Managing European Shorelines and Sharing Information on Nearshore Areas

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Mats Persson
Lund University
Construction Management

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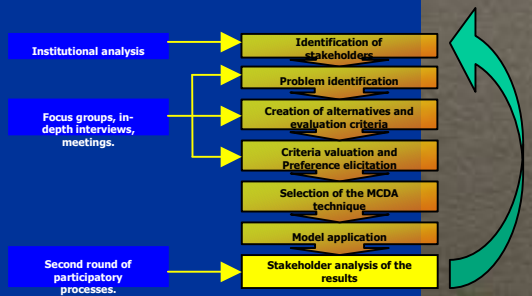
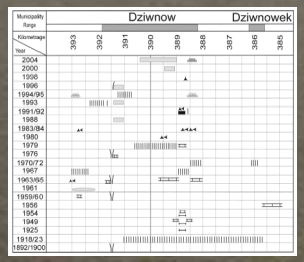
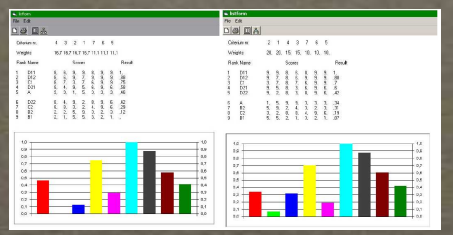
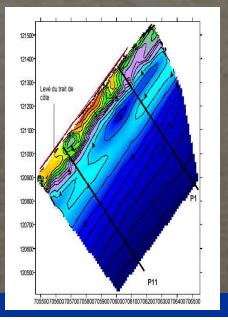
Socio-economic valuation of shorelines – experiences from the MESSINA-project









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Presentation

1. MESSINA Project
2. Valuing the shoreline
3. Guideline
4. Continued work
5. Closing comments

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MESSINA context

M anaging
E uropean
S horelines
& S haring
I nformation
on N ear shore
A reas

based on EUROSION recommendations

"scientific knowledge relevant for coastline management and mitigation of coastal hazards is fragmented and poorly accessible to local managers"

MESSINA initial wish:

to explore further the recommendations of EUROSION and test their practical feasibility in the fields.

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MESSINA context - Interreg

- Programme financed from the European Regional Development Fund (ERDF), as part of the Structural Funds, and co-financed by national project partners
- INTERREG IIIC for interregional co-operation
  - give access to experience of other actors involved in regional development policy
  - create synergies between "best practice" projects and the Structural Fund's mainstream programmes.

The overall aim is to improve the effectiveness of regional development policies and instruments through large-scale information exchange and sharing of experience (networks) in a structured way.

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MESSINA context

Long-term Objective

to help bridge these gaps by breaking "knowledge isolation" of some local authorities and institutions in Europe and by raising their managerial and technical capabilities through the mutualisation of the experience

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MESSINA context

Provide a state of the art of shoreline monitoring and modelling techniques supporting coastline management policies;

Review concrete examples of socio-economic analysis methodologies applied to shoreline management

Embed lessons learnt from existing coastal defence engineering practices - with a particular attention paid to innovative techniques;

Assess information requirements to better integrate coastal erosion processes into spatial planning policies;

Design and implement a pilot GIS-based information system dedicated to shoreline management planning at the local level, to be experimented by the project partners themselves.

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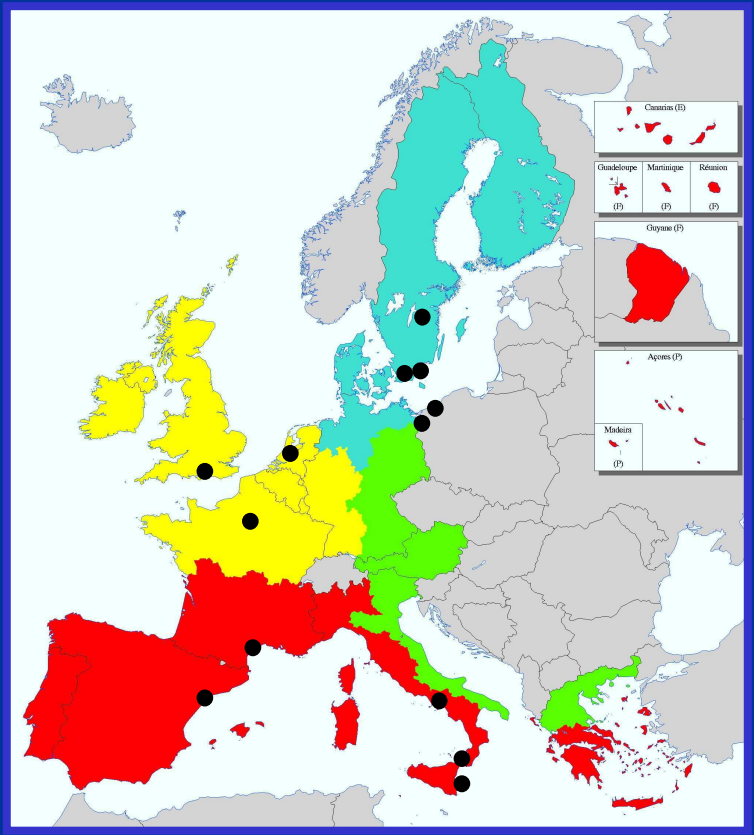
Partners



1. Institut Géographique National (IGN France International)
2. National Institute for Coastal and Marine Management of the Netherlands (RIKZ)
3. Swedish Geotechnical Institute (SGI)
4. Community of Agglomeration of the Thau Bassin (France)
5. Municipality of Ystad (Sweden)
6. Municipality of Rewal (Poland)
7. Province of Ragusa (Italy)
8. Isle of Wight Council (UK)
9. Autonomous University of Barcelona (UAB) - (Spain)
10. University of Szczecin (Poland)
11. University of Naples Federico II (Italy)
12. University of Messine (Italy)
13. Centre for coastal erosion studies (Sweden)

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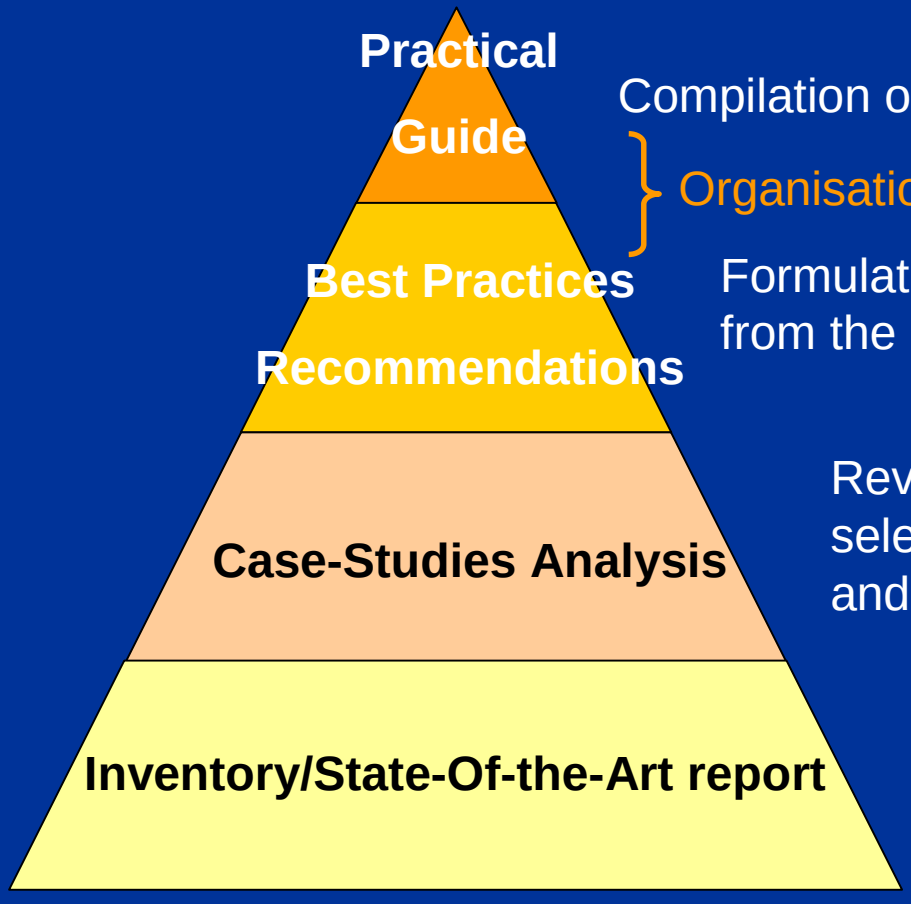
Methodology



