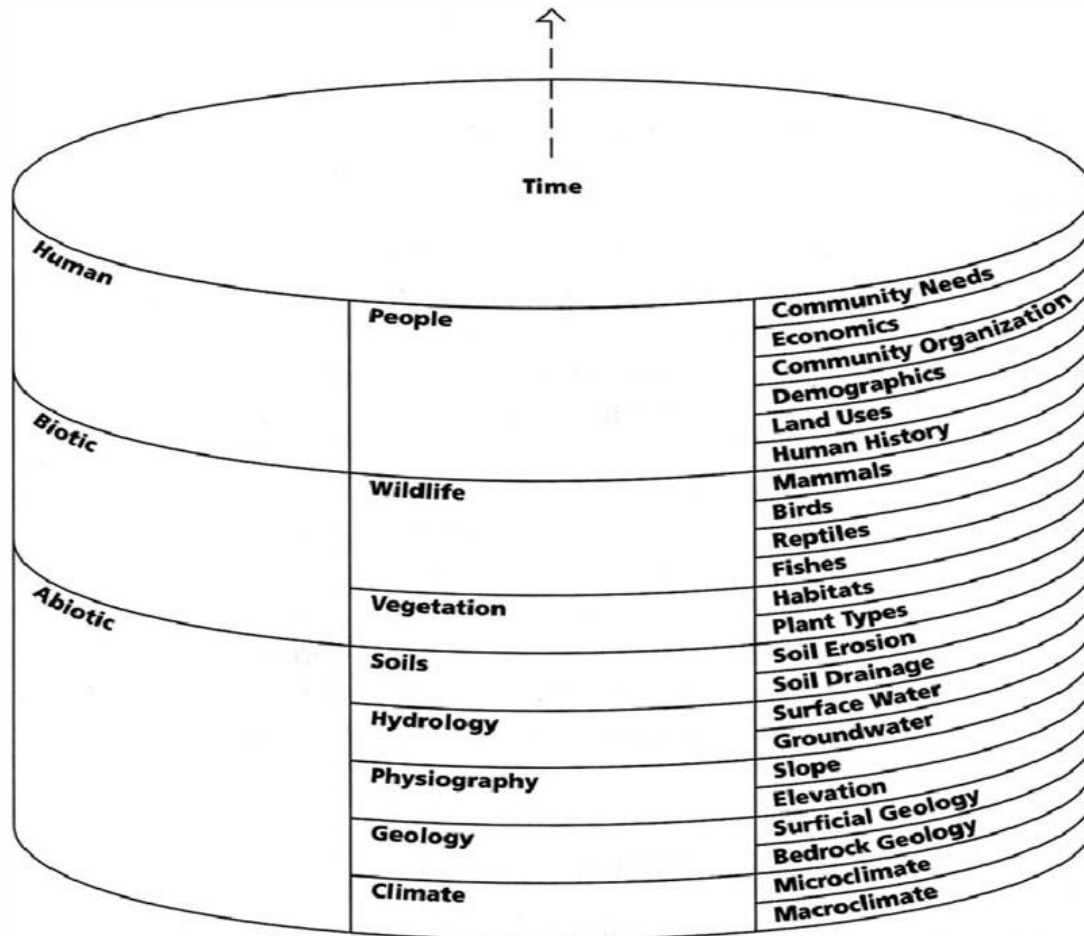
- Tagus South Bank
- Sudoeste Alentejano

- 3 - Final Remarks
-

Landscape definitions

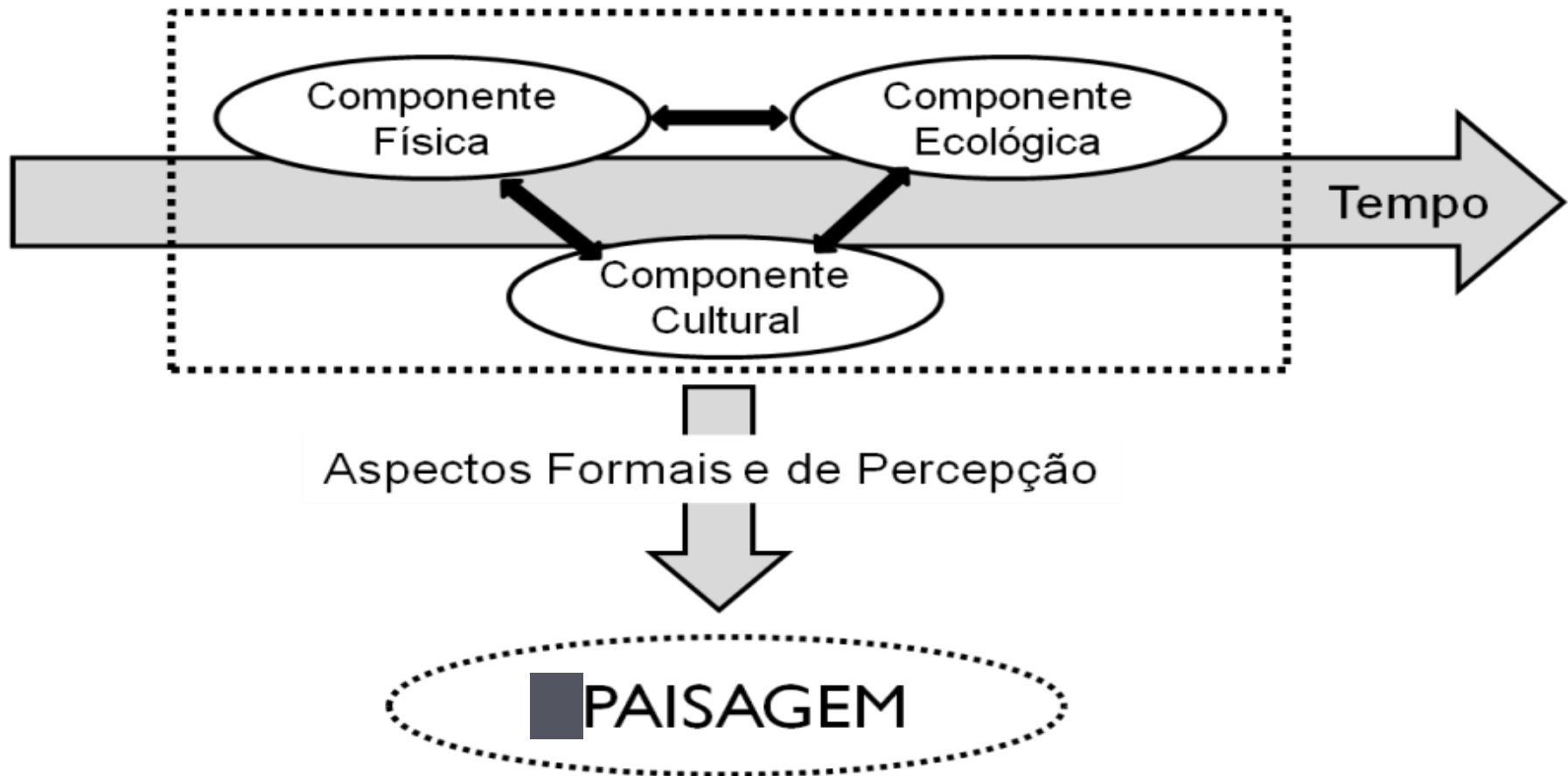
- ▶ *“The appearance of the land.”*
Brabyn (1996, 2009)
 - ▶ *“A landscape is a kilometers-wide area where a cluster of interacting stands or ecosystems is repeated in similar form.”*
Forman & Godron (1981)
 - ▶ *“Area that is spatially heterogeneous in a least one factor of interest.”*
Turner *et al.* (2001)
 - ▶ *“«Landscape» means an area, as perceived by people, whose character is the result of the action and interaction of natural and/or human factors.”*
European Landscape Convention (2000)
-

Graphic concepts

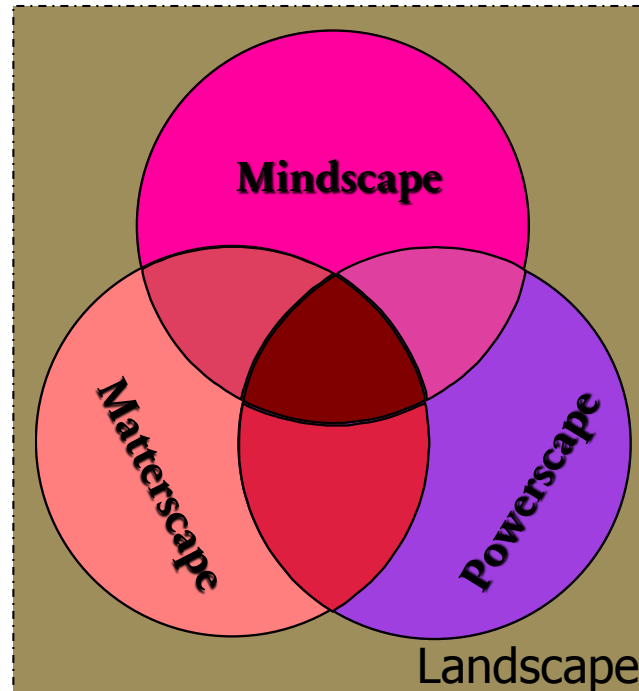


“The layer cake”,
 Steiner (1990, 2000)

Graphic concepts



The production of **MINDSCAPES** a comprehensive theory of landscape experience Maarten Jacobs (2006)



A tripartite theory of landscape

Landscape phenomenon	Matterscape	Powerscape	Mindscape
Mode of reality	Physical reality	Social reality	Inner reality
Validity claim	Truth	Justness	Truthfulness
Science	Natural sciences	Social sciences	Experience sciences

Short Note

An ontology for landscapes

Christopher A. Lepczyk^{a,*}, Christopher J. Lortie^b, Laurel J. Anderson^c

^aDepartment of Forest Ecology and Management, University of Wisconsin-Madison, Madison, WI 53706, USA

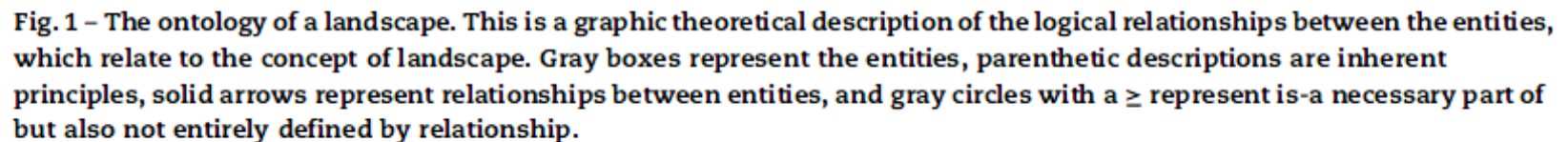
^bBiology Department, York University, 4700 Keele St., Toronto, ON, 3J 1P3 Canada

^cDepartment of Botany/Microbiology, Ohio Wesleyan University, Delaware, OH 43015, USA

- In this paper, we develop *an ontology for the concept of 'landscape'* that captures the most general definitions and usages of this term. *We selected the concept of landscape because it is often used in very different ways by investigators and hence generates linguistic uncertainty.* A graphic theoretic (i.e., visual) model is provided which describes the set of structuring rules we used to define the relationships between 'landscape' and appropriately related terms.
-

