blueMed
ECOMEDPORT
Start-up Action

ALMA MATER STUDIORUM
UNIVERSITÀ DI BOLOGNA

Project co-financed by the European Regional Development Fund

ECOMEDPORT Conference

"Research & Innovation in sediment management for the port areas"

27/09/2019

Sediment management for coastal nourishment in Emilia-Romagna

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RegioneEmilia-Romagna

Soil and Coast Protection and Land Reclamation Service
Directorate General for Territory and Environment Care

ECOMEDPORT 1st meeting
Bologna, 26-28 September 2019

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- Role of the regional Service for Soil and Coast Protection
- Driving elements for littoral and sediment management
- TNEC guidelines and good practices
- Offshore sediments exploitation
- Littoral sediments management system - SICELL
- Port dredging sediments management dimension
- Some example of sediment management on RER coasts

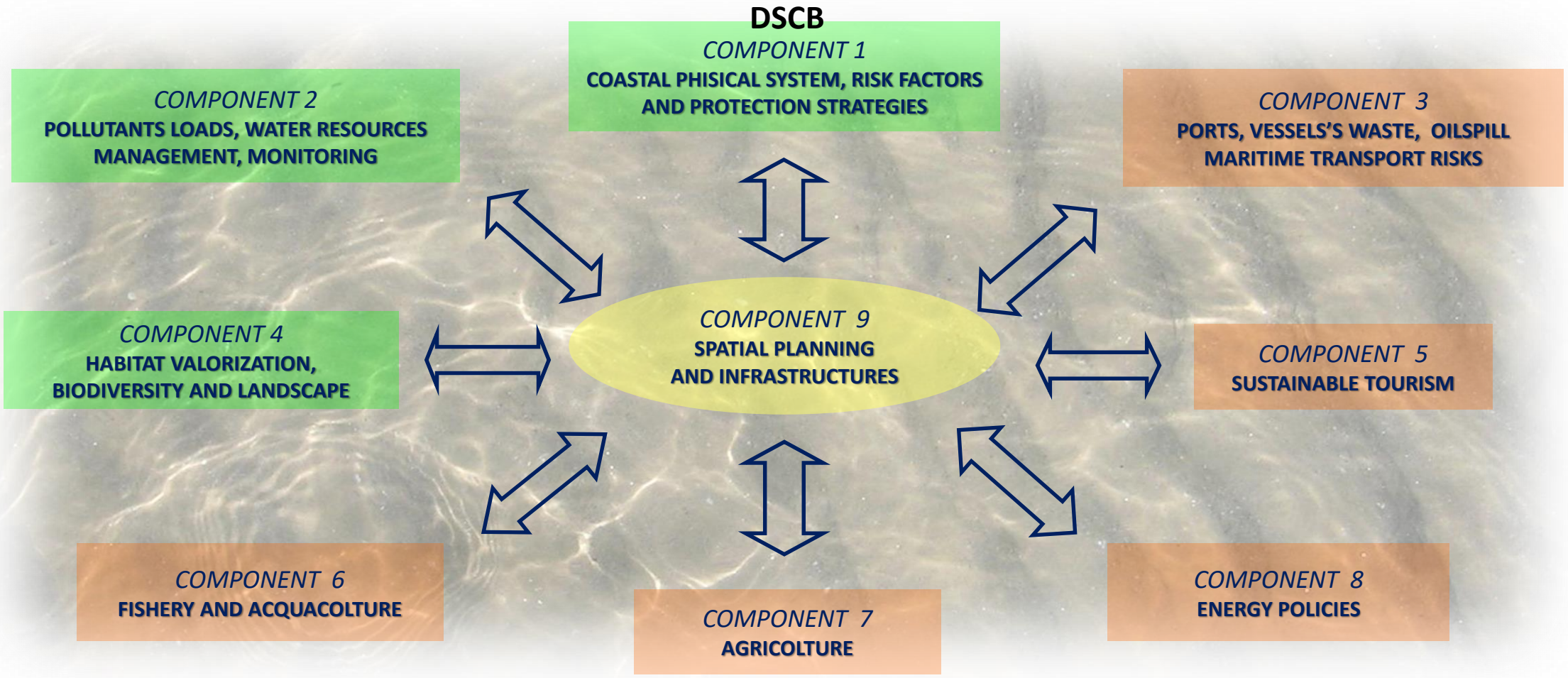
ROLE OF THE REGIONAL SERVICE
for the Coast Protection and Management

Soil and Coast Protection and Land Reclamation Service (DSCB)

- ***REGIONAL POLICY AND STRATEGY FOR COASTAL PROTECTION*** — **REGIONAL GUIDELINES ICZM - COMPONENT 1 Responsible**
- ***PLANNING AND PROGRAMMING OF MANAGEMENT & COASTAL WORKS***
- ***KNOWLEDGE INSTRUMENTS SUPPORTING LITTORAL MANAGEMENT***
- ***NATIONAL COMMITMENTS*** *(direct involvement in Ministerial Boards on COASTAL EROSION and FLOOD RISKS Directive, collaboration on MSP and MARINE STRATEGY)*
- ***EUROPEAN COMMITMENTS*** *(CPMR-IMC, projects and initiatives as Co-Evolve project, the BolognaCHARTER Eu Coastal Regions initiative, BLUEMED SR&I Agenda, MedCoast4BlueGrowth UfM labeled project)*

THE REGIONAL ICZM STRATEGY (DCR 645/2005)