Compilation of results into Practical Guide

Organisation of a validation and discussion workshop

Formulation of a set of operational recommendations from the review of case-studies

Review of lessons learnt from Case-studies: selected as representative of different methods and practices inside and outside Europe

Existing methods and practices: technical, financial, organisational, social aspects… strenghts and weaknesses

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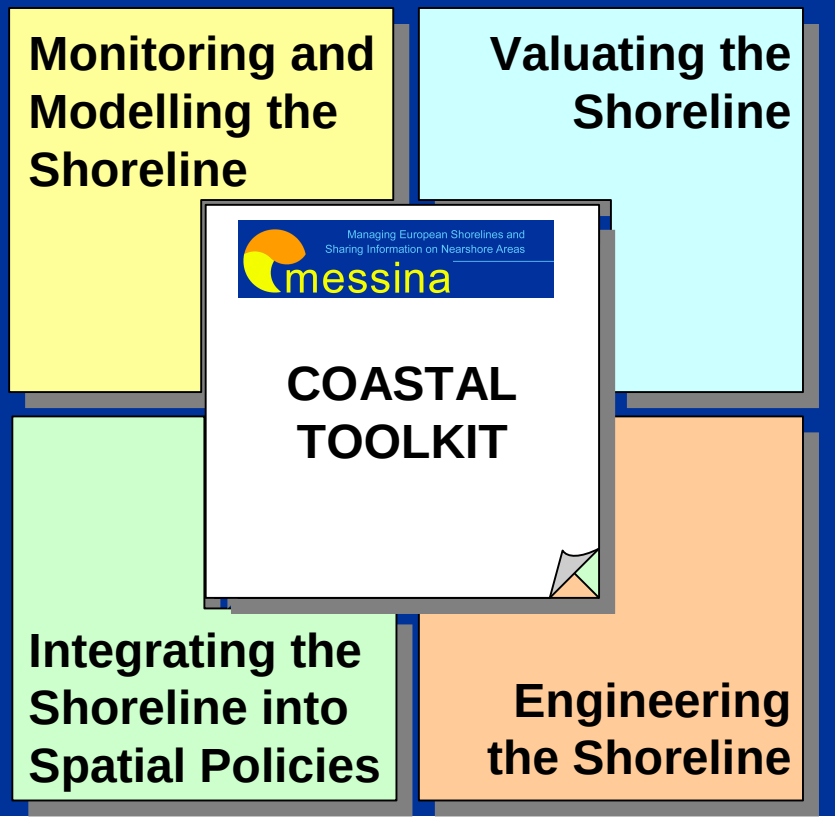
MESSINA toolkit

MESSINA toolkit

for local authorities / coastal managers

- Leaflet of presentation for MESSINA,
- 4 Practical Guides
- A demo CDROM featuring GIS-based prototype(s).

- A series of 4 workshops in line with the topic of each Practical Guide



www.interreg-messina.org web site giving a full online access to

- the project outputs and events
- a database of highly documented engineering techniques

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Messina - Component 3

Valuing the Shoreline

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Valuing the shoreline

Objectives

- Review concrete examples of economic analysis methodologies applied to shoreline management policy in Europe
- Create Guideline for socio-economic analysis for coastal management

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Valuing the shoreline

Partners

- Swedish Geotechnical Institute (SGI), CP leader SE
- National Institute for Coastal and Marine Management (RIKZ) NL
- Autonomous University of Barcelona (UAB) ES
- University of Szczecin PL
- Municipality of Ystad SE
- Centre for Coastal Erosion Studies SE

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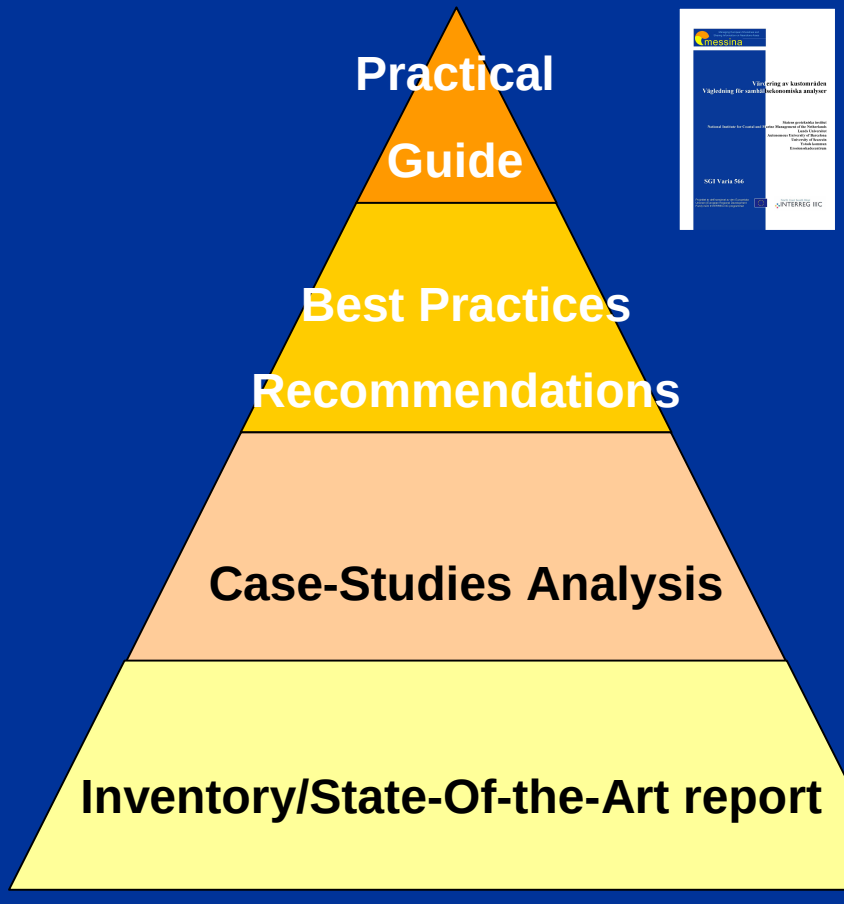
Work methodology



Guideline for Socio-economic analysis

Seminars and analysis

France, Holland, Italy, Poland, Sweden

”State-of-the-Art”-report

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Guideline for socio-economic analysis

Best Practice for socio-economic valuation for coastal management

- How to evaluate coastal erosion projects
- Analyses of coastal erosion projects in Europe
- Recommendations for maximising the benefits of investments and use of the coastal areas
- Raise the public awareness on coastal issues

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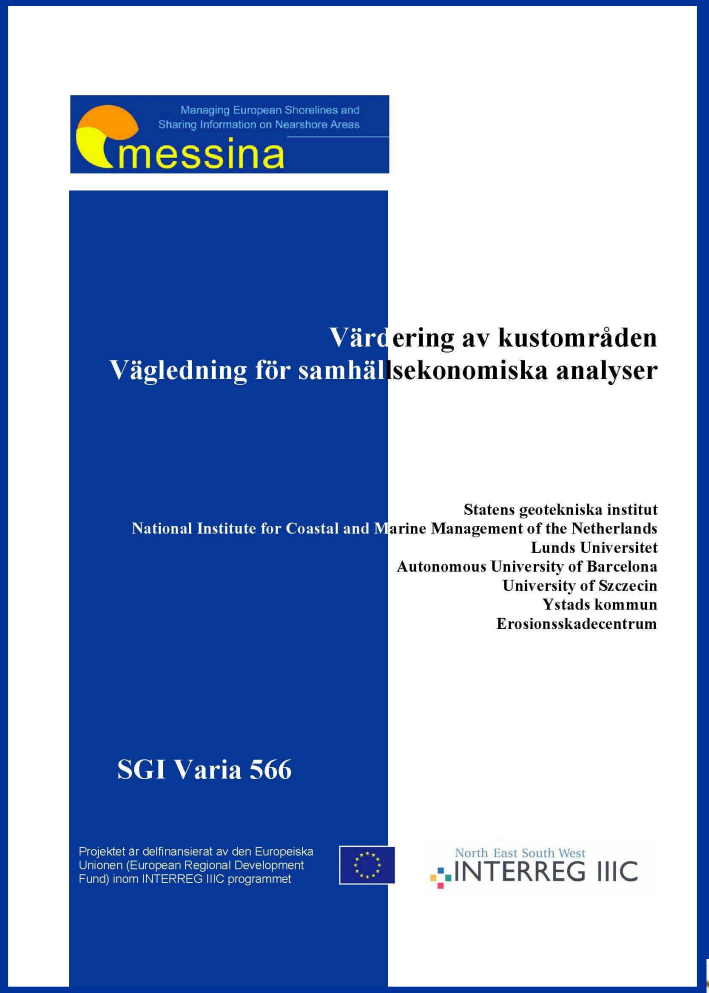
Guideline