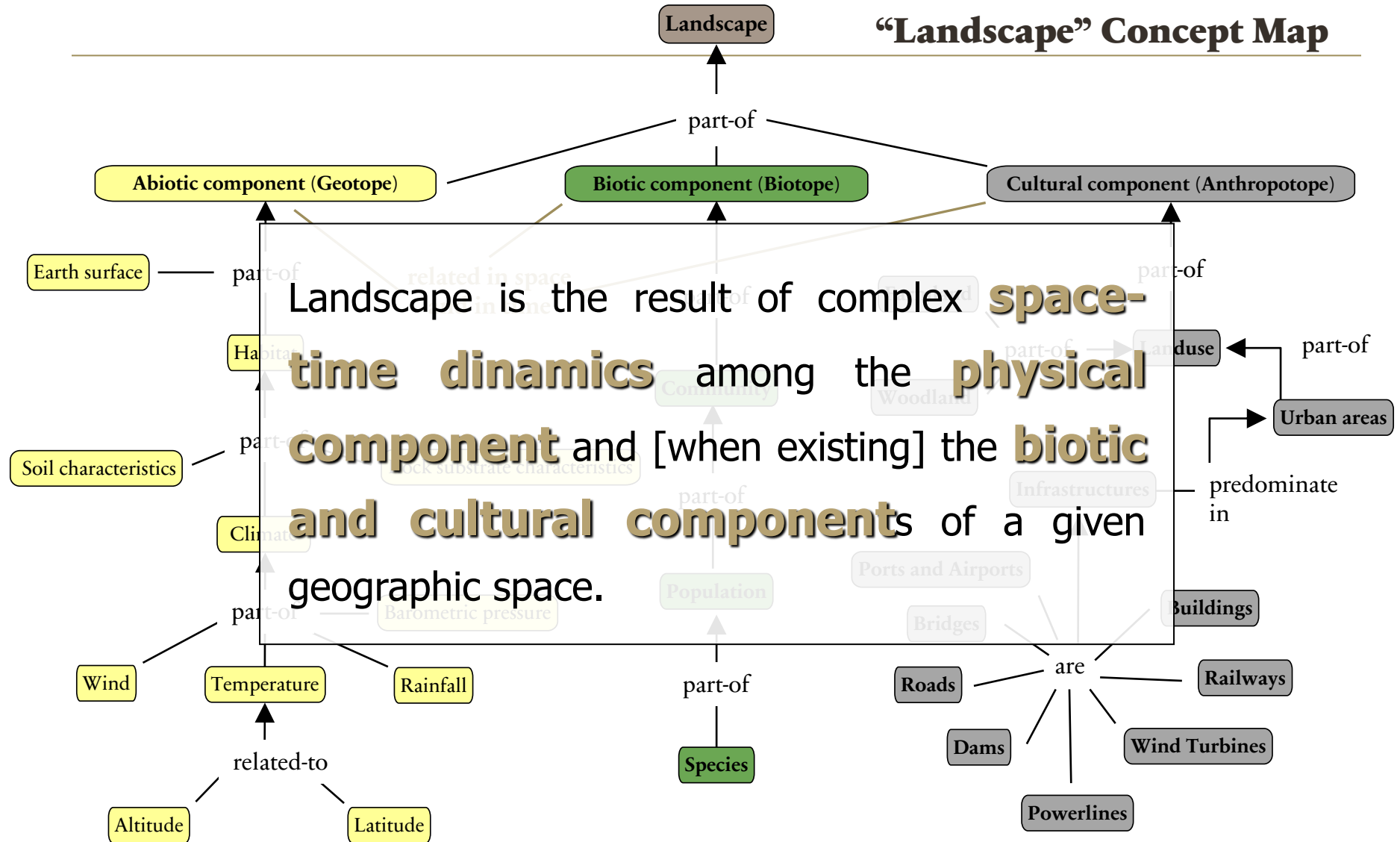
Ontologies

- *In philosophy, [ontology] means **theory of existence**. It tries to explain what is **being** and how the world is configured by introducing a system of critical categories to account things and their intrinsic relations.*
- [...]
- *From **knowledge-based systems** point of view, it is defined as “a theory (system) of concepts/vocabulary used as building blocks of an information processing system”.*
- [...]
- *An ontology consists of **concepts**, **hierarchical organization** (is-a) of them, **relations** among them (in addition to is-a and part-of), **axioms** to formalize the definitions and relations.*



A tentative

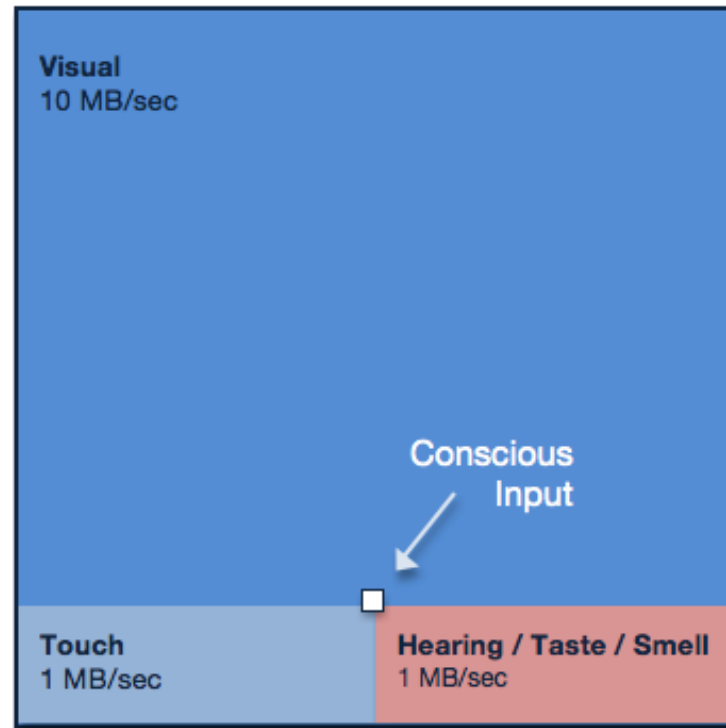
“Landscape” Concept Map



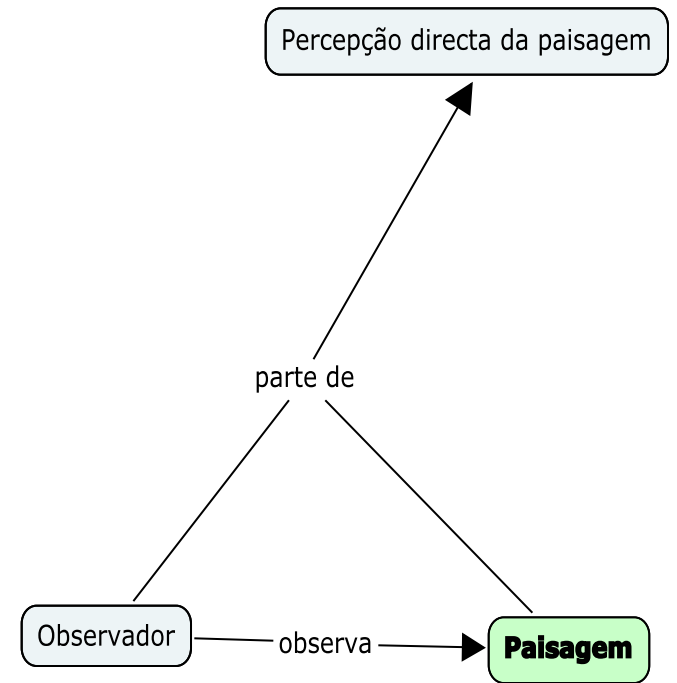
Landscape perception concept map

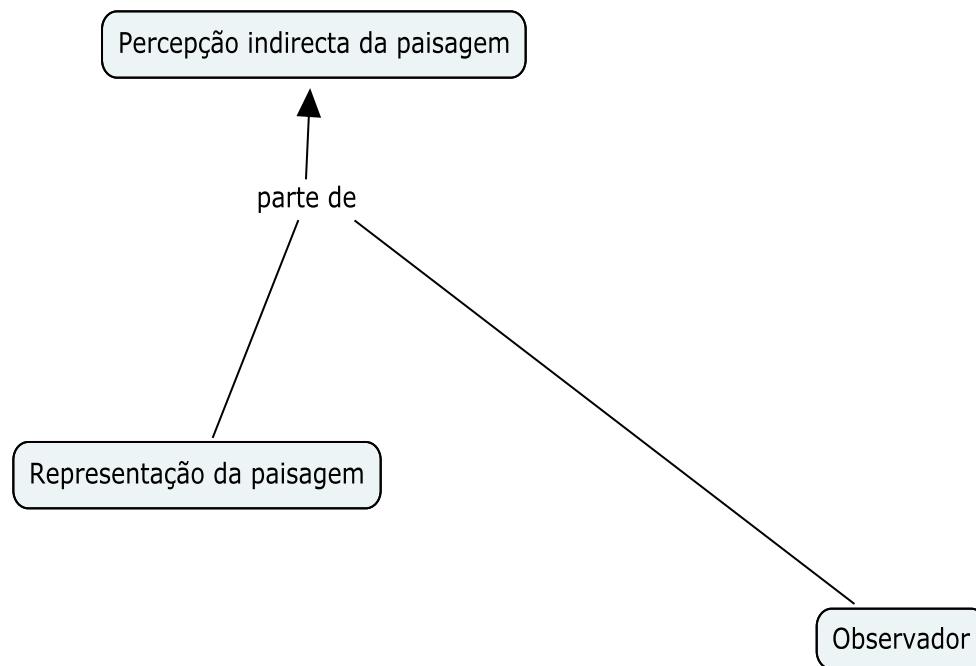
‘Visual’ perception

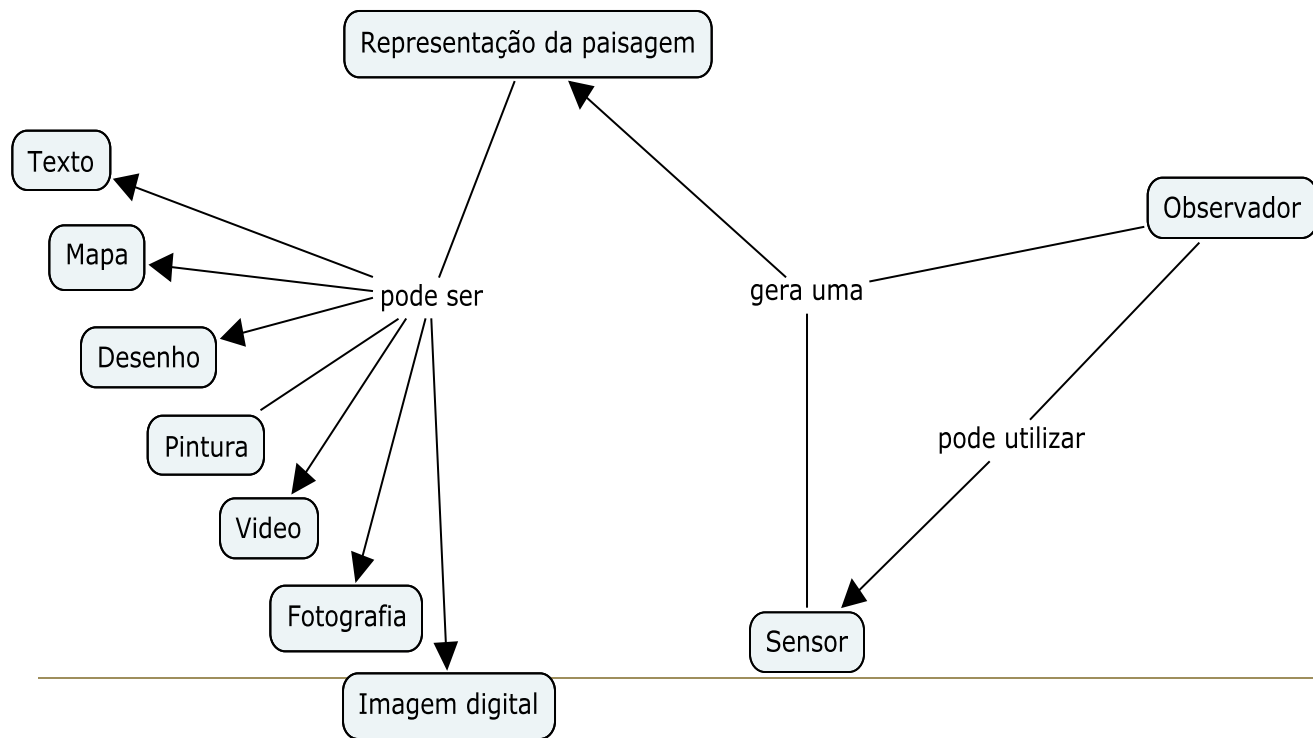
- Perception is a multisensory activity but the studies presented here are restricted to ‘visual perception’