ICZM GUIDELINES ADOPTED BY THE 14 COASTAL MUNICIPALITIES A 4 PROVINCES, IN SPATIAL PLANNING AND URBANISTIC TOOLS

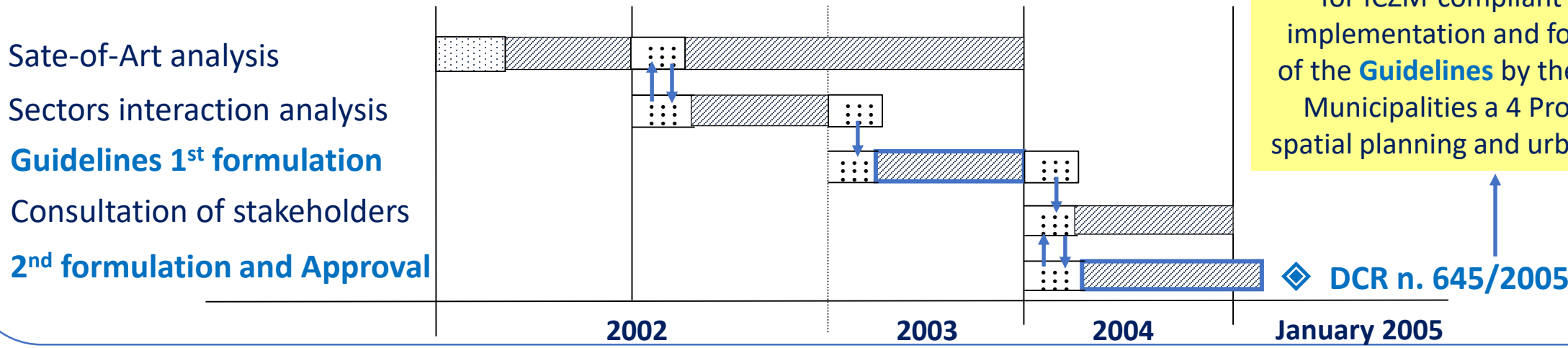


THE REGIONAL ICZM STRATEGY (DCR 645/2005)

Strucuture, boards and process development

- **Institutional Committee** – Policy (6 Regional Ministers, 4 Provinces Presidents, 14 Municipalities Mayors)
- **Board of Directors** – Management (Environment, Soil/Coast protection, Industry, Tourism, Spatial Planning, Transport, Agriculture)
- **10 Working Groups** – Development (about 200 among experts, regional officers, scientists and stakeholders representatives)

Timeline



2006-2010 financing period (8 M€) for ICZM-compliant projects implementation and for adoption of the **Guidelines** by the 14 coastal Municipalities a 4 Provinces, in spatial planning and urbanistic tools

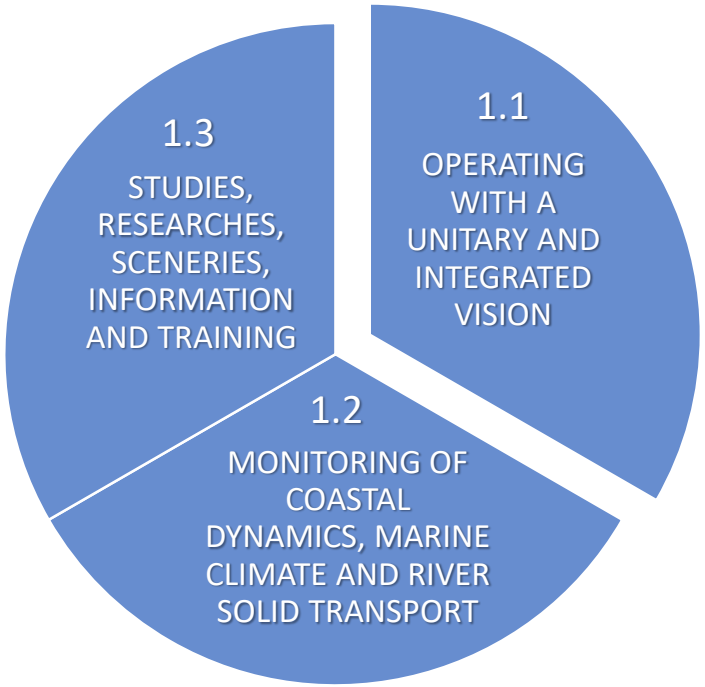
THE REGIONAL ICZM STRATEGY

DSCB

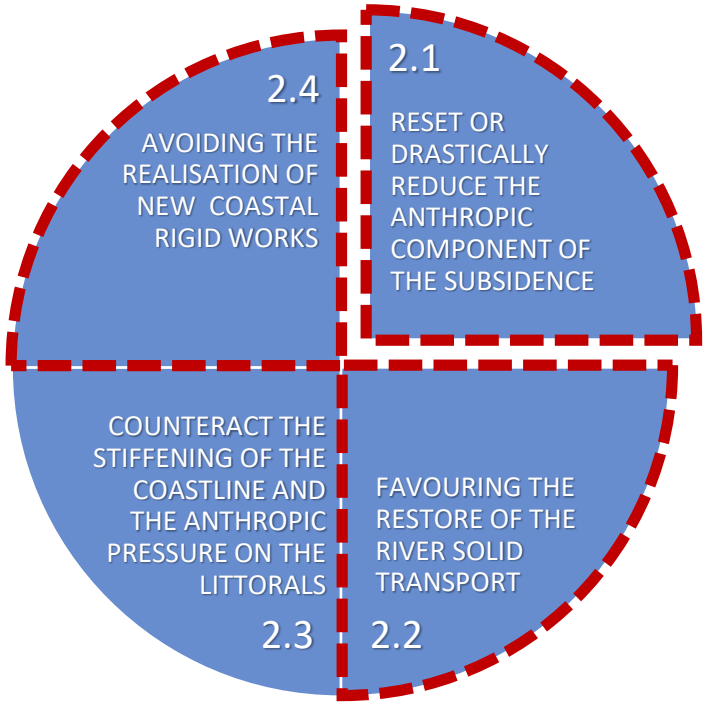
COMPONENT 1

COASTAL PHISICAL SYSTEM, RISK FACTORS AND PROTECTION STRATEGIES: 3 Scopes, 11 Themes, 37 Action lines