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Contents of the Guideline

1. Reader's Guide
2. Why socio-economic valuation of coastal projects?
3. Socio-economic analysis of coastal erosion projects
4. General remarks on socio-economic analysis of coastal projects

Appendix 1. Economic analysis models

Appendix 2. Selection of socio-economic evaluation method

Appendix 3. Case studies – lessons learned

Appendix 4. Literature for further reading

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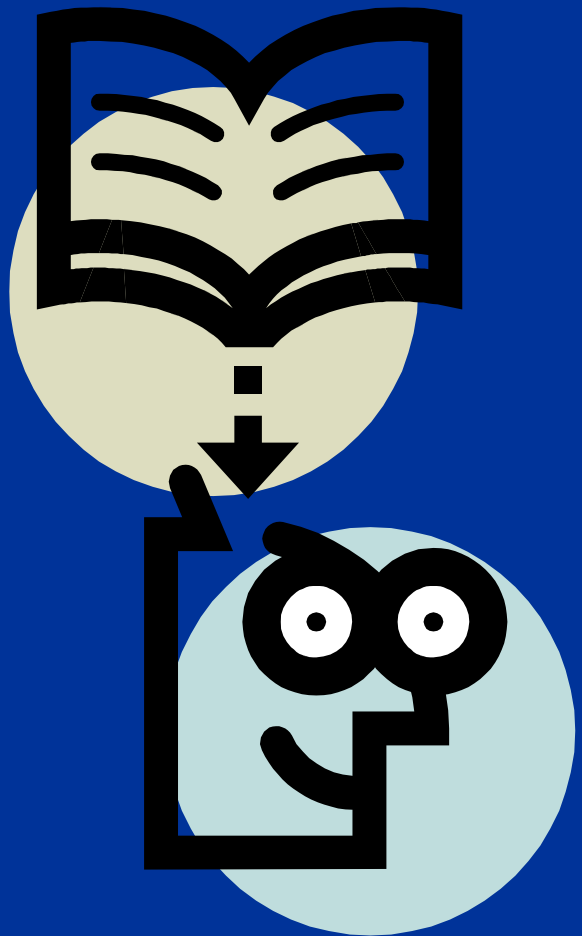
1. Reader's Guide



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2. Why socio-economic valuation of coastal projects?

Integrating cost and benefits in decision-making!

- Internalize coastal erosion cost and risks in planning and investment decision
- Make responses to coastal erosion accountable (transparent)

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Project appraisal in context

- The political and policy level
- The engineering or project level

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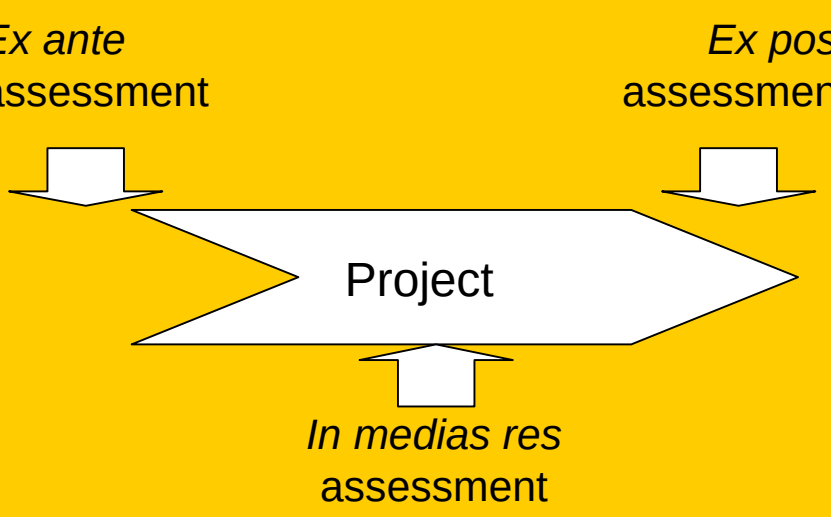
Project appraisal in context

Coastal erosion processes



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3. Socio-economic analysis of coastal erosion projects

Main steps

- Initialise analysis - Hazard and risk analysis
- Problem analysis
- Stakeholder management/involvement
- Strategy and project scope
- Evaluation method
- Identify effects – quantify and qualify
- Evaluate alternatives and presentation

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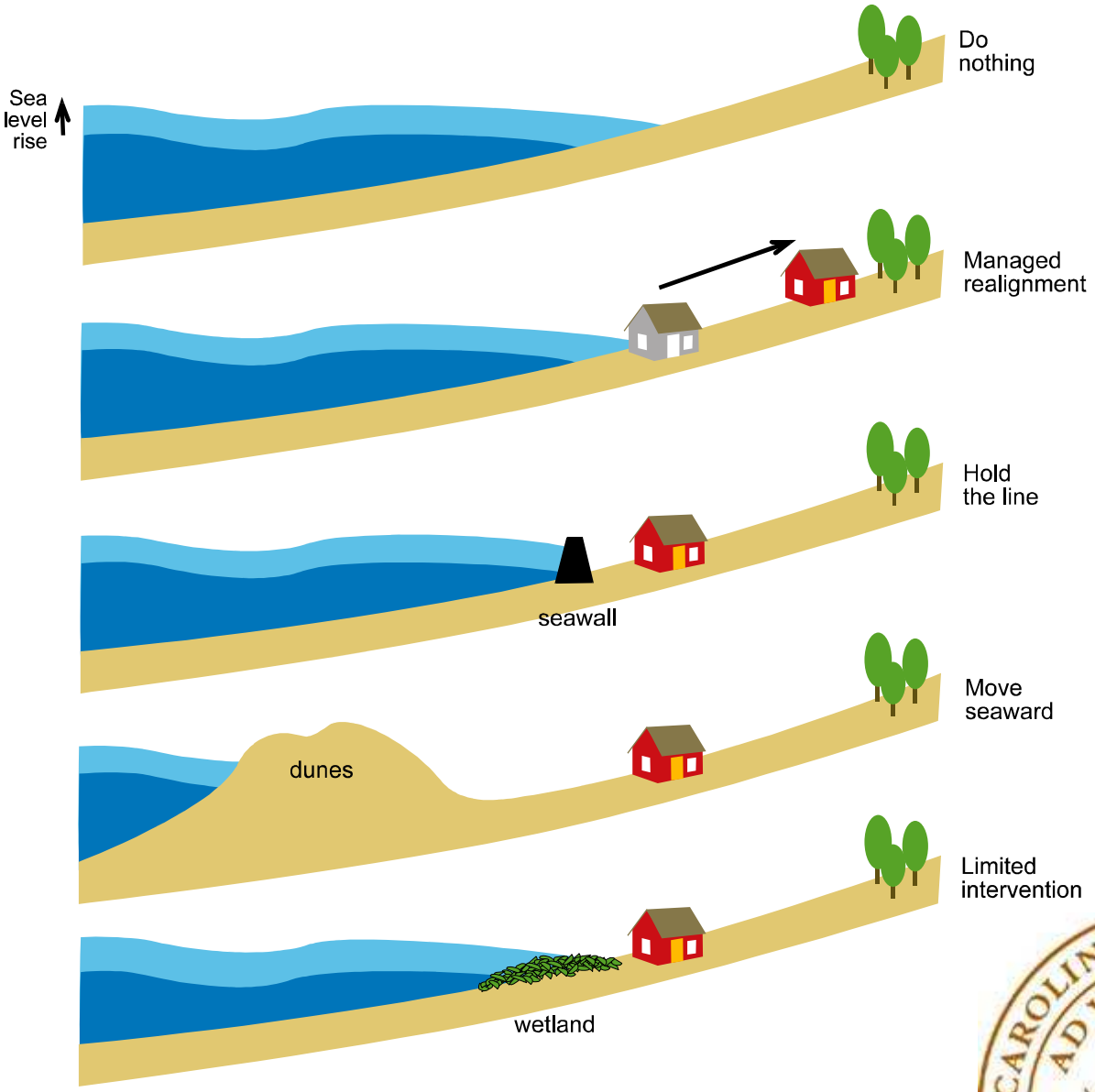
Policy options for coastal management