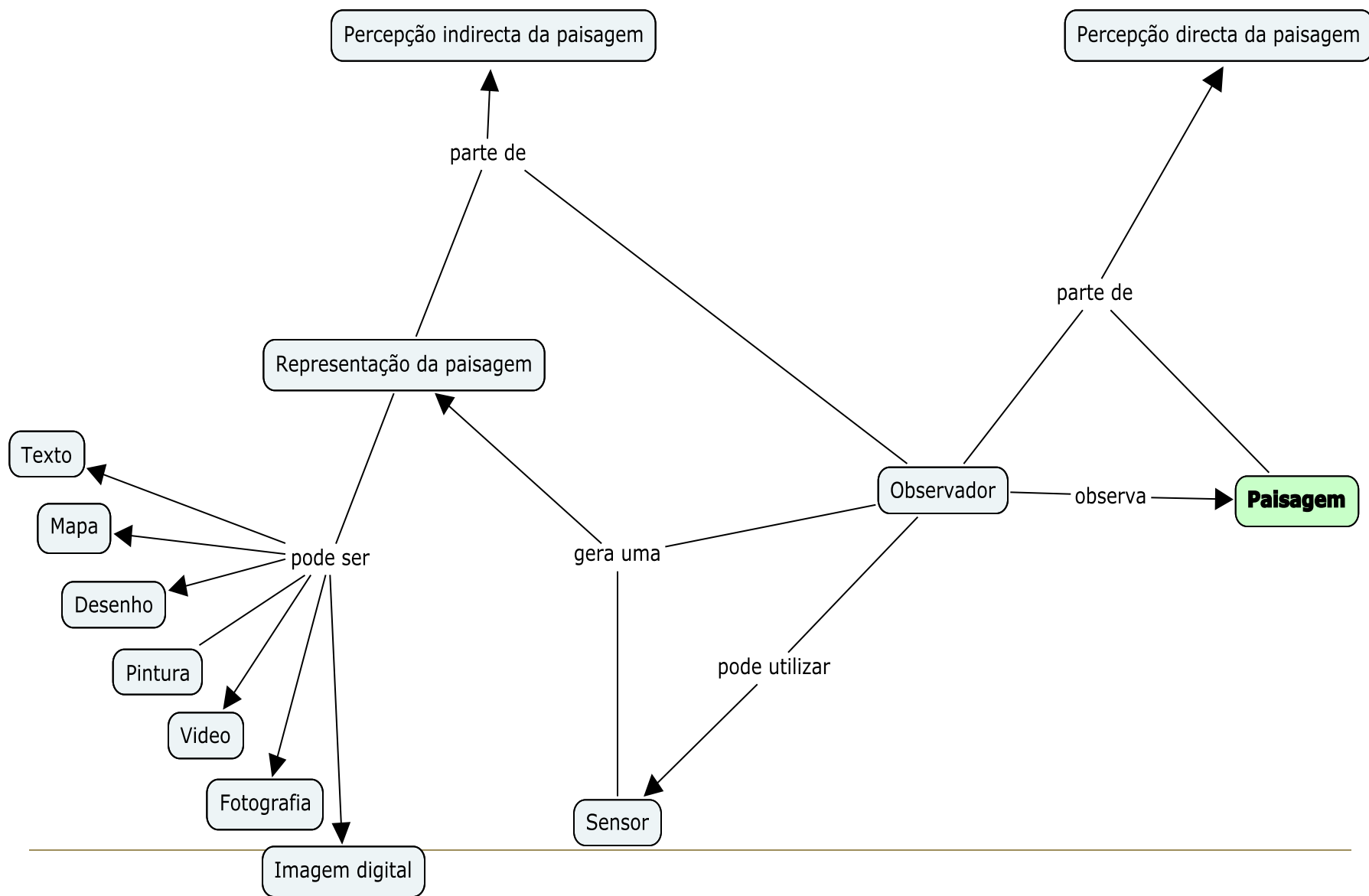


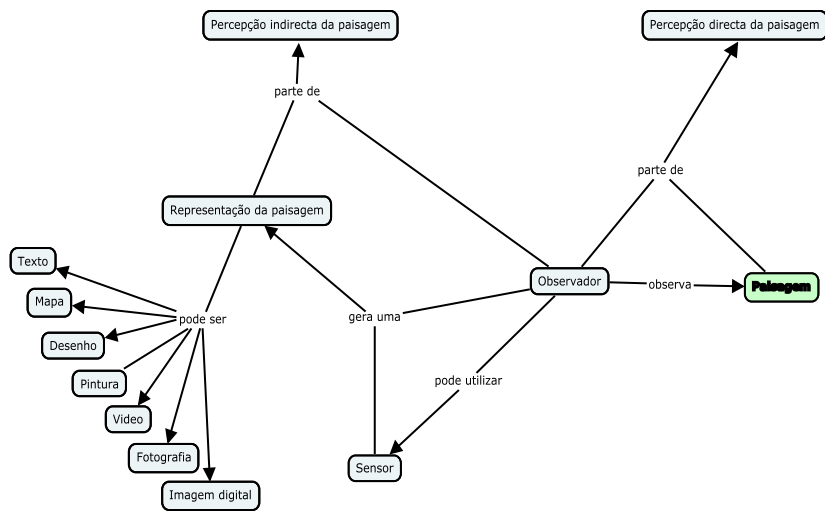
Nørretranders, T. (1999). *The User Illusion: Cutting Consciousness Down to Size*. Penguin (Non-Classics).



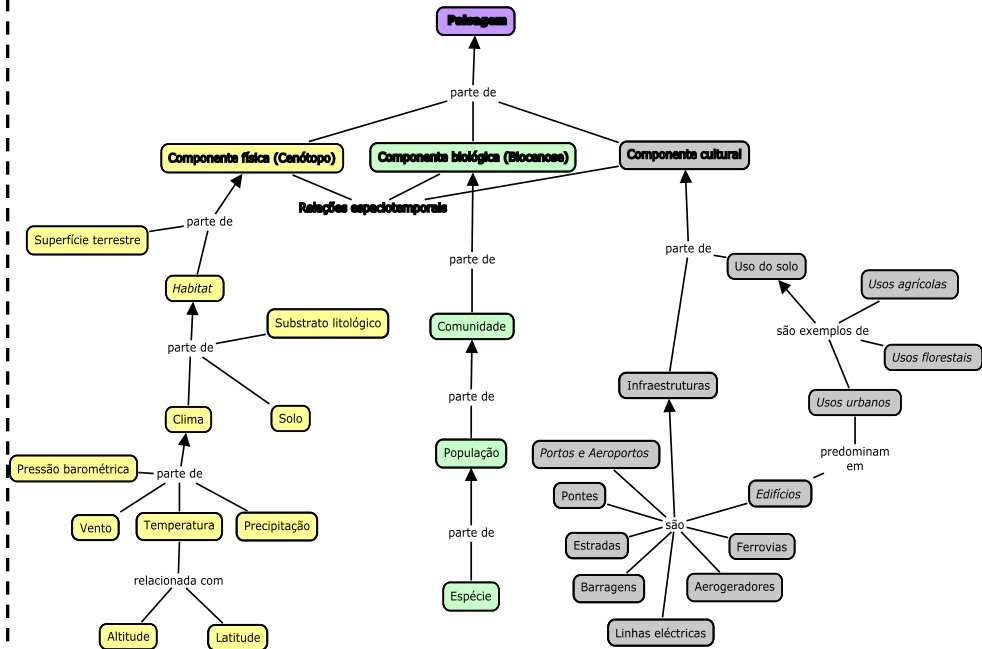




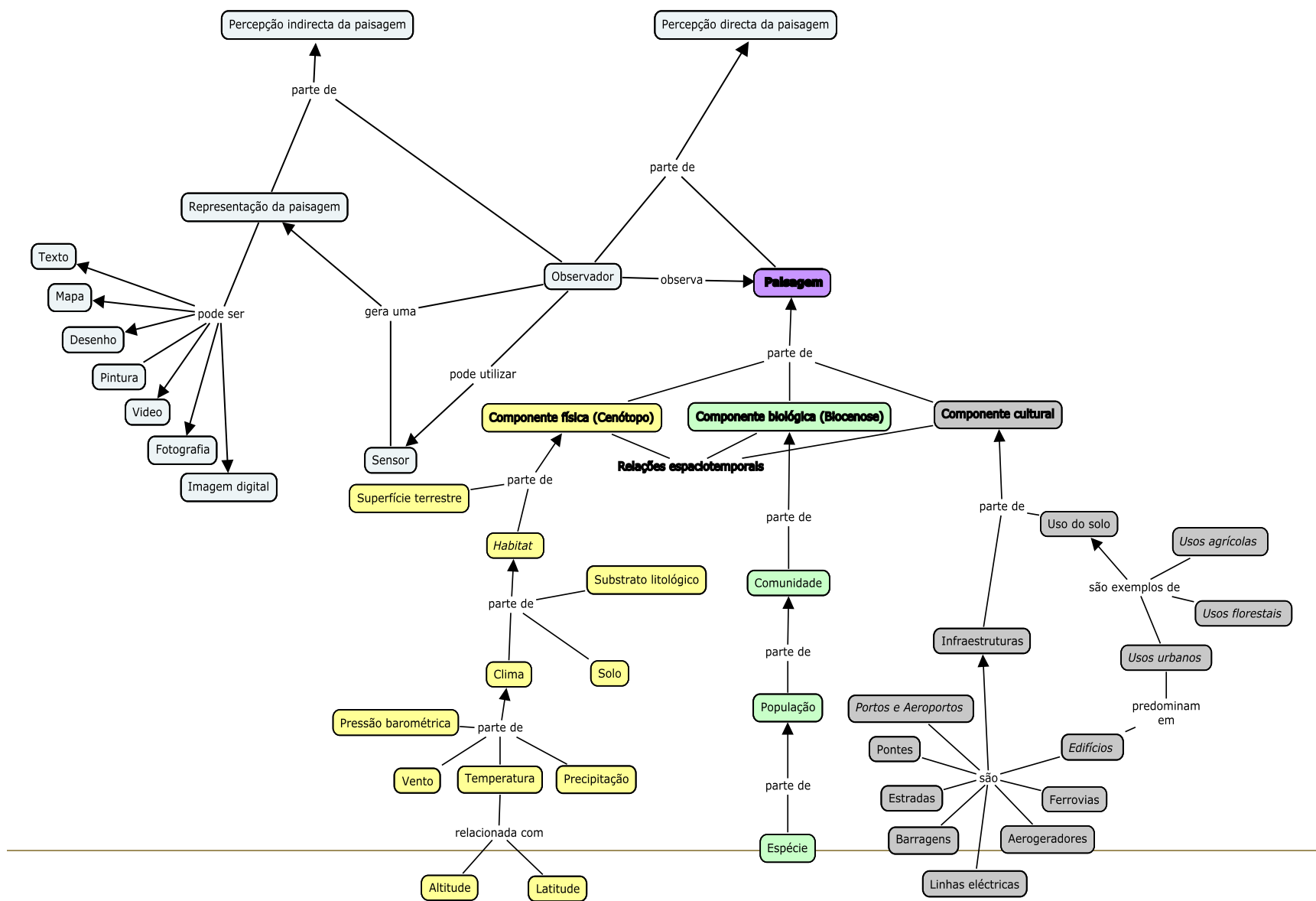




Percepção

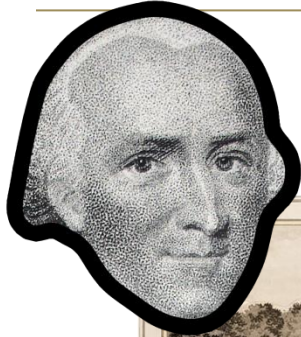


Paisagem



Landscape monitoring studies using the ‘Repeat Photography’ method

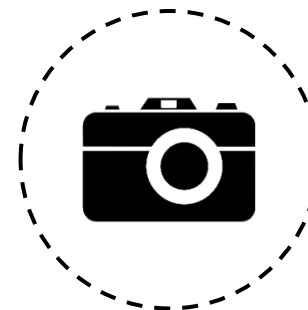
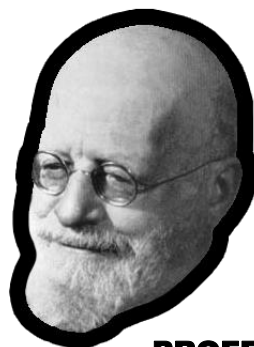
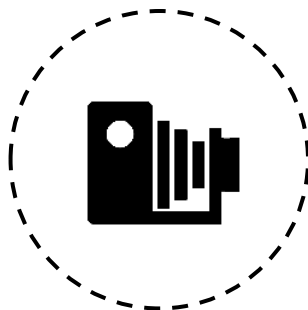
Precedents



✱ **HUMPHRY REPTON** (1752 –1818) ilustrações como meio de registar alterações: ‘antes’ e ‘depois’ da paisagem para a qual projectava → tornar mudança inteligível: *“um mero mapa ou plano era insuficiente; não poderia transmitir uma ideia das paisagens tal como a planta de uma casa não o faz para a sua elevação”* (Repton *et al.*, 1907, p. xxi)

Figura 9 – Ilustrações de Humphry Repton: as imagens da primeira fila correspondem à cena antes da intervenção (com a aba) e as imagens em baixo ilustram a paisagem já com a proposta de projecto (sem a aba) (Repton *et al.*, 1907).