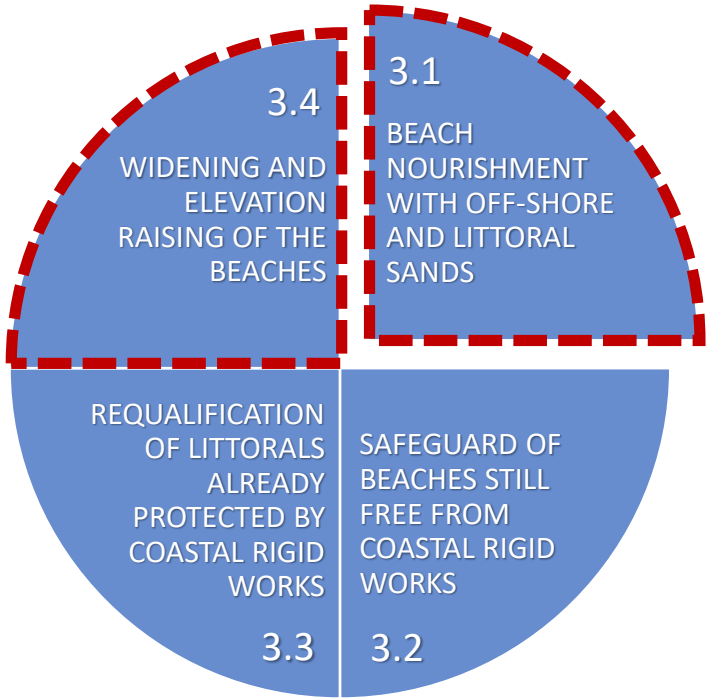
1. INTEGRATED MANAGEMENT OFTHE LITTORALS AND SYSTEMATIZATION OF KNOWLEDGE



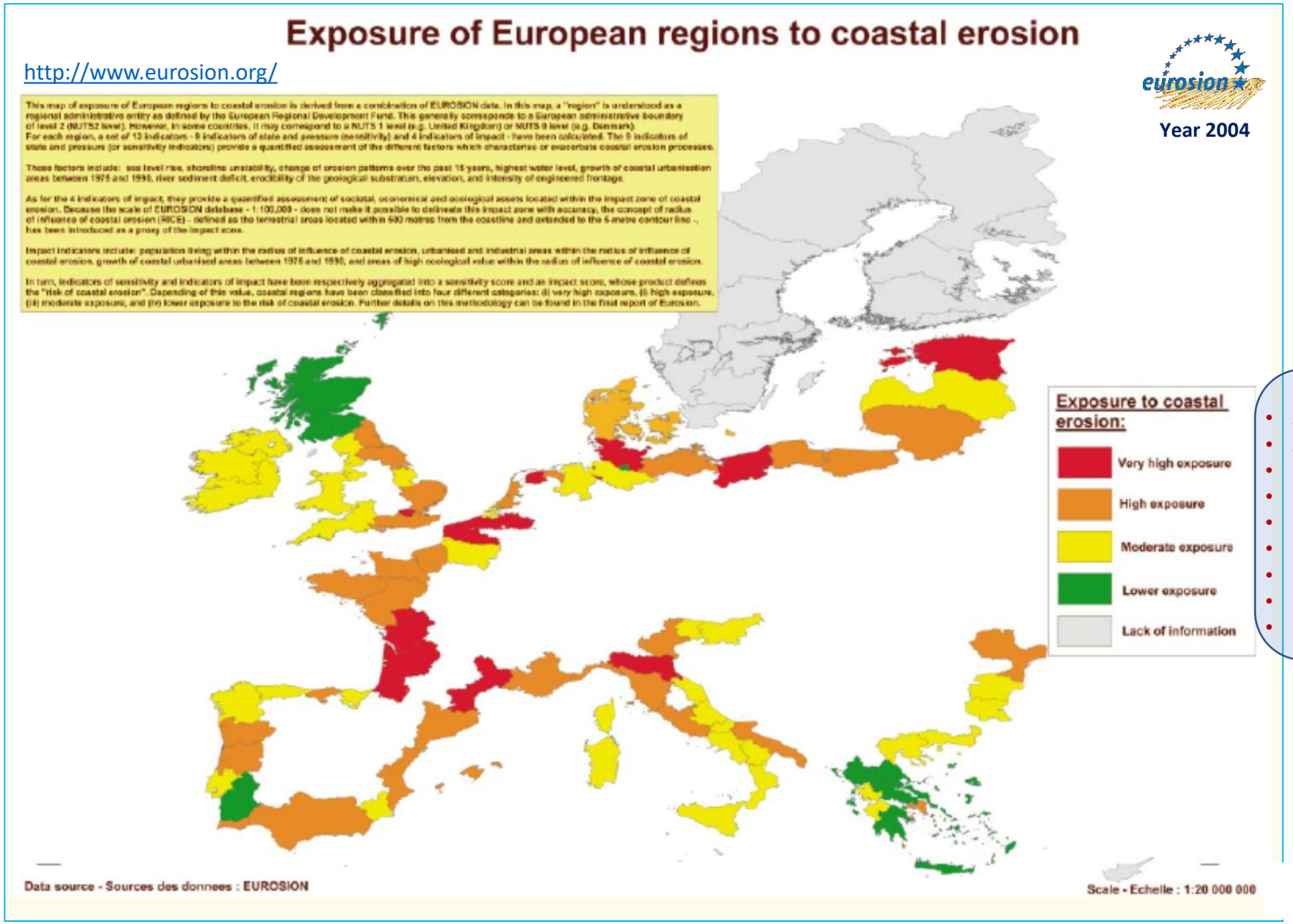
2. REMOVAL OR MITIGATION OF THE CAUSES OF EROSION AND REDUCTION OF MARINE INGRESSION RISK