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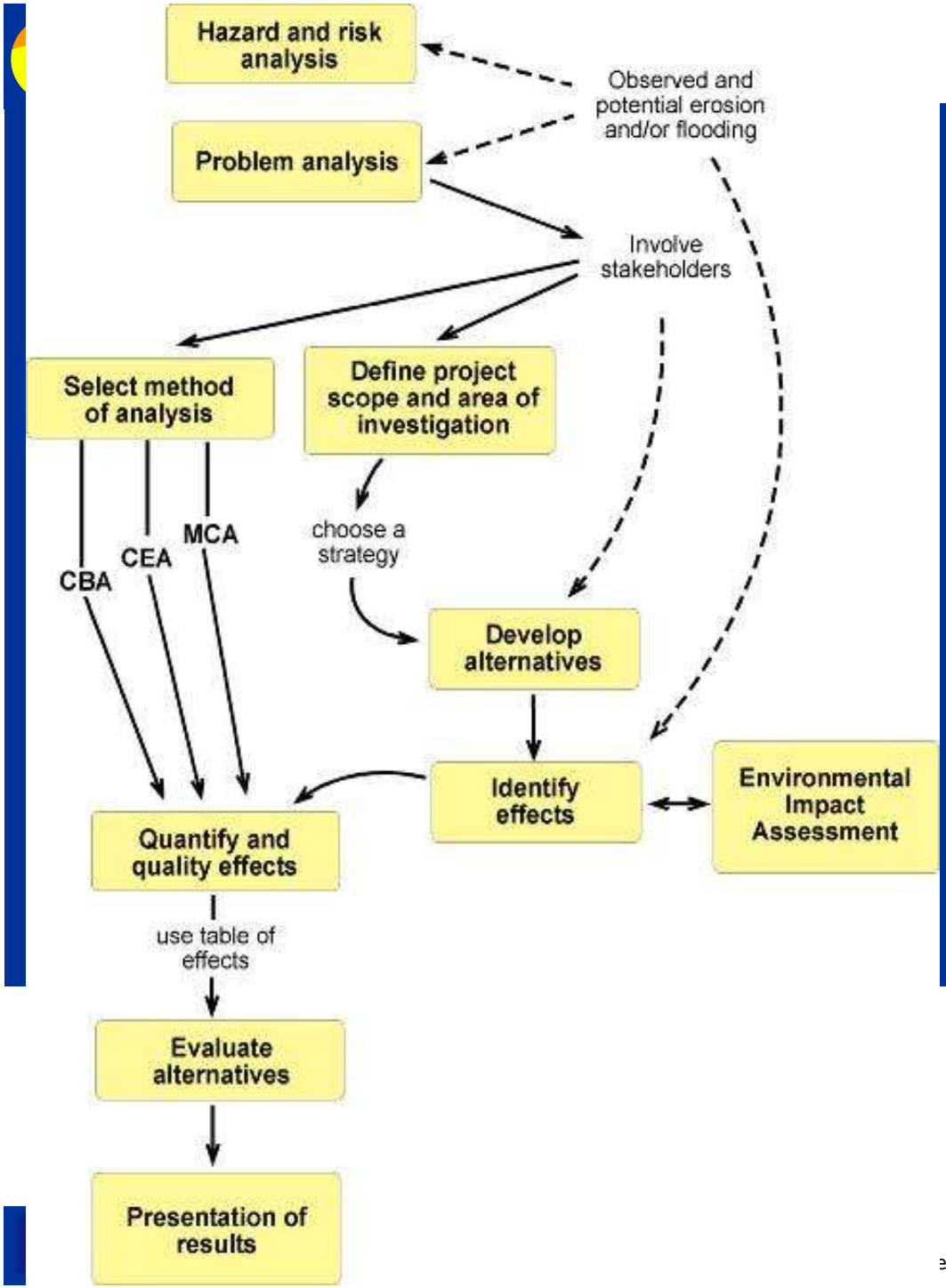

Steps in impact assessment and project appraisal of coastal projects

Table of effects

	Units	Alternatives				
		Do nothing	1	2	3	4
Direct effects						
Investment costs	million €	0	8353	5350	3262	6487
Maintenance costs	million €	0	250	305	358	293
Direct/indirect effects						
Maintaining legal safety levels	yes/no		yes	yes	yes	yes
Damage to property and infrastructure	million €	3947	0	0	0	0
Agriculture	million €	396	0	0	0	0
Recreation	million €	1754	0	0	0	0
Other damages	million €	2657	0	0	0	0
Effects on current usage						
Purchase properties	number	0	2290	320	70	1540
Purchase land	ha	0	15835	2980	2210	10705
Sand mining	million m3	0	74	26	21	25
Effects on future usage						
Extra nature areas	ha	0	16354	4229	3102	9869
Chances of landscape	+/-	0	-	+	+	-

4. General remarks on socio-economic analysis of coastal projects

An integrated assessment of the various impacts, together with **stakeholder** participation should lead to more sustainable and acceptable solutions.

It is important to **monitor** the economic impact during the lifetime of coastal erosion projects that have been completed and to **review systematically** the approaches and methods employed for the valuation of the economic, ecological and social impacts of the projects

The case studies:

- helps **clarifies impacts** and effects of coastal erosion
- provides **transparency** of public decisions and **public spending**
- requires **co-operation** between various disciplines in establishing present situation and forecasting future development, the subsequent impacts and effects, valuation of technical, economic and social aspects and presentation for decision-makers.

Appendix 1. Economic analysis models

Appraisal methods

- Cost-Benefit Analysis (CBA)
- Cost-Effectiveness Analysis (CEA)
- Multi-Criteria Analysis (MCA)

Methods and techniques

Methods for valuation of effects:

- Travel Cost Method (TCM)
- Hedonic Pricing Method (HPM)
- Contingent Valuation Method (CVM)
- Production Factor Method (PFM)
- Prevention Cost Method (PCM)
- Shadow Project Method (SPM)
- Benefit Transfer Method (BTM)

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App 2. Selection of socio-economic evaluation meth.

- This appendix help a user to select the appropriate socio-economic evaluation method to assess the economic challenges regarding a project. This is based on literature, analysis of the Messina case studies and the experience in other projects by consultants Donkers and van Cleef.