Precedents



**PROFESSOR
SEBASTIAN FINSTERWALDER (1862 – 1951)**

PROGULSKE + SOWEL Black Hills no estado de Dakota do Sul (1874 >> I=100)

SKOVLIN + WARD + STRICKLER ecossistemas de montanha no Oregon (1914 >> I=70/90)

HASTINGS + TURNER deserto do sul do Arizona e Sonora, no México (1800/1900 >> I=60/90)

FREDERICK C. HALL processo e componentes do Repeat Photography

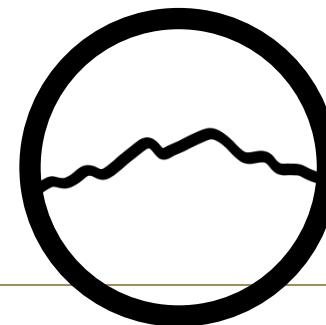


RECOLLECTING LANDSCAPES

VERDWENEN NEDERLAND

TRANSFORMATIE IN BEELD

MARK KLETT



Precedents



TRANSFORMATIE IN BEELD, by Piet Hein
Stulemeijer (1977-2008)

Precedents



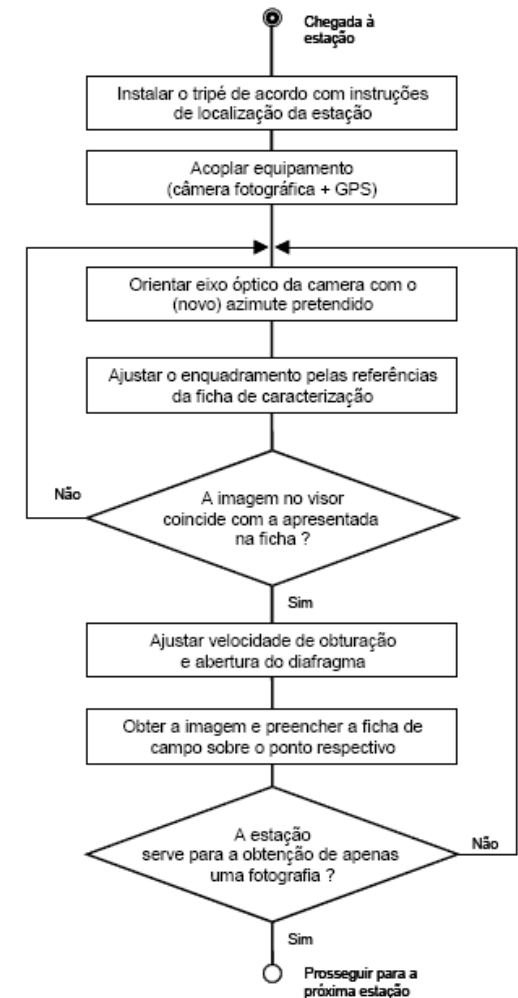
MARK KLETT alia o método baseado na repetição de imagens à própria forma de arte que é a fotografia → **noção de tempo e interação do ser humano**, a impressão da sua marca, com a sua **envolvência**: *“Klett apercebeu-se que o potencial da refotografia é maior do que simplesmente controlar a mudança; pode tocar a experiência do tempo em si”* (“The Rephotography of Mark Klett: Views Across Time,” 2011)

Figura 13 – A ‘reconstrução da vista’: alguns trabalhos de Mark Klett que aliam o objectivo de representar a transformação da paisagem à própria intenção artística (“The collaborative works of Mark Klett and Byron Wolfe,” n.d.).

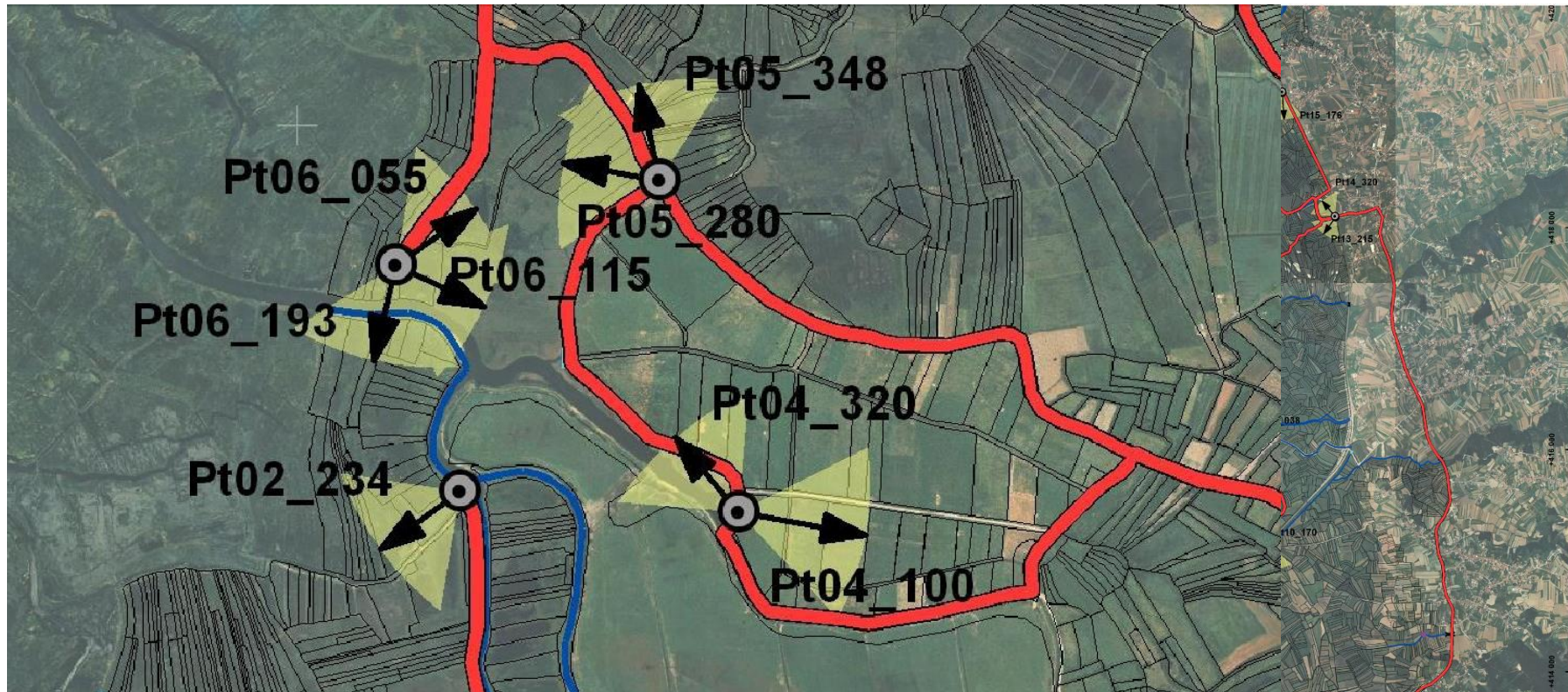
Landscape monitoring

- Methodology largely influenced by the work of **Frederick C Hall (2002)** e **Puschmann & Dramstad (2002)**;
- A **Procedures Manual** was produced

USDA United States
 Department of
 Agriculture
 Pacific Northwest
 Research Station
 Research Station
 PNW-357R-02R
 March 2002
**Photo Point
 Monitoring
 Handbook:
 Part A—Field
 Procedures**
 Frederick C. Hall



Monitoring points network



• Insured
repeatability



Analysis

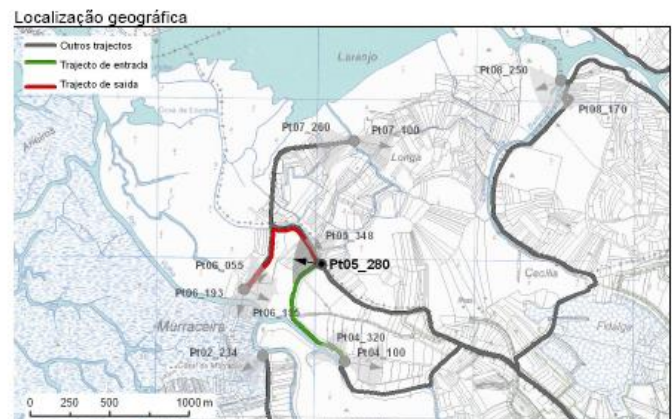
Monitoring manual for the field survey, including a detailed description of each procedure;

The images obtained periodically would be compared using consecutive observation periods (spring and autumn);

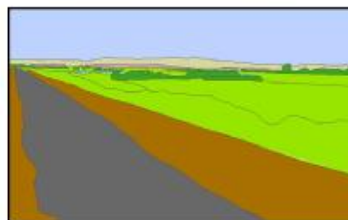
The results are presented in the form of a transition matrix between the two times.

Manual de procedimentos a adoptar para efectuar o levantamento de campo no âmbito do programa de monitorização da paisagem do BBVL
Ficha de caracterização

Unidade de Paisagem Sistemas Húmidos	Pt05_280
Localização da estação Marca topográfica (cravo)	FimBetao
Azimute 280°	Distância focal 18 mm
Coordenadas	
P: 415898,89	
M: 158868,03	
Z: 2,18	
	
Referências de enquadramento Caminho no limite esquerdo da fotografia; horizonte (topo do dique) na base da mira 1	

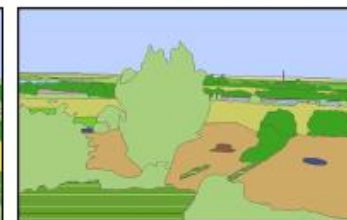


A cross-sectional diagram of the Earth's crust and upper mantle. The top layer is the lithosphere, shown in light blue. Below it is the asthenosphere, shown in a darker blue. The boundary between them is a wavy line representing the Mohorovičić discontinuity. The surface of the lithosphere is uneven, with some areas higher than others, representing topography. The asthenosphere is shown as a solid, continuous layer.



	Céu	Água	Arvor.	Estrut.	Veg. Nat.	Agric.	Outros	Perdas	Ait. Liq.
Céu	58.75	0.00	0.03	0.00	0.00	0.00	1.18	1.21	0.55
Água	0.00	77.38	6.50	0.00	16.02	0.00	0.00	22.62	21.54
Arvor.	0.02	0.34	86.47	1.18	11.66	0.00	0.32	13.53	0.21
Estrut.	0.00	0.00	0.13	39.33	0.49	0.00	0.05	0.67	4.23
Veg. Nat.	0.02	0.33	2.63	0.45	56.57	0.00	0.00	3.43	25.24
Agric.	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Outros	0.62	0.00	3.93	3.26	0.49	0.00	51.70	8.30	6.75
Ganhos	0.66	0.67	13.32	4.50	28.66	0.00	1.55		

27



☐ Same class

	Céu	Água	Arvor.	Estrut.	Veg. Nat.	Agric.	Outros	Péssas	Alt. Lq.
Céu	93.87	0.00	0.13	0.00	0.00	0.00	0.00	0.13	1.92
Água	0.00	72.45	26.90	0.00	0.65	0.00	0.00	27.55	0.11
Arvor.	2.05	1.98	81.12	0.34	4.24	10.27	0.00	18.88	45.26
Estrut.	0.00	2.33	10.59	87.08	0.00	0.00	0.00	12.92	12.48
Veg. Nat.	0.00	22.45	14.18	0.00	58.12	5.24	0.00	41.88	36.50
Agric.	0.00	0.90	9.54	0.00	0.49	89.07	0.00	10.33	21.48
Outros	0.00	0.00	2.80	0.10	0.00	16.90	80.20	19.80	19.80
Ganho	2.05	27.68	64.14	0.44	5.38	32.41	0.00		

51

MARIA JOÃO PATRÍCIO

(Landscape Architecture Msc)



IN SITU LANDSCAPE VS. PANORAMA PHOTOS VS. STANDART PHOTOS

FOTOGRAFIA NORMAL

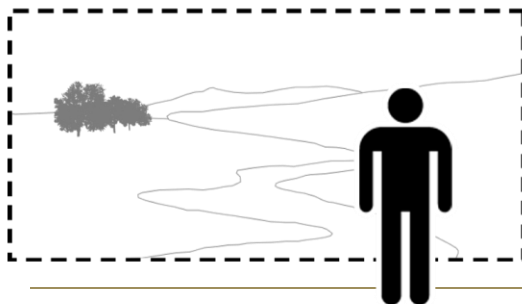
limitada pelo ângulo de visão +
ilustra somente uma parcela da
paisagem: representação incompleta



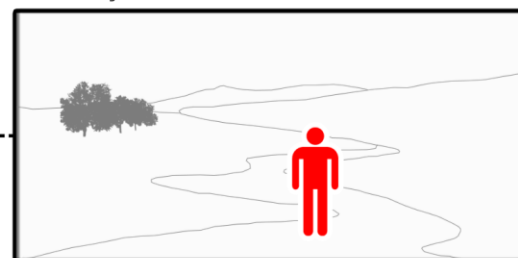
FOTOGRAFIA PANORÂMICA

imita o ângulo de visão horizontal
humano + evita
tendência/preferência dos fotógrafos
originais para captar apenas
determinadas cenas:
representação legítima

FOTOGRAFIA PANORÂMICA



OBSERVAÇÃO IN SITU



FOTOGRAFIA PADRÃO

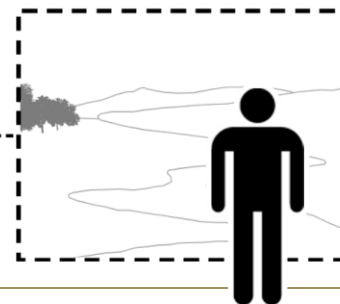


Figura 22 – *Validade de
representação*: comparação
entre uma observação *in situ* e
duas formas distintas de
reprodução da paisagem, a
fotografia panorâmica e a
fotografia padrão (nesta
última a vista encontra-se
bastante mais restringida)
(adaptado de Sevenant e
Antrop, 2011).