3. PROTECTION AND REQUAILIFICATION OF LITORALS AND BEACHES



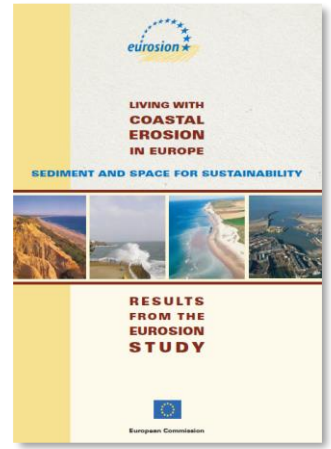
Erosion and sediment management: a common issue in EU



Exposure identified by 9 indicators:

- Sea Level Rise
- Shoreline instability
- Change of erosion pattern last 15 years
- Highest water level
- Growth of coastal urbanisation ‘75-’90
- River sediment deficit
- Erodibility of geological substratum
- Elevation
- Intensity of engineered frontage

driving elements for a correct littoral and sediment management



http://www.eurosion.org/

1. **Increase coastal resilience by restoring the sediment balance and providing space for coastal processes**
   (a) restoring the sediment balance;
   (b) allocating space necessary to accommodate natural erosion and coastal sediment processes and
   (c) designation of strategic sediment reservoirs.

2. **Internalize coastal erosion cost and risk in planning and investment decisions** (through existing instruments)
   1. Environmental Assessment;
   2. Financial instruments;
   3. Integrated Coastal Zone Management (ICZM).

3. **Make responses to coastal erosion accountable**
   - Operating within an **integrated and planned approach** based upon accountability principles;
   - Consider the **optimization of investment costs** against values at risk;
   - Consider the **social acceptability** of actions and keep options for the future.

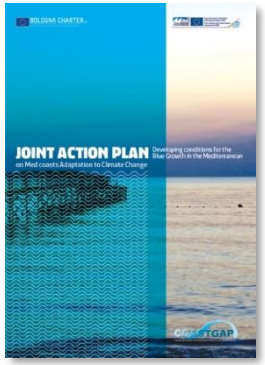
4. **Strengthen the knowledge base of coastal erosion management and planning**
   - development of information governance strategies;
   - information on 'best practice', also including learning from failures;
   - proactive approach to data and information management and for an institutional leadership at the regional level

The Bologna Charter initiative

*Med maritime regions initiative aimed at the sustainable development, integrated management and protection of the coastal areas - involves today up to **29 MED coastal regions** and the **IMC-CPMR**, www.bolognacharter.eu*

Policy Paper 2013

Joint Action Plan 2015-2020



- following ICZM&MSP principles, it defines a Strategy and a Plan (JAP 2015-2020) for developing shared actions by maritime regions,
- several cooperation projects started in the last years, among which recently:

CO-EVOLVE (Interreg Med),
MedCoast4BG (UfM labeled)
Co-Evolve4BG (ENI-CBC-MED)
focused on **C&M sustainable tourism**

and R&I initiative as
ECOMEDPORT

BC-JAP

Strategic Themes	Action lines
Development of knowledge, network-based monitoring, data management systems	Asses coastal assets, dynamics, phenomena and risks / Build an Observatory network / Individuate Sediments stocks
Sustainable use of resources and coastal governance for the Blue Growth	Sustainable management of coastal spaces, sediments, strategic resources/ Integrated management, coordination mechanisms
Support Research & Innovation projects clustering and implementation	Innovation in coastal protection & adaptation measures, interact with EU Research programs (H2020) & initiatives (BLUEMED)
Responding to the challenge Driven by Climate Change - Major Coastal Projects (MCP)	Design adaptive management solution for resilience enhancing, structural coastal works, support and fund rising

The National Framework

…sharing best practices, collaboration and synergies between PAs, added values of the TNEC experience

NATIONAL BOARD on COASTAL EROSION (TNEC)

Creation of the Board

aprile 2015 — Creazione di un TAVOLO TECNICO Nazionale (TNEC)

Data census and collection

set-dic 2015 — Censimento DATI

Coordination meetings

Riunioni di COORDINAMENTO

aprile 2016 — Sottoscrizione PROTOCOLLO D'INTESA

Working Groups

ottobre 2016 — Elaborazione di LINEE GUIDA

Dissemination

aprile 2017 — DIFFUSIONE Linee Guida

maggio 2017 — Condivisione Linee Guida con la COMUNITÀ SCIENTIFICA

2018 — 2019 — 2020

Continuous updating, upgrading

Signature of a MoU

- MINISTRY of ENVIRONMENT
- COASTAL REGIONS
- ISPRA
- Hydrographic District Authorities
- UNIVERSITIES & CNR — Science and Research Institutions

Elaboration of Guidelines

"National Guidelines for the protection of the coasts from erosion and climate change effects"

Good Practices in Littoral and Sediment Management

…some basic concepts

- ✓ **beach** ⇨ first **«protection structure»** of the inland from marine ingression phenomena
- ✓ **sediments** ⇨ **«strategic resource»** for beach nourishment and coastline management (identification of strategic reservoirs, offshore deposits, littoral accumulations, etc.)
- ✓ **2 main ambits of action** for the management of littoral systems:
  - ⇨ **reducing losses from the littoral system** (e.g. correct management and balance of beach sediments, mitigation of anthropic component of subsidence, work, etc.)
  - ⇨ **feeding of the littoral system and stretches in erosion** (using external and internal sediment resources, within the littoral system, external as inland or offshore sources)