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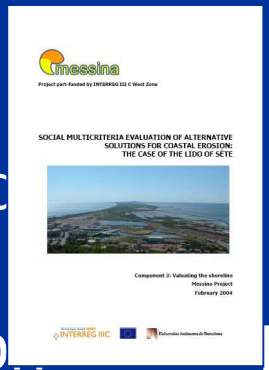
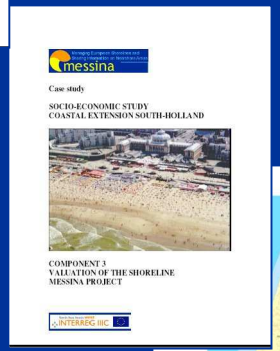
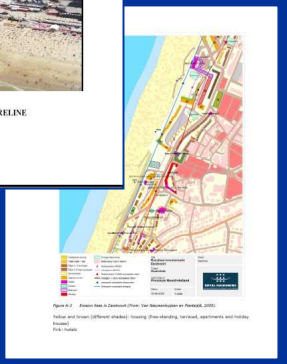
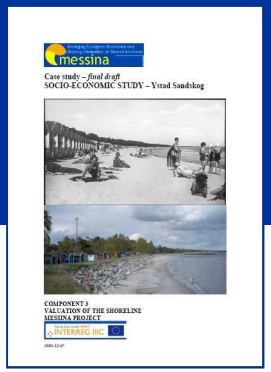
Appendix 3. Case studies – lessons learned

- Lido of Sète (France)
- Coastal extension in south Holland (The Netherlands)
- Economic optimisation of protection level of coastal areas outside the dike (The Netherlands)
- Beach nourishment in Ostia (Italy)
- Beach drainage in Procida (Italy)
- Trzesacz (Poland)
- Ystad Sandskog (Sweden)









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Case study

SOCIO-ECONOMIC STUDY
COASTAL EXTENSION SOUTH-HOLLAND

COMPONENT 3

Case study – *Draft version*

SOCIO-ECONOMIC STUDY - TRZESACZ (POLAND)

MESSINA PROJECT
COMPONENT 3
VALUATION OF THE SHORELINE

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Case study – Ystad Sandskog

- 1936

- 2005

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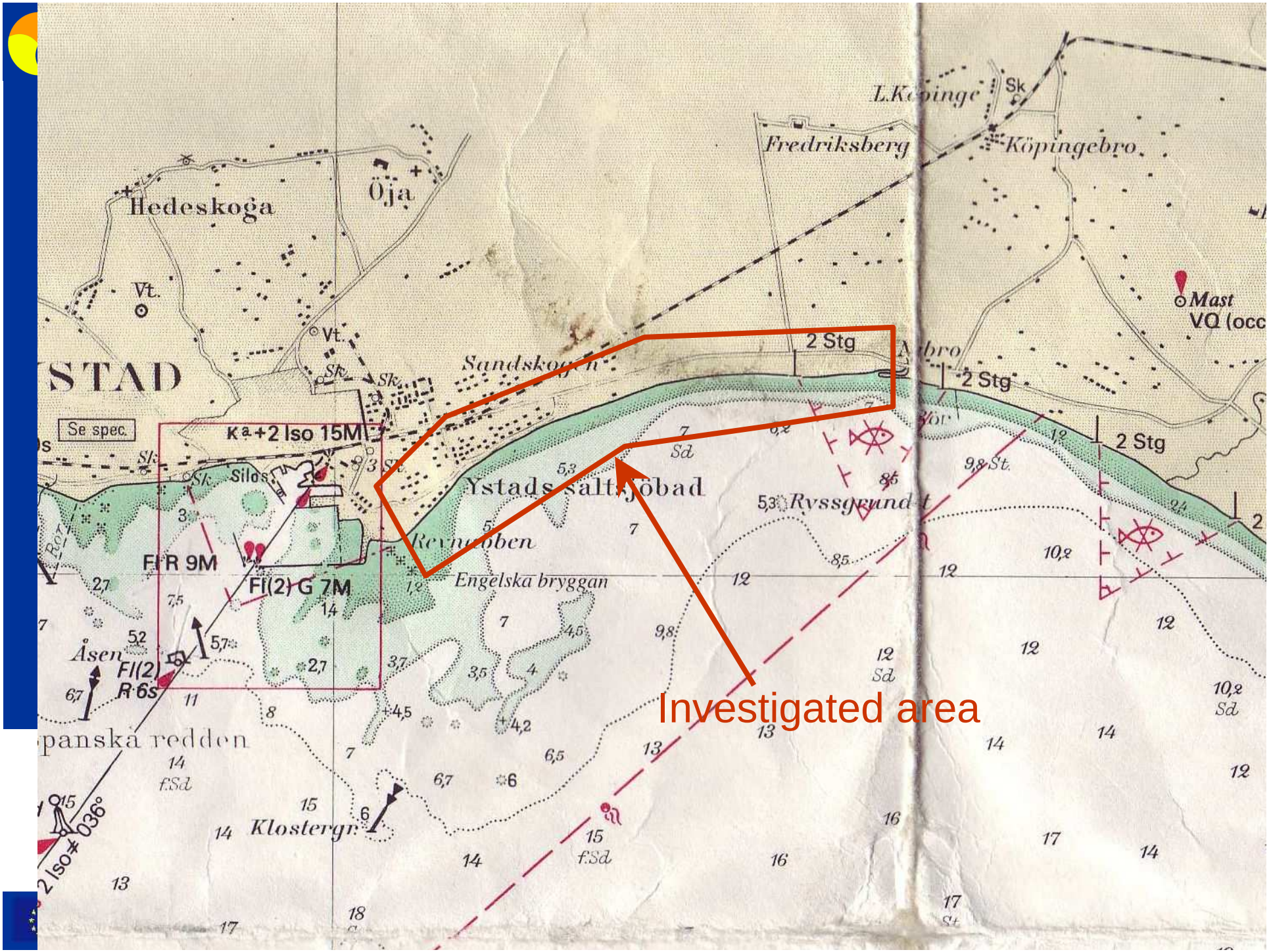
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Öja
Vt.
Fredriksberg
Köpingebro
Mast
VQ (occ
2 Stg
2 Stg
2 Stg
Sandskogen
Se spec.
Ka+2 lso 15M
Ystads saltsjöbad
Ryssgrundet
Fl R 9M
Fl(2) G 7M
Engelska bryggan
Åsen
Fl(2) R 6s
Klostergr
2 lso 036°
Investigated area

Infrastructure at risk

- Hotel on the beach, summer cottages, road etc.

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Estimated coastline movement over next 100 year - if nothing is done

Section	Type of coastline	Length (m)	Coastline retreat (m)	
			due to erosion	due to sea level rise
0-A	Stone protection	400	-40	-50
A-B	Stone protection + gabion ±100 meter of B	450	-30	-50
B-C	Sand	230	-30	-50
C-D	Sand + gabion	310	-30	-50
D-E	Sand + gabion	290	-30	-50
E-F	Sand + gabion	300	-30	-50
F-G	Sand + Stone protection	150	-30	-50
G-H	Sand + Stone protection	300	-50	-50
H-I	Sand + Stone protection	400	-50	-50
I-J	Sand	100	-70	-50

Predicted coastline movement for options

Section	Type of coastline	Length (m)	Coastline movement (m) "-" = retreat "+" = extension		
			No Project *Do nothing*	Option 1 *Mainte-nance*	Option 2 *Beach nourishment*
0-A	Stone protection	400	-90	-0	-0
A-B	Stone protection + gabion ± 100 meter of B	450	-80	-0	-0
B-C	Sand	230	-80	-0	+5
C-D	Sand + gabion	310	-80	-0	+5
D-E	Sand + gabion	290	-80	-0	+2
E-F	Sand + gabion	300	-80	-0	+2
F-G	Sand + Stone protection	150	-80	-0	+2
G-H	Sand + Stone protection	300	-100	-0	+2
H-I	Sand + Stone protection	400	-100	-0	+2
I-J	Sand	100	-120	-50	-1

Table of effects

	Do nothing	Option 1 Mainte-nance	Option 2 Beach nourishment
Direct effects			
Investment costs	0	Yes	Yes
Maintenance costs	0	Yes	Yes
Direct/indirect effects			
Damage to property and infrastructure	Yes	Some	Some
Agriculture	0	0	0
Recreation/Tourism	Yes	0	0
Other damages	Yes	0	0

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Evaluation in Excel-spreadsheet

Erosion Value Calculation Sheet with delay options

Client/Authority

Ystad kommun - Teknik och fastigheter

Project name | **Option:**

Ystad Strandskog

Project reference	Messina Case
Base date for estimates (year 0)	Oct-2005
Scaling factor (e.g. MSEK, KSEK, SEI	MSEK
Discount rate	1.5%