PARTE IV MÉTODO 'REPEAT PHOTOGRAPHY'

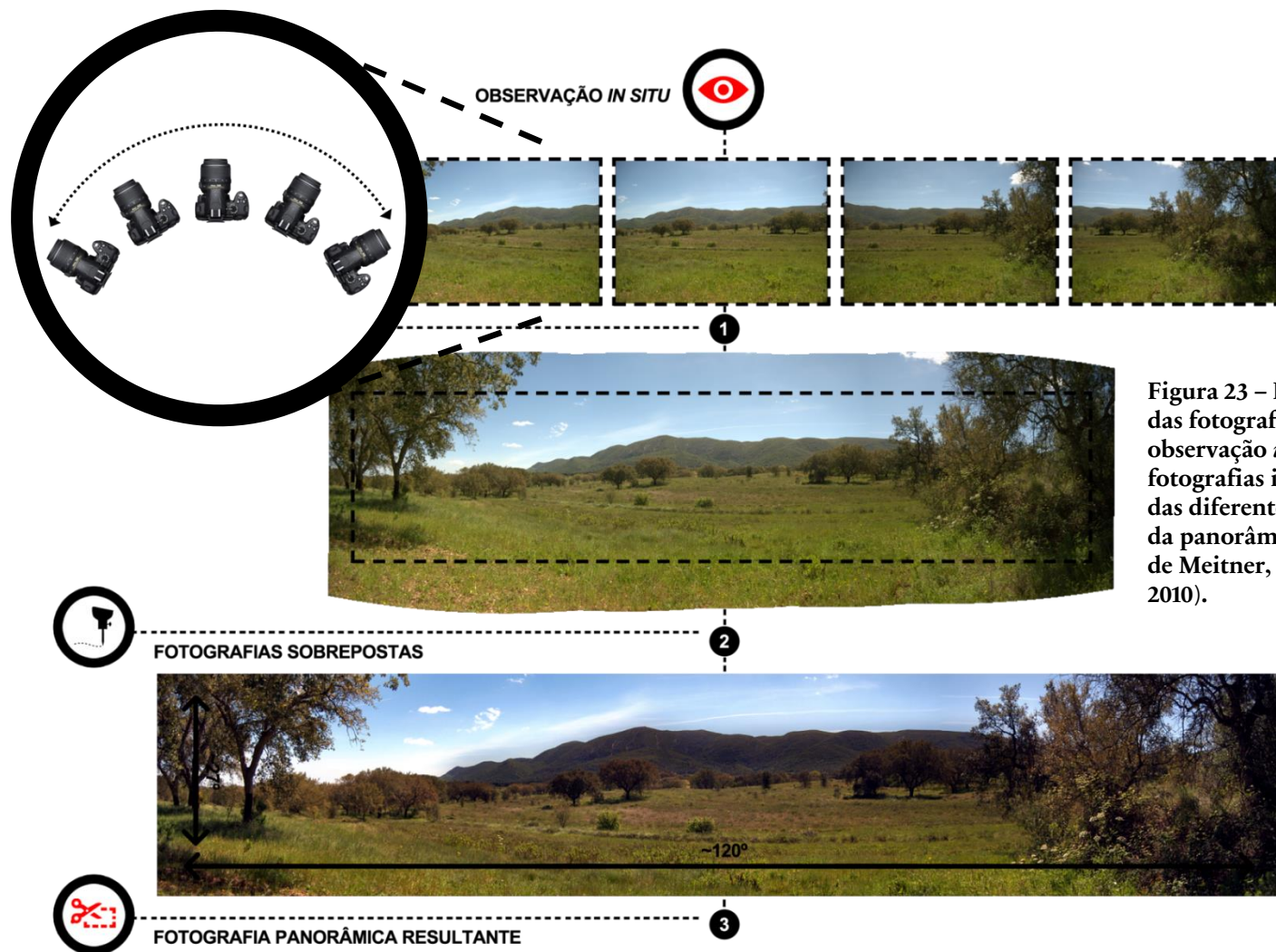


Figura 23 – Processo de criação das fotografias panorâmicas: observação *in situ*; captura das fotografias individuais; *stitching* das diferentes imagens; e corte da panorâmica final (adaptado de Meitner, 2004; Sevenant, 2010).



COORDENADAS
GPS



LAT 38° 28.719' N LONG 9° 0.049' O ALT 486 m

DISTÂNCIA
FOCAL



18 mm

X observações
Divulgação dados a respeito do progresso da paisagem: **consequências** da adopção de determinadas **medidas de gestão** + servir de **base** à proposta de **alternativas** → **informações perceptíveis pelos visitantes em geral**: imagens panorâmicas disponibilizadas → **educação ambiental**: configuração da postura do ser humano

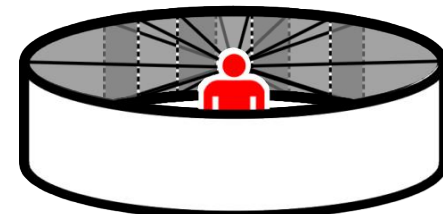


Figura 24 – Exploração das
 panorâmicas (adaptado de Meitner,
 2004).

FICHA DE CARACTERIZAÇÃO **PM01**. CASTELO DE SESIMBRA (ANTENAS)

COORDENADAS GPS LAT 38° 27.513' N LONG 9° 5.970' O ALT 259 m DISTÂNCIA FOCAL 18 mm

PM01-01_126	PM01-02_162	PM01-03_274	PM01-04_295	PM01-05_309
Horizonte na base da mira central; arbustos fazem a diagonal da fotografia.	Horizonte na base da mira central; arbusto no limite inferior esquerdo da fotografia; Castelo de Sesimbra alinhado com a mira intermédia direita.	Horizonte a meio da mira central; Castelo de Sesimbra entre a mira esquerda e a mira intermédia esquerda.	Horizonte no topo da mira central; arbustos alinhados com a mira direita.	Horizonte na base da mira central; arbustos preenchem a fotografia até à mira inferior.

PALAVRAS-CHAVE
COLINA DA FORÇA; CASTELO; VILA DE SESIMBRA

OBSERVAÇÕES
Comparativamente à fotografia histórica, a colina da Força encontra-se agora bastante mais coberta de vegetação, tendo a população de pinheiros, que já se destaca nesta imagem, aumentado substancialmente, assim como, evidentemente, o número de edifícios da vila. A vegetação que tedia a estrada de acesso ao centro de Sesimbra apresenta-se também muito mais desenvolvida.

EXEMPLO DE FICHA DE CARACTERIZAÇÃO

FICHA DE CAMPO **PM01**. CASTELO DE SESIMBRA (ANTENAS)

OBSERVAÇÃO
-1 19--

OBSERVAÇÃO
1 2014

OBSERVAÇÃO
2 20

COORDENADAS GPS LAT 38° 27.513' N LONG 9° 5.970' O ALT 259 m DISTÂNCIA FOCAL 18 mm

FICHA DE CAMPO **PM02**. CASTELO DE SESIMBRA (A POENTE DOS MOINHOS DO FACHO)

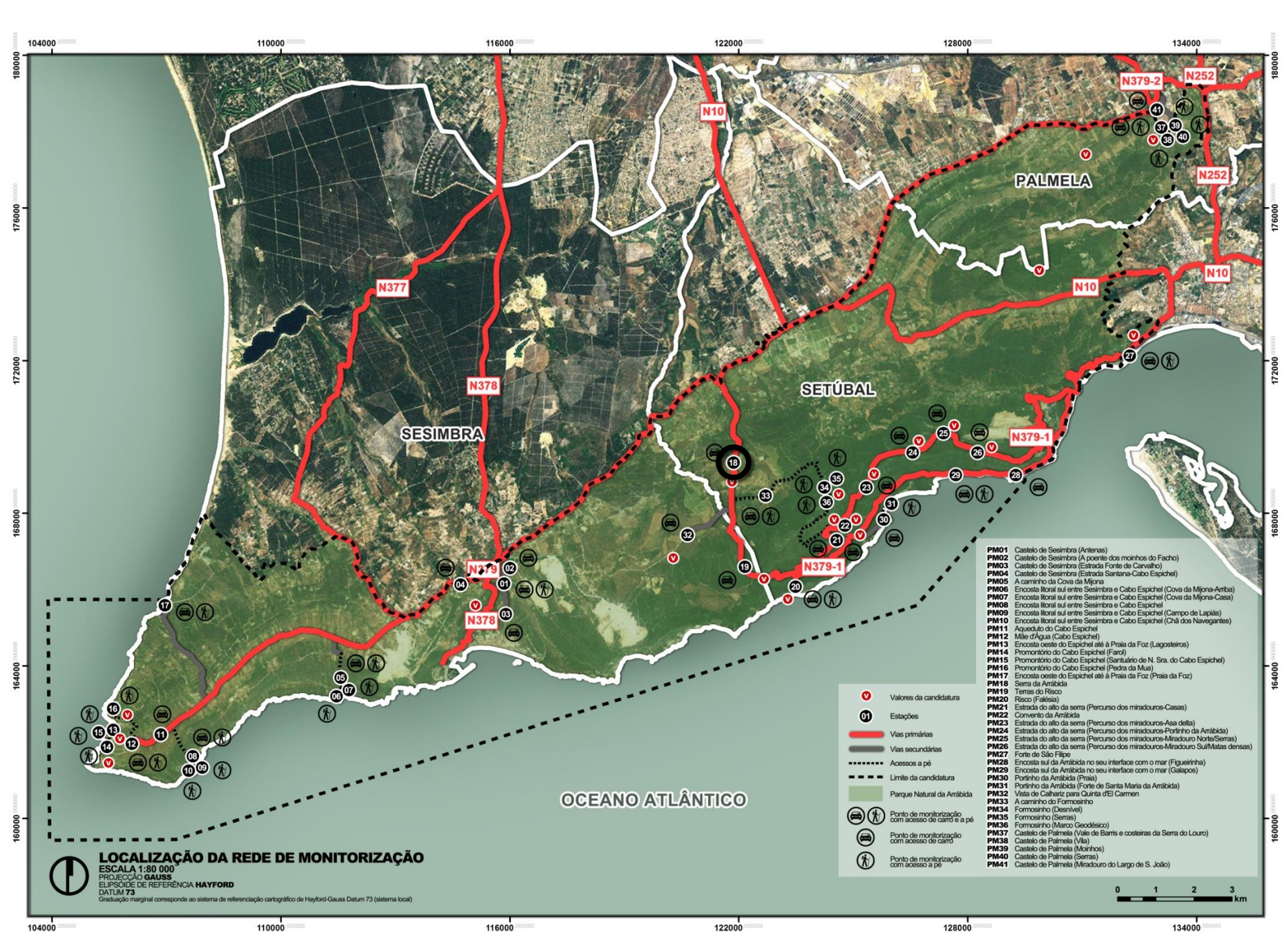
OBSERVAÇÃO
-1 19--

OBSERVAÇÃO
1 2014

OBSERVAÇÃO
2 20

COORDENADAS GPS LAT 38° 27.665' N LONG 9° 5.992' O ALT 229 m DISTÂNCIA FOCAL 38 mm

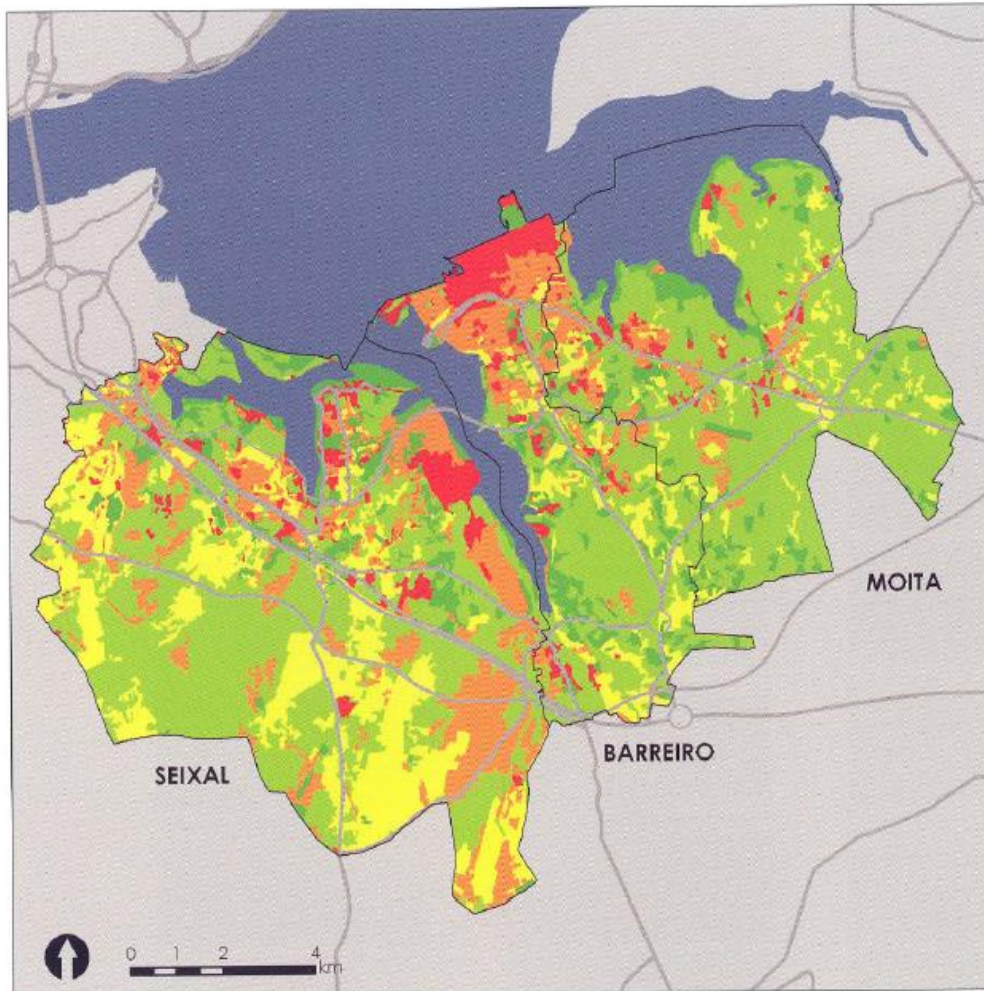
EXEMPLO DE FICHA DE CAMPO



Landscape visual quality studies

Precedents

■ Carl



Preferências Visuais Visual Preferences



Muito elevada
Very high



Elevada
High



Moderada
Medium



Baixa
Low



Muito baixa
Very low

... part of my PhD study

▪ Sudoeste alentejano, SW Portugal



Area: 673,5 sq. km

Length (N-S): 58 km

Maximum width: $\pm$ 27,5 km (Serra de São Luís);