TNEC guidelines - Good Practices in Littoral and Sediment Management

REDUCTION OF LOSSES

RP - REDUCTION OF COASTAL SEDIMENT LOSSES FROM THE SYSTEM

AMBITS OF ACTION	POSSIBLE ACTIONS / MEASURES
RP-1 Managing beach sediments	**RP-1.1** Beach cleaning operation
	RP-1.2 Construction of wind traps
	RP-1.3 Construction of winter embankment defense works
RP-2 Reduction of subsidence	**RP-2.1** Reduction in groundwater withdrawals, water supply infrastructures
	RP-2.2 Hydrocarbon Extraction Control, regulation
	RP-2.3 Mitigation measures, regulation
RP-3 works to reduce losses and retreating of the coastline	**RP-3.1** Interventions and works to reduce the energy of incident waves
	RP-3.2 Interventions and works for the reduction of coastal sediment transport

SCHEME FOR AN INTEGRATED APPROACH IN COASTAL PROTECTION MANAGEMENT

To deal with coastal erosion in a overall integrated strategy, 2 set of practices and policy measures are considered :

1. **feed the coastal system** and the critical coastal stretches, through inputs from out of the system and through a correct management of littoral sediments, the diversification of sources of sediments and the optimization of sampling and nourishment practices;
2. **integrate the management strategy** with all those good practices, actions, measures, interventions and works, aimed at reducing sediment losses from the coastal systems.

http://www.erosionecostiera.isprambiente.it/

FEEDING THE SYSTEM

AS - COASTAL SYSTEM NOURISHMENT

AMBITS OF ACTION	POSSIBLE SOURCES / MEASURES
AS-1 Contributions from external sediments to nourish the coastal system	**AS-1.1** Offshore Deposits management and cultivation for beach nourishment
	AS-1.2 River sediment transport enhancement (actions aimed at restoring) for natural beach nourishment
	AS-1.3 Excavations in the coastal hinterland, using sediments for nourishment
AS-2 Contributions from internal sediments to the coastal system *(Management of coastal sediment accumulations)*	**AS-2.1** Surface Coastal Deposits along the littorals of the coastal system
	AS-2.2 Submerged coastal Deposits, submerged fans, accumulation nearby coastal protection works or harbor works
	AS-2.3 Hydraulic management, dredging for and navigation safety

TNEC Guidelines (Annex 3)– reconnaissance on diverse sources of sediments for coastal nourishment

Littoral deposits/accumulation

Tabella 2.2.1 — Depositi Litoranei - quantità media m3/anno (movimentazioni autorizzate)

Regione	Dragaggi portuali	Barre di avanspiaggia	Depositi alle foci o bocche lagunari	Depositi emersi e sommersi artificiali	totale
Liguria	43.842	19.236	520	0	63.598
Toscana	80.000	0	0	0	80.000
Lazio	113.863	55.534	1.500	19.458	190.355
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	nd
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	550
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	nd
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	000
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	np
Puglia	nd	nd	nd	nd	nd
Molise	nd	nd	nd	nd	nd
Abbruzzo	25.000	0	0	0	25.000
Marche	60.000	50.000	5.000	0	115.000
Emilia-Romagna	10.000	50.000	80.000	0	140.000
Veneto	0	0	222.554	0	222.554
Friuli Venezia Giulia	45.250	0	34.000	0	79.250
totale	636.480	220.795	363.574	19.458	1.240.307

nd = non disponibile; np=non pervenuto

Voulmes autorized by Italian coastal Regions about 1.240.000 m³ /year

Tabella 2.2.2 — Depositi Litoranei - quantità media m3/anno (valori potenziali)

Regione	Dragaggi portuali	Barre di avanspiaggia	Depositi alle foci o bocche lagunari	Depositi emersi e sommersi artificiali	totale
Liguria	0	0	150.000	0	150.000
Toscana	80.000	0	0	0	80.000
Lazio	200.000	50.000	50.000	50.000	350.000
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	nd
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	nd
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	000
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	000
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	np
Puglia	nd	nd	nd	nd	nd
Molise	nd	nd	nd	nd	nd
Abbruzzo	25.000	0	0	0	25.000
Marche	100.000	50.000	5.000	0	155.000
Emilia-Romagna	115.000	92.500	321.500	150.000	679.000
Veneto	70.000	0	580.000	0	650.000
Friuli Venezia Giulia	45.250	0	34.000	0	79.250
totale	888.250	212.500	1.170.500	200.000	2.471.250

nd = non disponibile; np=non pervenuto

Potential volumes available by Italian Regions about 2.470.000 m³ /anno

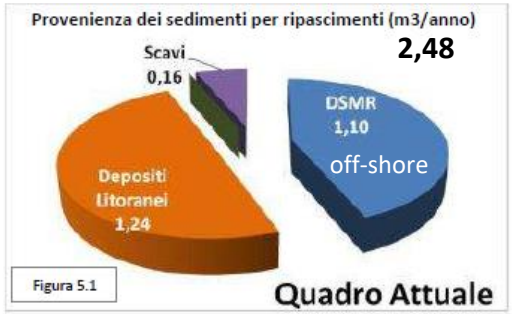
Deposits in artificial basins

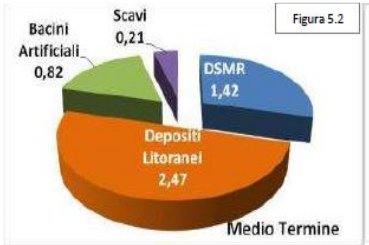
Tabella 3.1.2 — Depositi di sedimenti accumulati nei Bacini Artificiali