Ref	Asset Description	MV MSEK	Year	Prob of loss without project in year	Without Project
0	Hotell	40.00	10	0.3	10.34
1		40.00	20	0.4	11.88
2		40.00	30	0.3	7.68
3	Fotball area (part of)	4.00	20	0.25	0.74
4		4.00	21	0.25	0.73
5		4.00	22	0.25	0.72
6		4.00	23	0.25	0.71
7	Summer villa area	400.00	10	0.2	68.93
8		400.00	20	0.2	59.40
9		400.00	30	0.2	51.18
10		400.00	40	0.2	44.10
11		400.00	50	0.2	38.00
12	Forest	40.00	10	0.2	6.89
13		40.00	20	0.2	5.94
14		40.00	30	0.2	5.12

North INT

P
B

Results from evaluation

Costs and benefits of options in Million SEK (9,4 SEK = 1 €)

	No Project	Option 1	Option 2	
Total PV Costs	0	60	50	
PV damage PVd	235	53	56	
Total PV benefits PVb		182	180	
Average benefit/cost ratio		3,0	3,6	
Brief description of options:		-	*Highest b/c*	

Option 1: Maintain existing seawall

Option 2: Beach nourishment

SOCIAL MULTICRITERIA EVALUATION OF ALTERNATIVE SOLUTIONS FOR COASTAL EROSION: THE CASE OF SÉTE'S LIDO

Component 3: Valuating the shoreline Messina Project

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Universitat Autònoma de Barcelona

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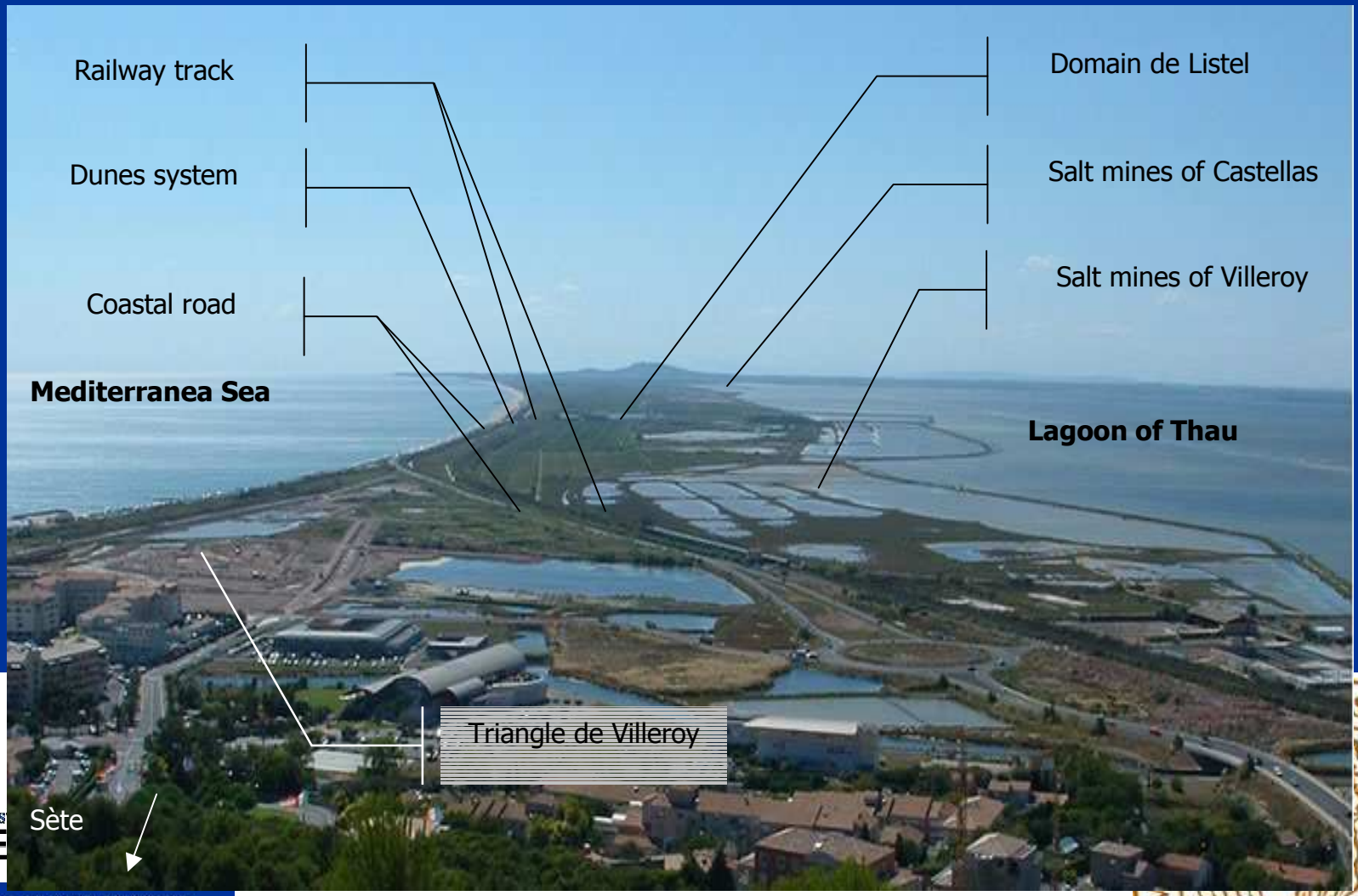
AREA OF STUDY



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Aim of study

Application of Social Multi Criteria Analysis (SMCA) for evaluating different alternatives to face coastal erosion in the Sète's Lido.

Characteristic of Social Multi Criteria Analysis:

***multi/inter-disciplinary* work**

Participatory and transparent process

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Capital at risk

Socio economic activities affected by the erosion; Tourism, Vine cultures, Fisheries and housing.

- Natural heritage: marshes and dunes ecosystems are threatened.

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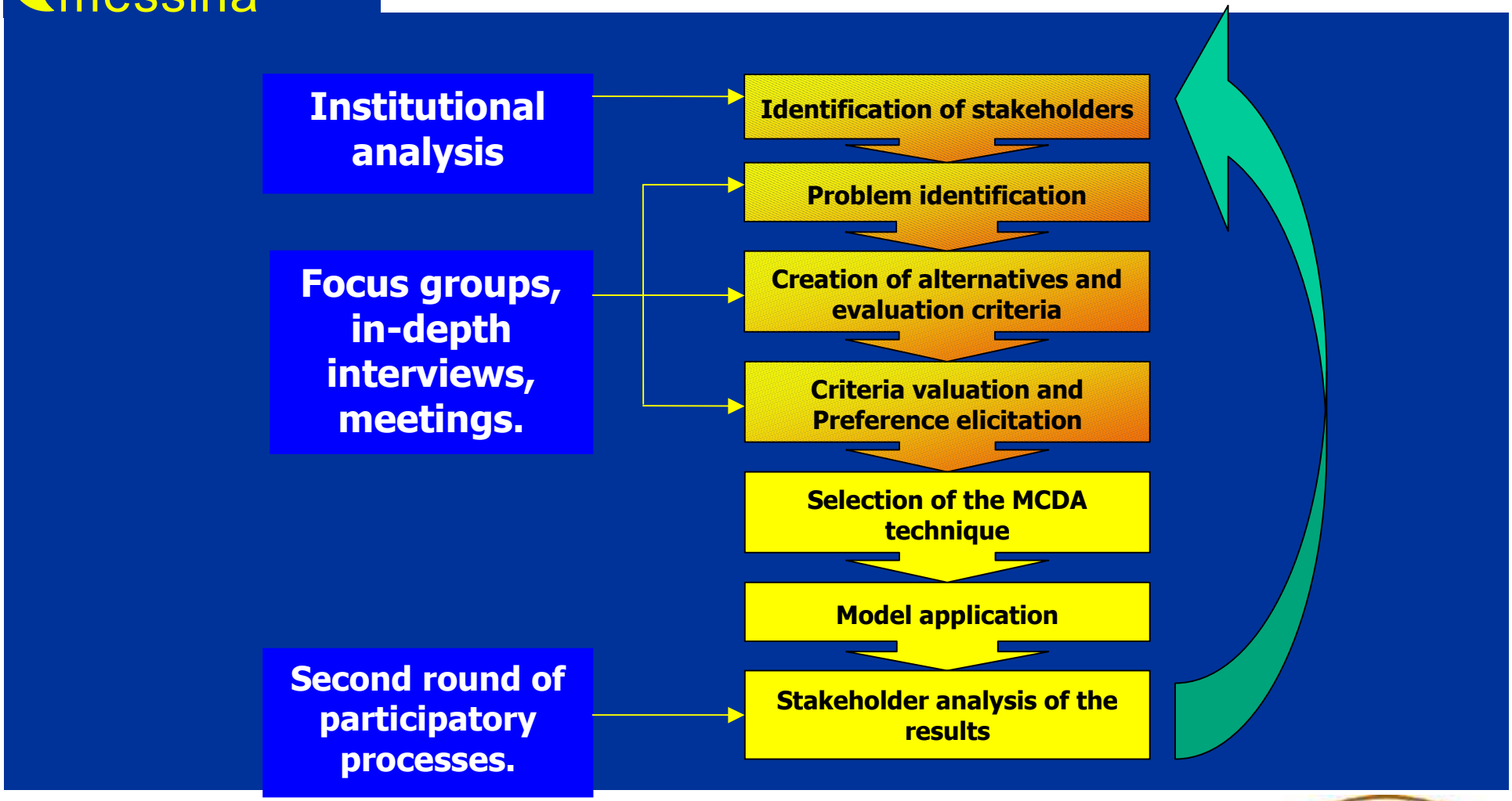
-The process