- ***NATURA 2000 Site of Community Importance.***

“PTCON0012 – Costa Sudoeste”;

- ***NATURA 2000 Special Protection Area***

“PTZPE0015 – Costa Sudoeste” (partially);

- Northern half of ***Sudoeste Alentejano e Costa Vicentina Natural Park.***

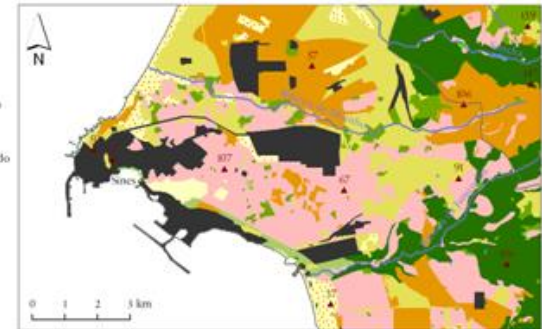
Landscape Ecological Quality



Cobertura do solo (2005)

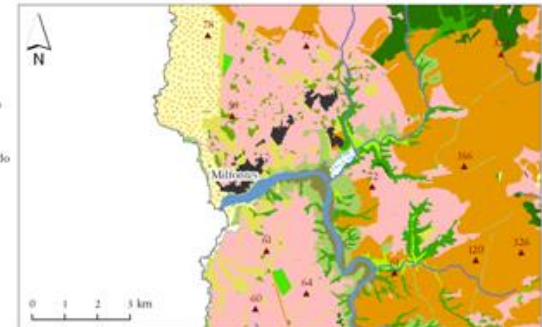
Classes de cobertura do solo (2005):

- Áreas sociais
- Eucaliptais e outra vegetação exótica
- Pinhais
- Afloramentos rochosos, pedreiras e areeiros
- Culturas arvenses, prados e pastagens pobres
- Esteiras e outros matos
- Culturas permanentes
- Mosaico de culturas hortofrutícolas e edificado
- Montados de sobreiro
- Cercas e sobreiros
- Pastagens higrofilas
- Arrozais
- Rio Mira e outros planos de água
- Vegetação de vau
- Salinas e aquaculturas
- Vegetação de arriba rochosa
- Vegetação psamófila e praias



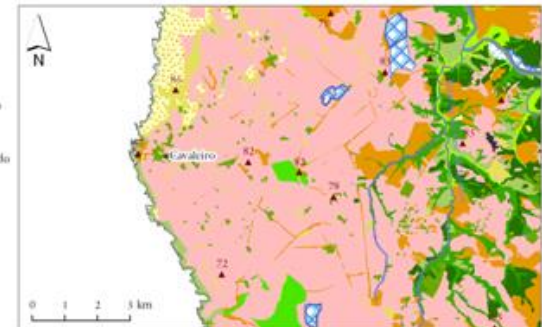
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- Culturas permanentes
- Mosaico de culturas hortofrutícolas e edificado
- Montados de sobreiro
- Cercas e sobreiros
- Pastagens higrofilas
- Arrozais
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- Vegetação de vau
- Salinas e aquaculturas
- Vegetação de arriba rochosa
- Vegetação psamófila e praias



Classes de cobertura do solo (2005):

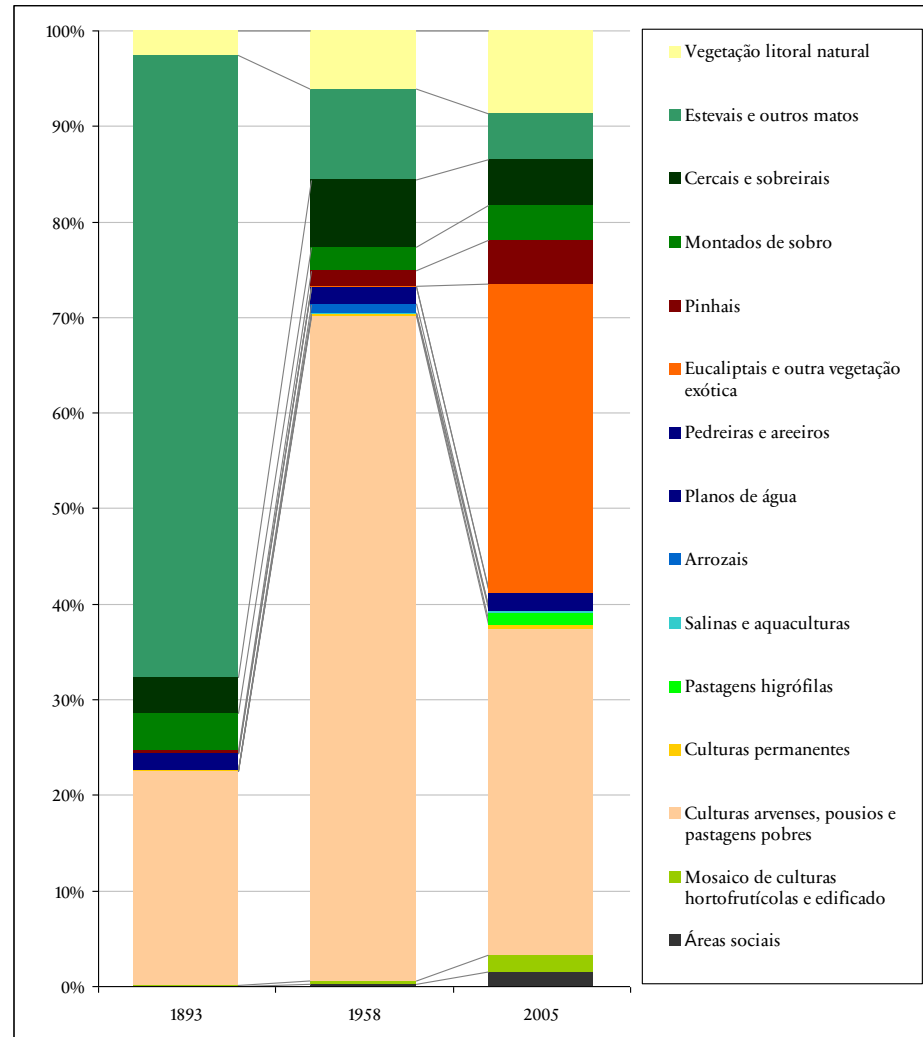
- Áreas sociais
- Eucaliptais e outra vegetação exótica
- Pinhais
- Afloramentos rochosos, pedreiras e areeiros
- Culturas arvenses, prados e pastagens pobres
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- Pastagens higrofilas
- Arrozais
- Rio Mira e outros planos de água
- Vegetação de vau
- Salinas e aquaculturas
- Vegetação de arriba rochosa
- Vegetação psamófila e praias



Landscape Ecological Quality

- Recent landscape evolution (1890, 1958, 2007)