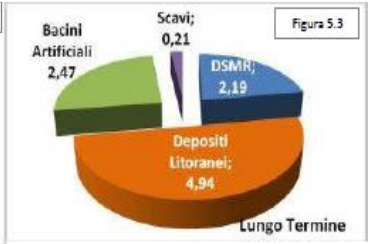
Regione	capacità morta di progetto Mm3	stima sedimenti già accumulati %	totale Mm3	stima sedimenti rimovimentabili annualmente dai piani di gestione %	sedimenti movimentati da alveo m3/anno	totale Mm3/anno
Liguria	0,10	100,0%	0,10	5,0%	124.749	0,13
Toscana	nd					-
Lazio	58,36	100,0%	58,36	0,3%		0,18
Sardegna	116,69	16,7%	19,46	0,3%		0,06
Campania	29,58	50,0%	14,79	0,3%		0,04
Basilic	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	0,15
Calab	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	-
Sic	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	-
Pu	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	0,04
Molise	12,85	20,0%	2,57	0,3%		0,01
Abbruzzo	nd					-
Marche	7,00	100,0%	7,00	0,3%		0,02
Emilia-Romagna	nd					-
Veneto	230,00	16,0%	36,80	0,3%		0,11
Friuli Venezia Giulia	29,44	100,0%	29,44	0,3%		0,09
totale	648,23		231,36			0,82

in rosso = valori attribuiti ai fini di una prima stima

Estimated in basins within the italian Regions About 230.000 Mm³







Inland escavation

Tabella 4.2.1

Regione	Prelievi da scavi/cave Mm3/anno
Liguria	0,07
Toscana	0,02
Lazio	0,00
Sardegna	nd
Campania	nd
Basilicata	nd
[illegible]	d
[illegible]	p
[illegible]	d
Molise	nd
Abbruzzo	nd
Marche	0,00
Emilia-Romagna	0,01
Veneto	0,07
Friuli Venezia Giulia	nd
totale	0,18

nd = non disponibile; np=non pervenuto

Italian coastal regions about 180.000 m³ /year

Dati 2015-2016

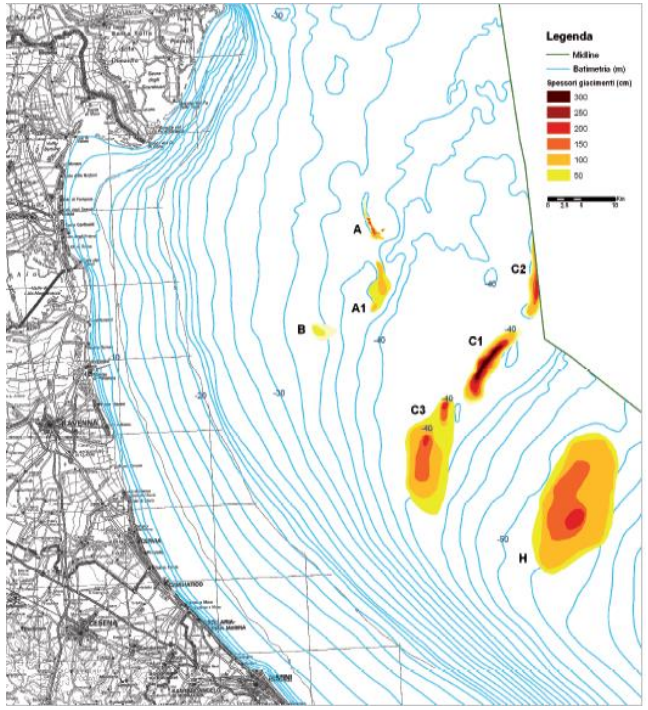
…prospettive fabbisogno/utilizzo

4,90 m³ /year **9,70**

2025 **2050**

http://www.erosionecostiera.isprambiente.it/

Offshore sediments exploitation (2002-2016)



Offshore sand deposits exploration between 1984 and 2008:

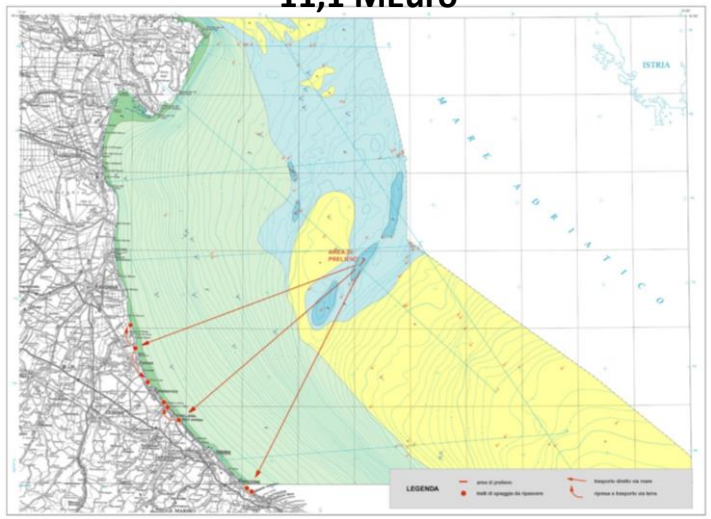
Former Idroser, today ARPAE, in collaboration with ISMAR-CNR in Bologna, realised several research and survey campaigns (also with EU projects) on the Adriatic sea bottom off-shore of Emilia-Romagna region

identified 7 sandy bodies offshore to the regional coasts (relict beaches 10-12.000 y. a.)

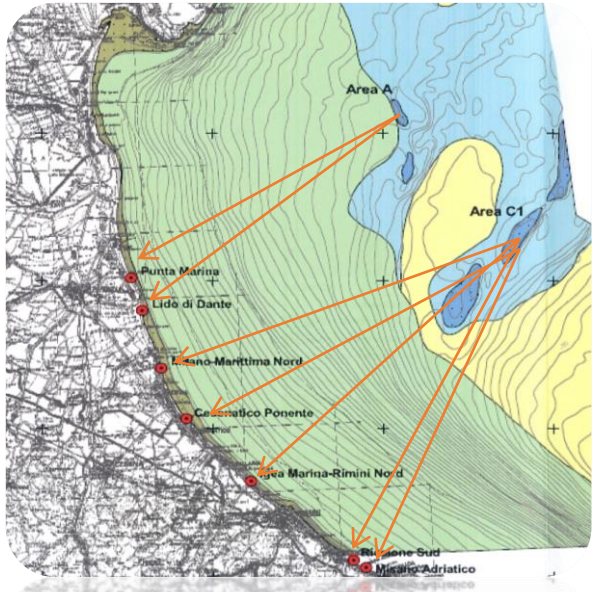
about 300 Mm^3 overall volume of sand (of which 150 Mm^3 of very fine sand)