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Creation of alternatives:

A- BUSINESS as USUAL

B- HARD-ENGINEERING

C- MEDIUM-DISPLACEMENT OF THE ROAD

D- ROAD DISPLACEMENT

Variables: Parking areas vs Parking along the road
Cycling track parallel to road vs Cycling track in the ancient dunes

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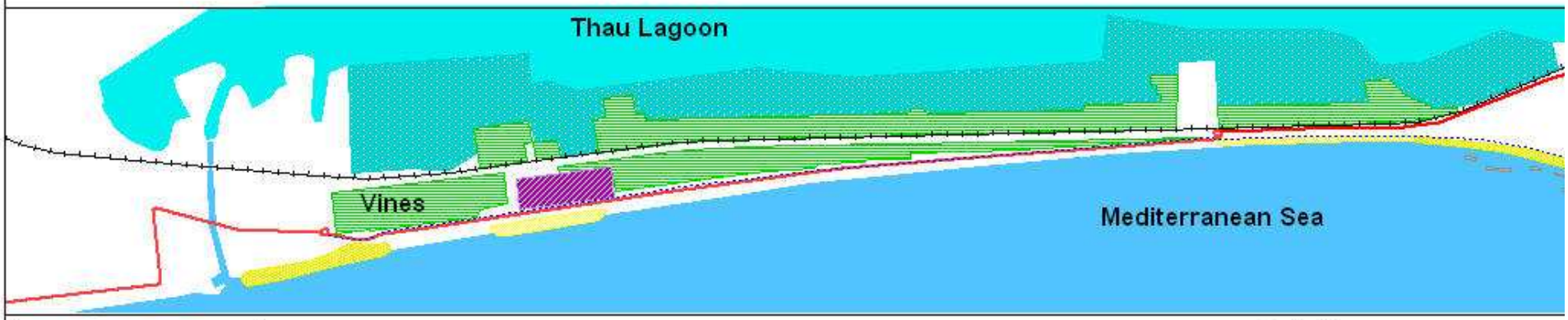
Alternative A



Cycle track
Camping site
Railway
Urban beach
Semi-natural beach
Vines
Marsh
Pond
brake waters
Sea
Road

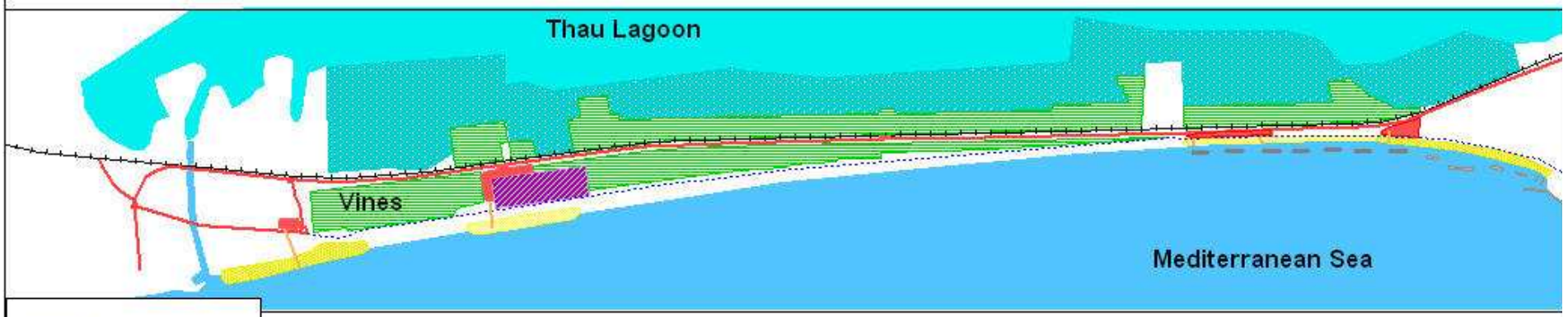
Scale in metres

0 500 1000

Alternative B-1

Alternative C-1

Alternative D-1.1.



Cycle track
Camping site
Railway
Urban beach
Semi-natural beach
Vines
Marsh
Pond
brake waters
Sea
New brake waters
Car parks
Road
Access to the Beach

Scale in metres
0 500 1000

Criteria definition

- Based on the social actors' preferences
  - Previous 14 in-depth interviews
    - What is the problem? Why?
    - What is important to protect?
  - 2 meetings
    - Alternatives presentation
    - Alternatives analysis (main elements: road, parking, cycling track...)

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Criteria selected

- Security
- Long term effectiveness
- Cost of the works
- Cost of management and maintenance
- Visual impact
- Influence over the marine environment
- Fragmentation

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Impact matrix

Naiade

Matrix type: Impact Case Study: Sète

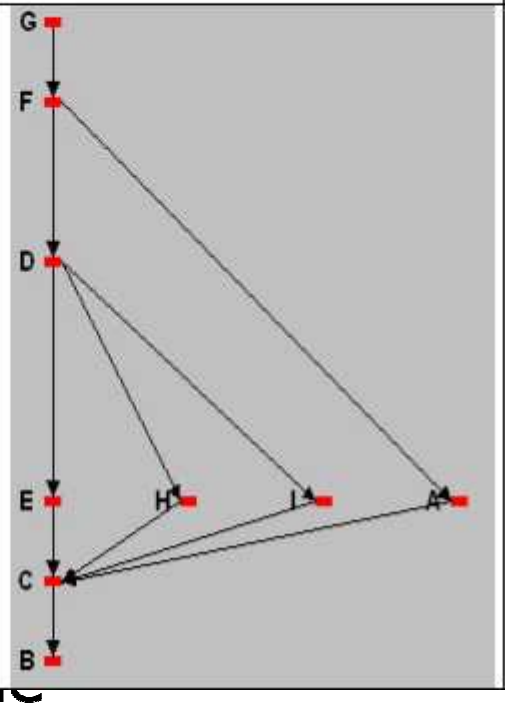
Criteria \ Alternatives	A	B1	B2	C1	C2	D1.1	D1.2	D2.1	D2.2
Security	+ or - Low	+ or - Low	High	+ or - High	Low	High	+ or - High	+ or - Low	Low
Long-term effectiveness	Very Bad	Good	Good	Moderate	Moderate	Very Good	Very Good	Very Good	Very Good
Investment costs	0	~ 48	~ 46.5	~ 38.9	~ 36.3	~ 44.3	~ 44.3	~ 45.3	~ 45.3
Maintenance costs	~ 500	~ 1.500	~ 1.500	~ 800	~ 800	~ 800	~ 800	~ 800	~ 800
Visual impact	High	Very High	High	Moderate	+ or - High	Moderate	Moderate	+ or - High	+ or - High
Impact over marine environment	Moderate	Very High	Very High	Low	Low	Low	Low	Low	Low
Fragmentation	Very High	Very High	Very High	Moderate	+ or - High	+ or - Low	Low	Moderate	+ or - Low