Milfontes



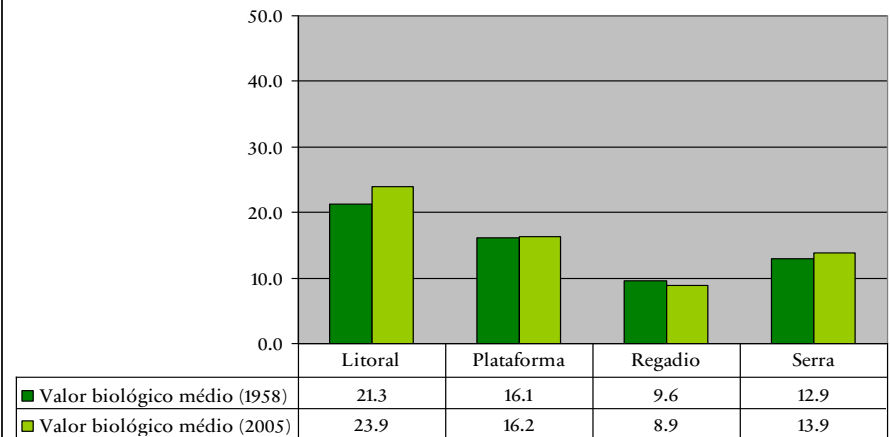
Landscape Ecological Quality

- Biological Value Index
- Conservation Interest Index

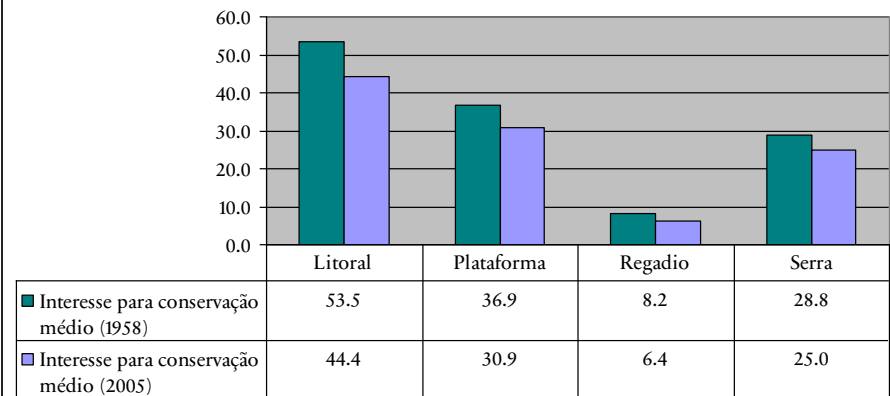
■ Cavaleiro



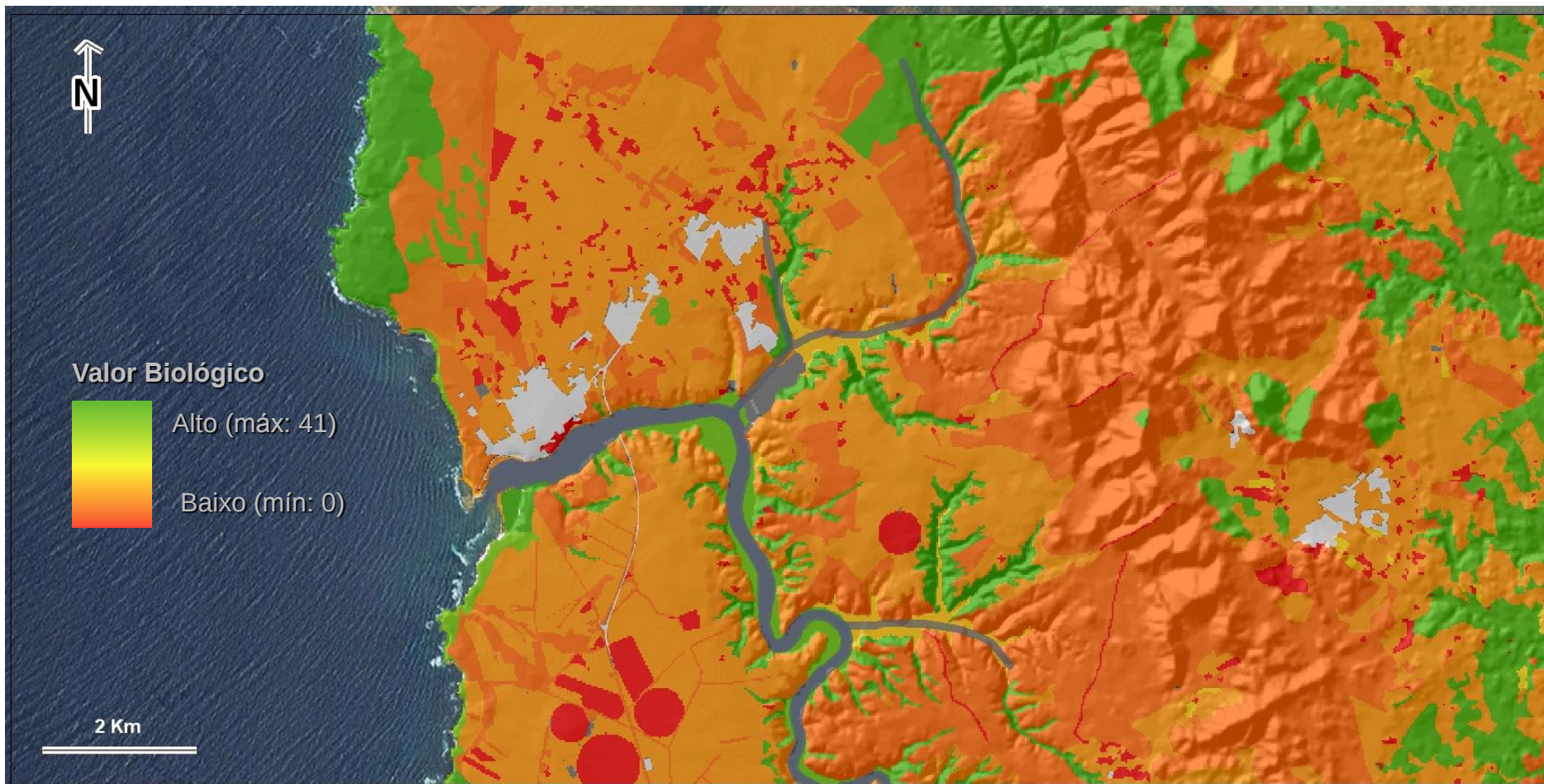
Sector 3 - Evolução do valor biológico médio (valor/m²)



Sector 3- Evolução do interesse para a conservação médio (valor/m²)



Biological Value (B) Index

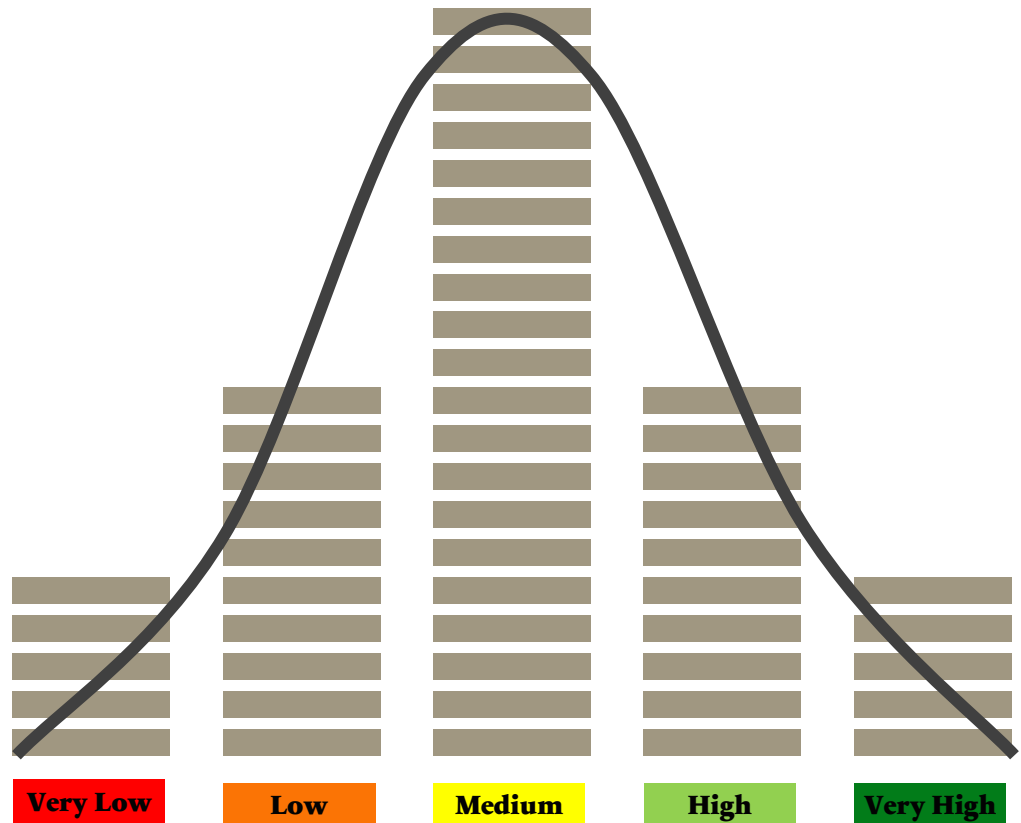


Landscape visual preference

- Is there a common pattern for all users?
 - A group pattern?
 - Or is it too personal?
-

■ Q-Sort method (Stephenson, 1953)

- ❑ 50 photos
- ❑ 5-point scale
- ❑ Forced (Normal) distribution
- ❑ 8 - 10 minutes



■ Q-Sort method (Stephenson, 1953)

- ❑ 300 Inquired
 - 41% Men
 - 59% Women

- ❑ Survey location
 - 80% On site
 - 10% Nature conservation technicians
 - 10% Wageningen Univ. students



Common pattern?

▪ Linear regression analysis

Model	R	R ²	Adjusted R ²
1	.901	.812	.786

Dependent Variable:

- Average scores of photos

Predicting factors:

- | | |
|---|------------------------------|
| <ul style="list-style-type: none"> • Landform, • Water (Lake, River or Sea) views, | Abiotic landscape component |
| <ul style="list-style-type: none"> • Vegetation structure, • Landscape 'greenness', | Biotic landscape component |
| <ul style="list-style-type: none"> • Traditional character of landscapes, • Heritage views. | Cultural landscape component |

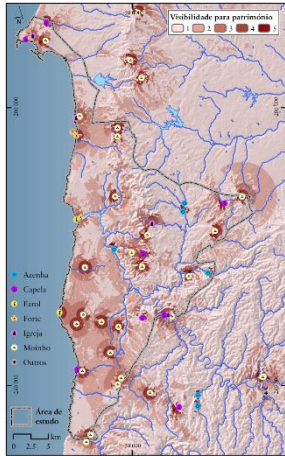
▪ Linear regression analysis

Model	R	R ²	Adjusted R ²
1	.901	.812	.786

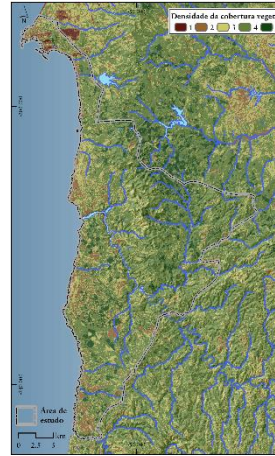
Average photo score = 1.088 + (0.229*Water views) + (0.157*Traditional character of landscape) + (0.104*Landform) + (0.113*Vegetation structure) + (0.100*Heritage views) + (0.095*Landscape ‘greenness’)



Explanatory factor maps



Heritage views



Landscape 'greenness'



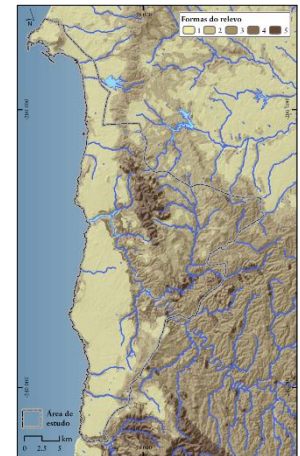
Water views



Traditional character of landscape

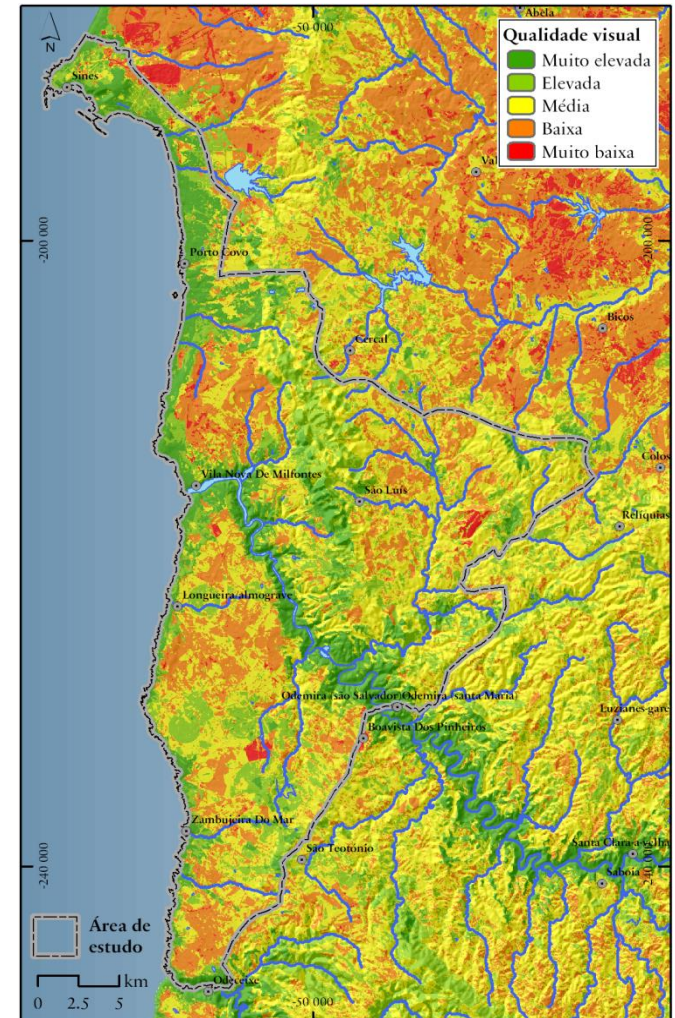
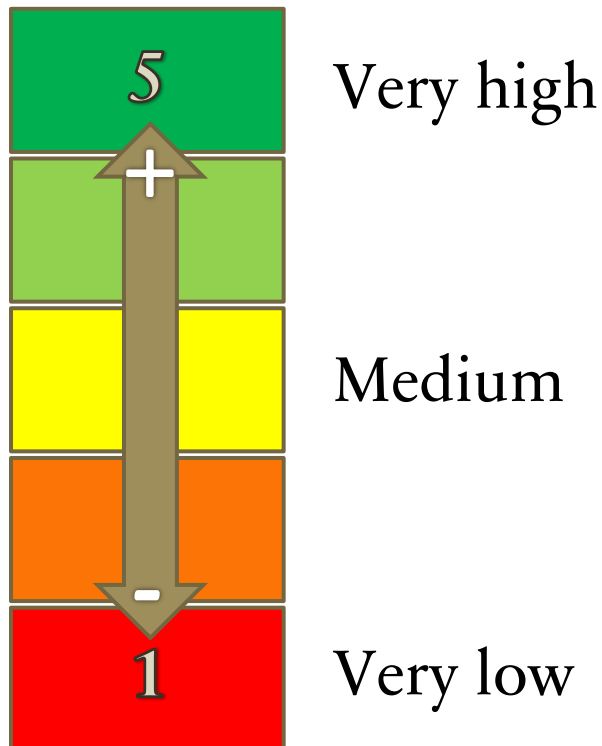


Vegetation structure



Landform

Sudoeste Alentejano's map of visual landscape quality



Group pattern?