about 220 Mm^3 of "useful volume" of sand

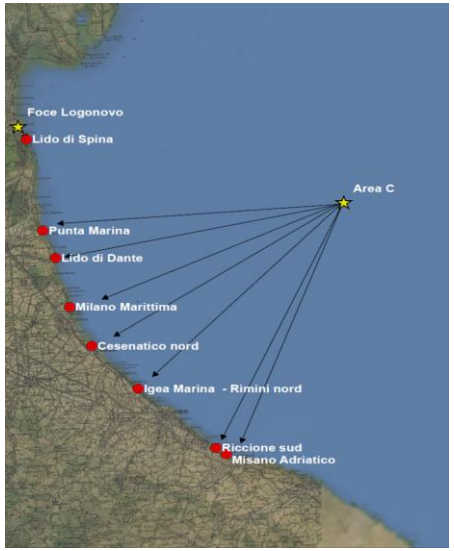
Year 2002: 1st intervention
880.000 m^3 of sand
on 8 sites overall 9 km
11,1 MEuro



Year 2007: 2nd intervention
815.000 m^3 of sand
on 7 sites overall 9,5 km
13,5 MEuro

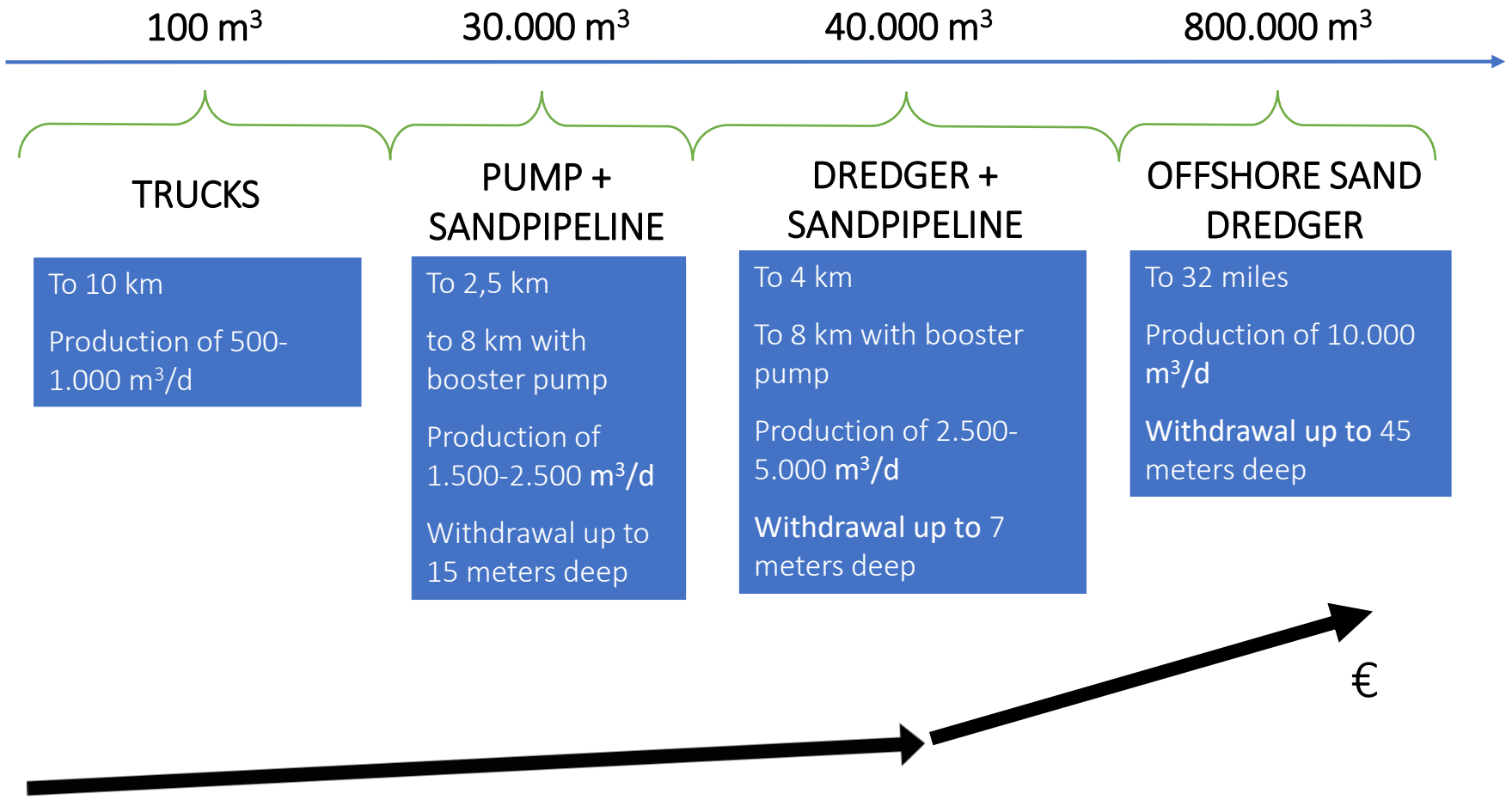


Year 2016: 3rd intervention
1.400.00 m^3 of sand
on 8 sites overall 11 km
20 MEuro