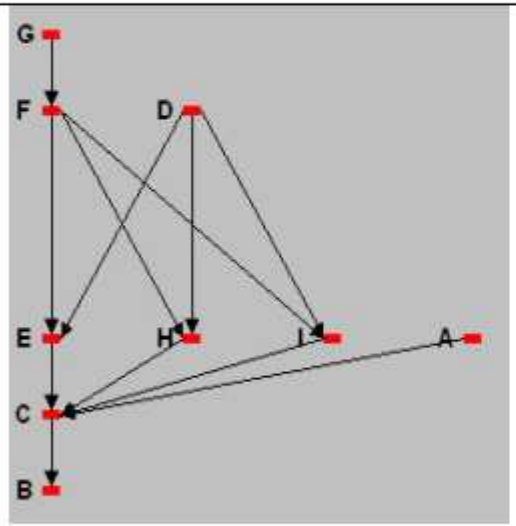
Regime

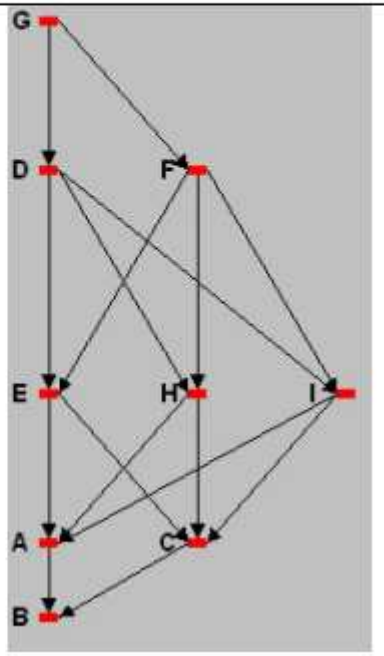
Security	5	5	9	7	2	9	7	5	2
Lon-term effectiveness	1	5	5	3	3	9	9	9	9
Investment costs	9	1	2	7	8	6	6	4	4
Maintenance costs	9	2	2	8	8	8	8	8	8
Visual impact	3	1	3	9	6	9	9	6	6
Impact over marine environment	3	2	2	9	9	9	9	9	9
Fragmentation	3	3	3	6	4	8	9	6	8

Results (NAIADE)

A A		Compensation	
B B1	F D1.1		
C B2	G D1.2		
D C1	H D2.1		
E C2	I D2.2		
α=0,5		γ=0	γ=0,5	γ=1







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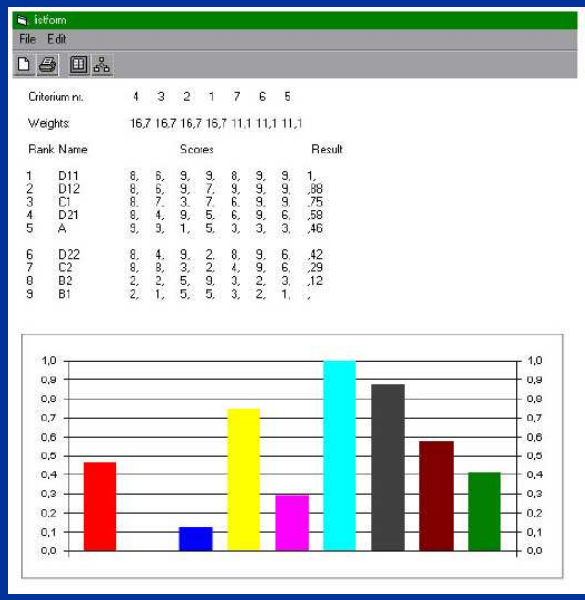
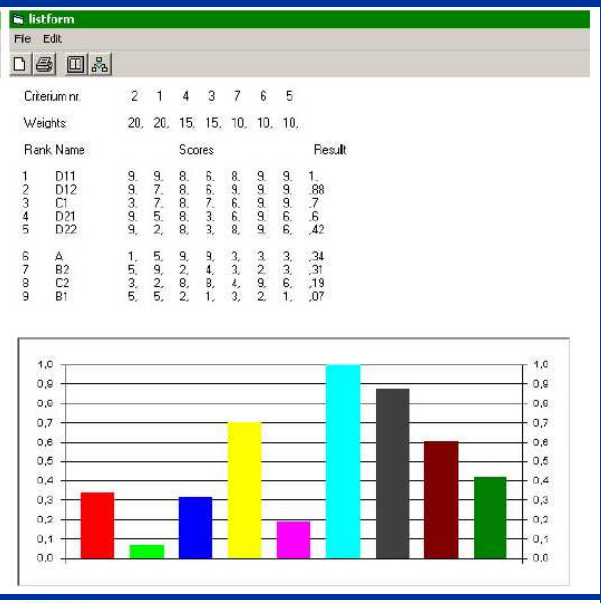
Results (REGIME)

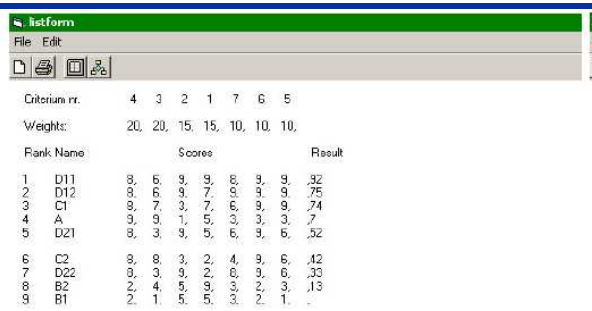
All dimensions equally weighted

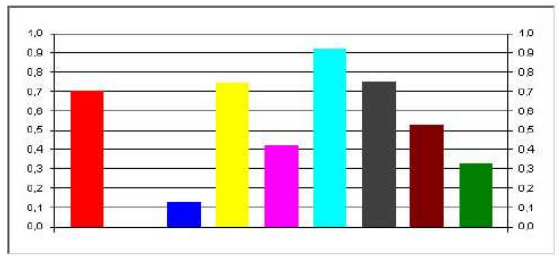


Social dimension weighted higher

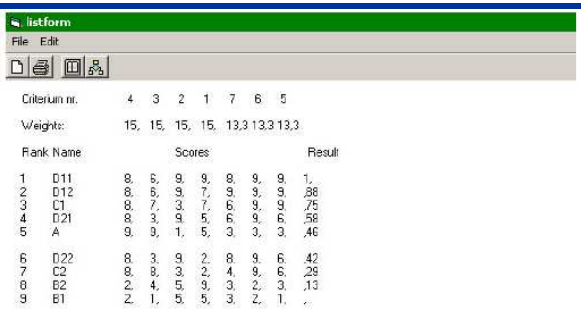


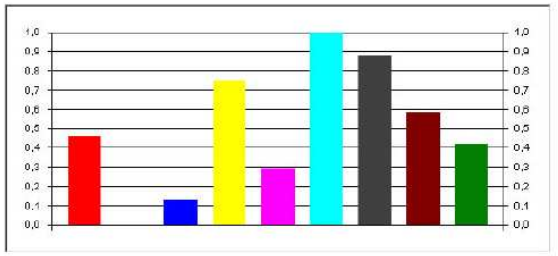
Economic dimension weighted higher





Environmental dimension weighted higher





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Conclusions – SMCA Lido de Sete

- **Results are coherent with the decision made by the authorities.**
  - **Long history of the project facilitates acceptance and unifies criteria**
- **Combination of different knowledges (rationalities)**
  - **Scientific disciplines and local knowledge**
- **Multicriteria models**
  - **Less reductionist – mix information (more transparent management of uncertainty)**
  - **Management of compensability**
- **Participatory process**
  - **Social control**
  - **Need of good communication**
  - **Legitimation of the decision**
- **It is necessary more time to apply the methodology**
  - **Feedbacks and learning process**

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Appendix 4. Literature for further reading

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Continued work –

- Project with National Swedish Geotechnical Institute (SIG) in developing methods and implementing the results of the Messina project in Sweden: For evaluation of effects of global warming and climate change on flooding and coastal erosion

"Sustainable development in coastal zone"

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Closing comments

- Many values to consider in impact assessment and project appraisal
- Each organisation (municipality etc) prioritizes based on their possibilities, resources and visions
- Opportunities – entrepreneurship

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Thank You!

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