TWINSPAN (Two Way INdicator SPecies ANalysis)

- Proposed by Hill (1979), its an ordination technique mainly used in **plant community classification** studies;
 - Its use has been tested with success in many other knowledge areas, including **landscape classification** (Chuman & Romportl 2010) and **landscape character mapping** (Vogiatzakis et al. 2004);
 - Through a **polythetic divisive classification** approach, TWINSPAN generates a sorted two-way table of the original data matrix
-

■ **TWINSPAN Analysis** (Hill, 1979)

Public survey (300 inquiries)

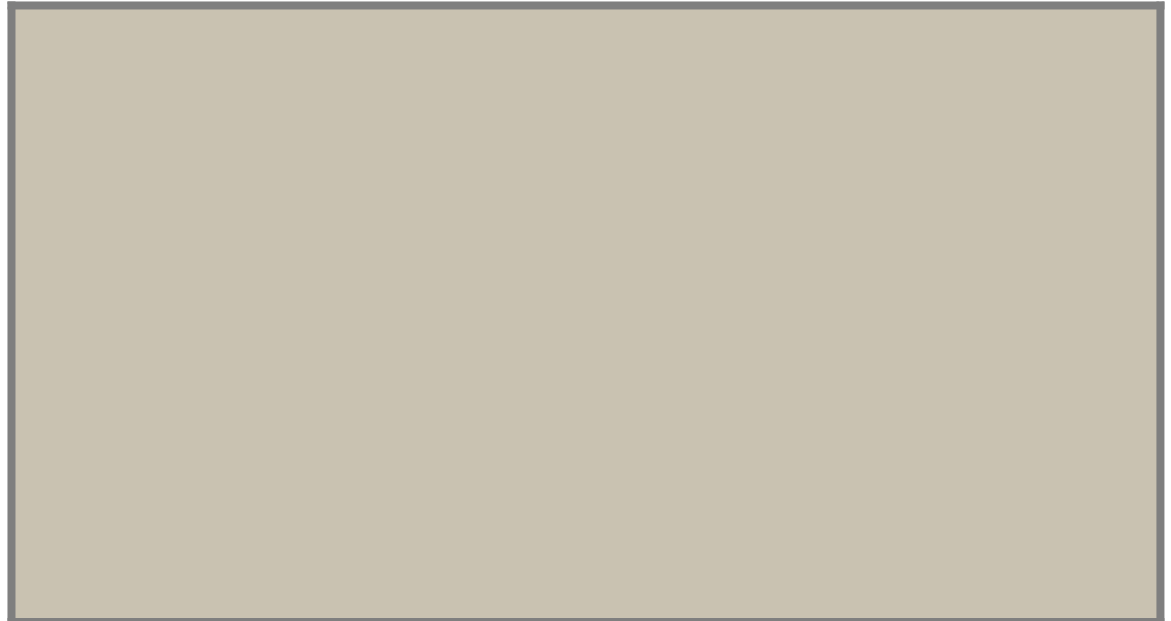
**Landscape
Photos**

1
2
3
4
5

(...)

45
46
47
48
49
50

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 (...) 295 296 297 298 299 300



■ TWINSpan Analysis (Hill, 1979)

		User Group I (80 inquired)	User Group II (85 inquired)	User Group III (114 inquired)	User Group IV (21 inquired)
		211, 213, 292, (...) 280, 287, 293	4, 5, 15, (...), 136, 177, 209	7, 12, 17, (...), 164, 184, 227	142, 210, 230, (...) 218, 276, 283
Photo Group A (3 photos)	14 20 21				
Photo Group b (40 photos)	10 15 (...) 17 27				
Photo Group c (7 photos)	30 44 45 46 48 50 49				

■ TWINSpan Analysis (Hill, 1979)

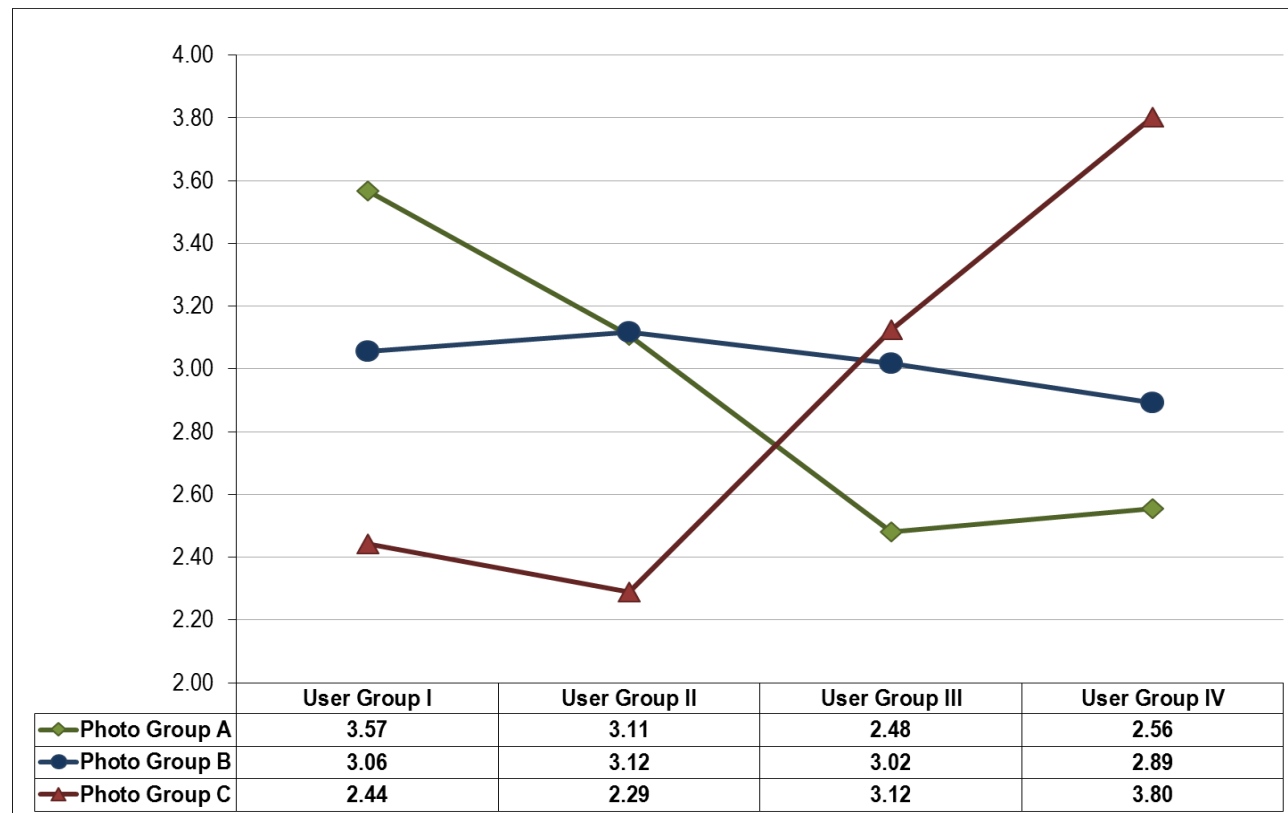
Photo Group A



Photo Group B



Photo Group C



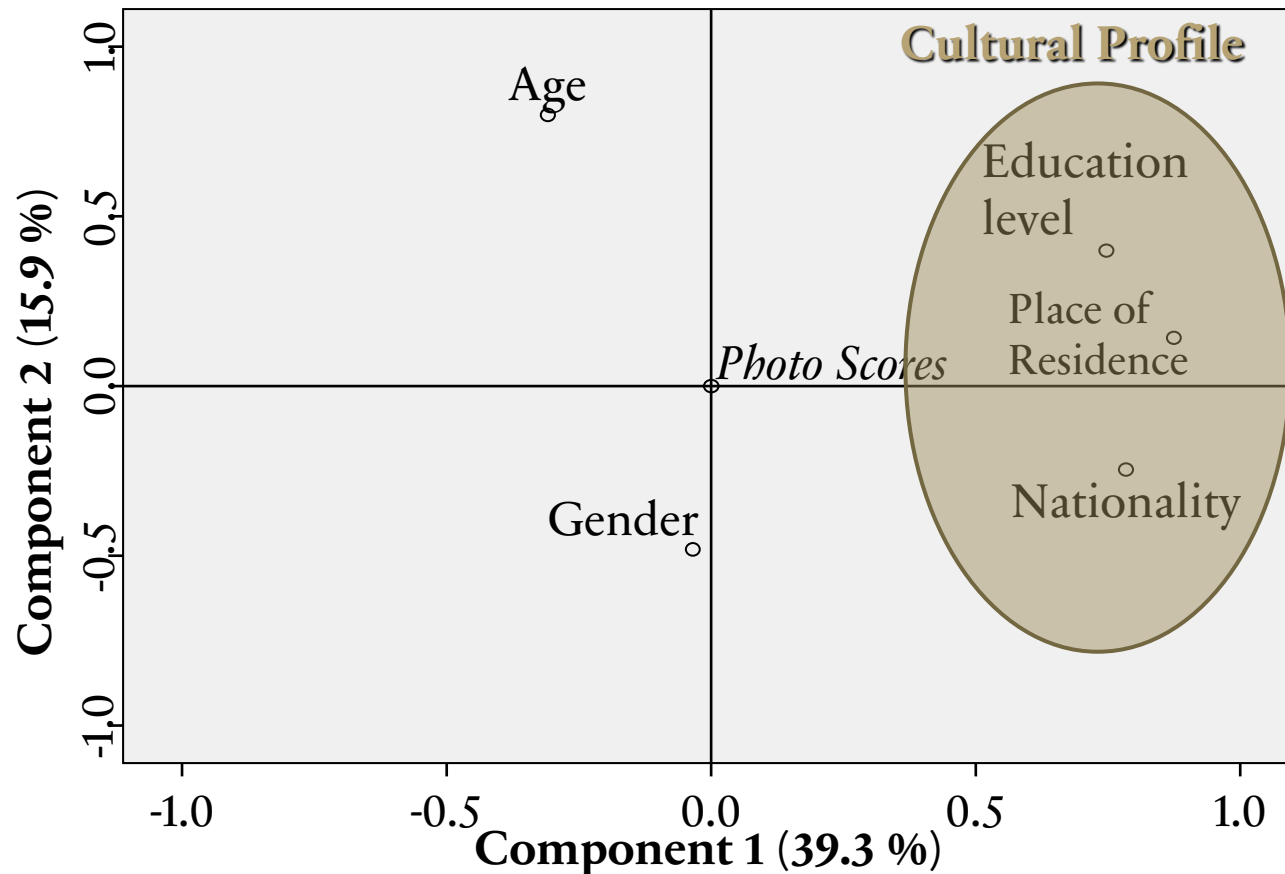
▪ Analysis of variance (ANOVA)

Statistically significant differences ($P > 0.05$) exist, as a result of the inquired person's **Cultural Profile** (Nationality * Place of residence* Education), as well as **Age** and **Gender**.

Dependent Variable: Average scores of photos

Source	Type III Sum of Squares	df	Mean Square	F	Significance
Photo	643.354	49	13.130	16.449	.000
Photo * Age	299.864	150	1.999	2.504	.000
Photo * Gender	94.453	50	1.889	2.367	.000
Photo * Nationality * Place of residence* Education	952.528	600	1.588	1.989	.000
Error	11294.899	14150	.798		
Total	18000.000	14999			

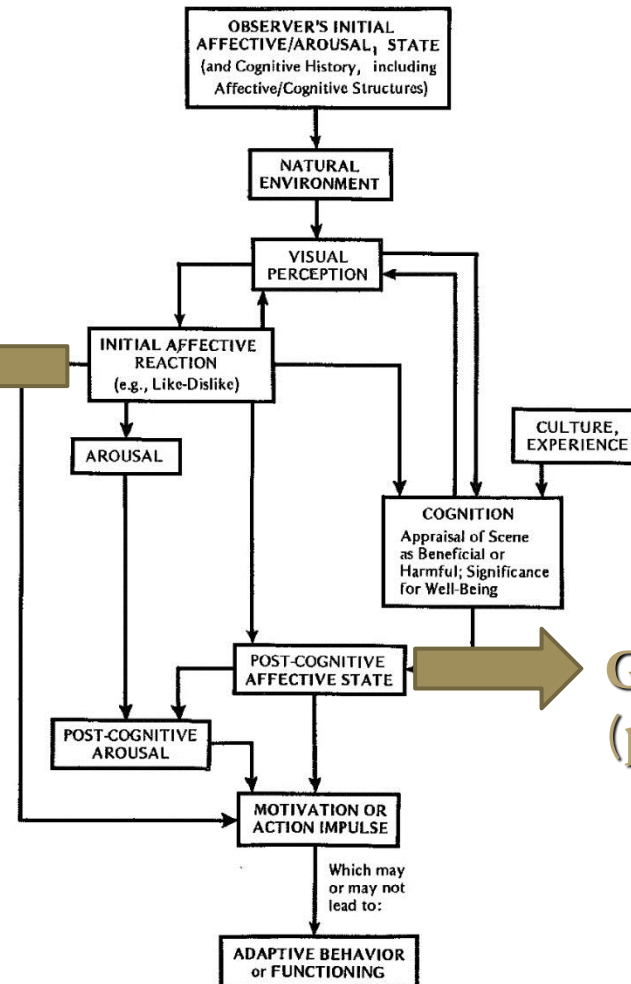
Principal Components Analysis



How to interpret the coexistence of
a **common pattern** and also **user
group patterns?**

Model of affective response to a natural scene (Ulrich, 1983)

Common pattern
(perception-based)



Group pattern
(preference-based)

Final Remarks

**‘Visual thinking’ should be largely encouraged in
landscape architecture research.**

Final Remarks

Regarding Visual landscape Monitoring, the use of terrestrial oblique photography is an inexpensive, easy way to record information, enabling also the possibility of analysing data, both quantitatively and qualitatively.

The improved access to technology and software will bring many new opportunities in this area.

Final Remarks

Regarding Visual landscape Quality results raise an interesting discussion on the **need to ask people their opinion, rather than relying solely on experts** when evaluating visual landscape quality.

Planning should be improved by the use of this information, namely in the context of **protected areas, heritage sites and high natural value farmland.**