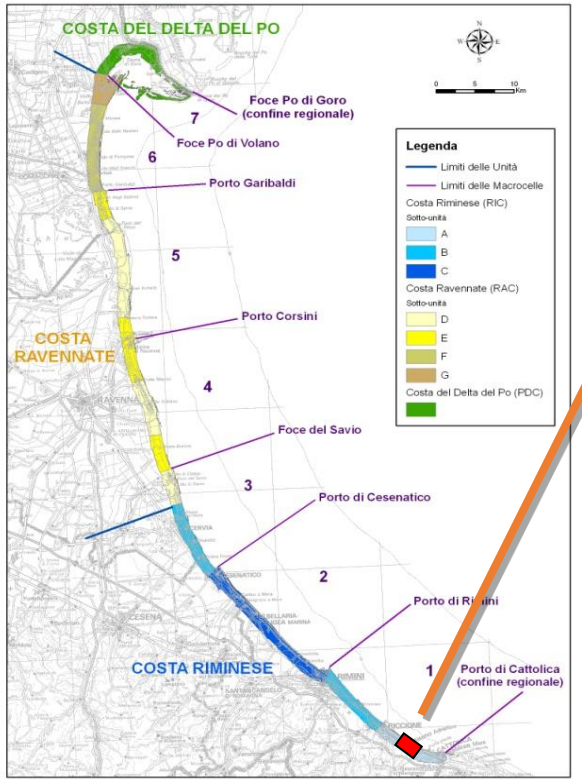


Beach nourishment with internal or external sand sources

Minimum volumes to optimize provisioning costs to the intervention site,
in relation to volumes concerned, distance, and type of sand transport



The Littoral sediments management system - SICELL



130 km coastiline, 118 Cells,
7 Macro Cells
From **general** to **detailed** analysis

Cell: littoral stretch characterized by homogeneous asset and evolution of the backshore and shoreface, differently from adjacent cells

Sedimentary balance
Eroded/Accumulated V in considered period
Variation of sediment volumes
Coastline trend in the period (AV - advanced, SB - stable, AR - recession)

Hard defence works
Presence of hard defence works
Hard defence typology
Works realised in considered period
Maintenance in the considered period

Nourishment
Volumes in the considered period

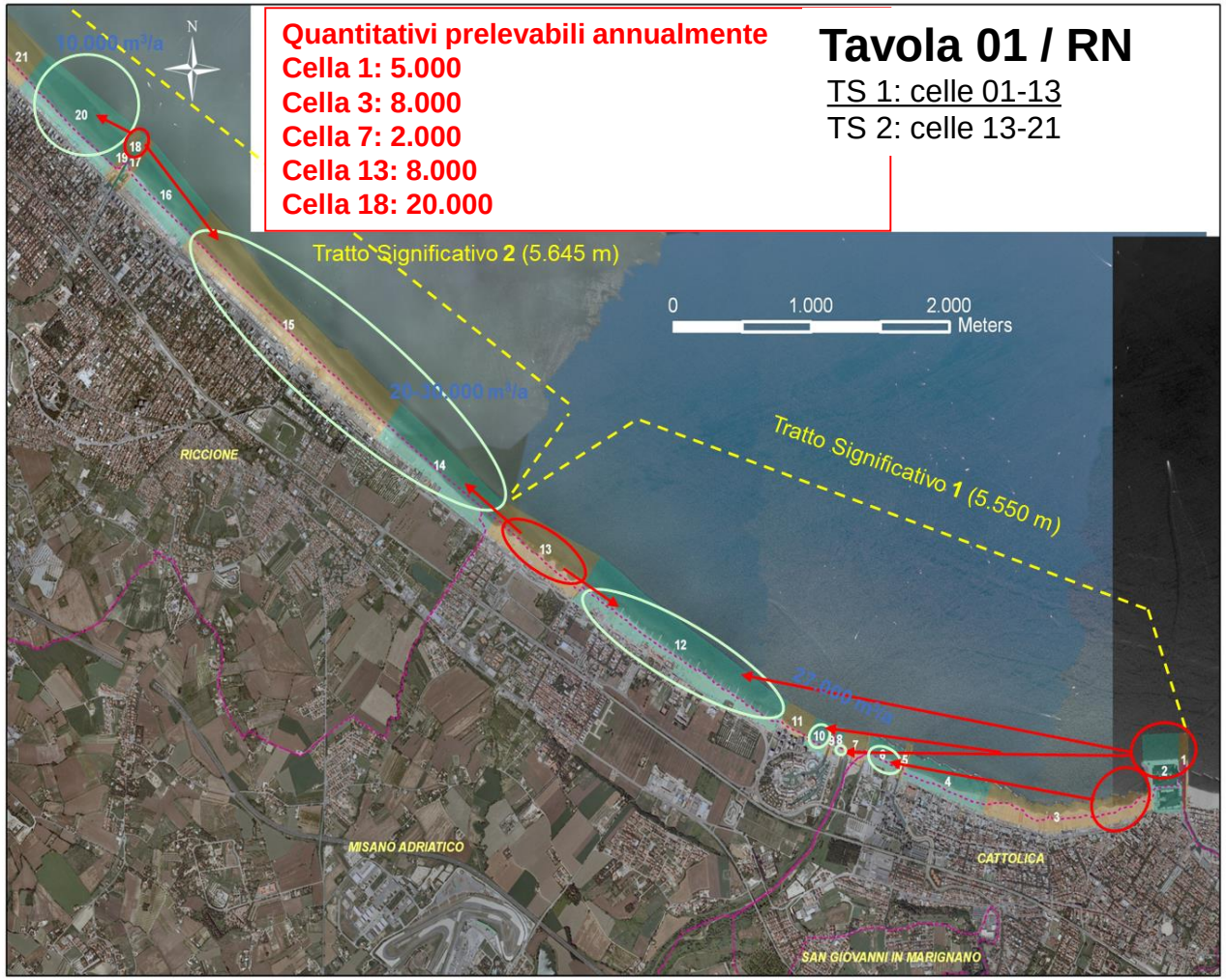
Withdrawals
Sand withdrawals in the period

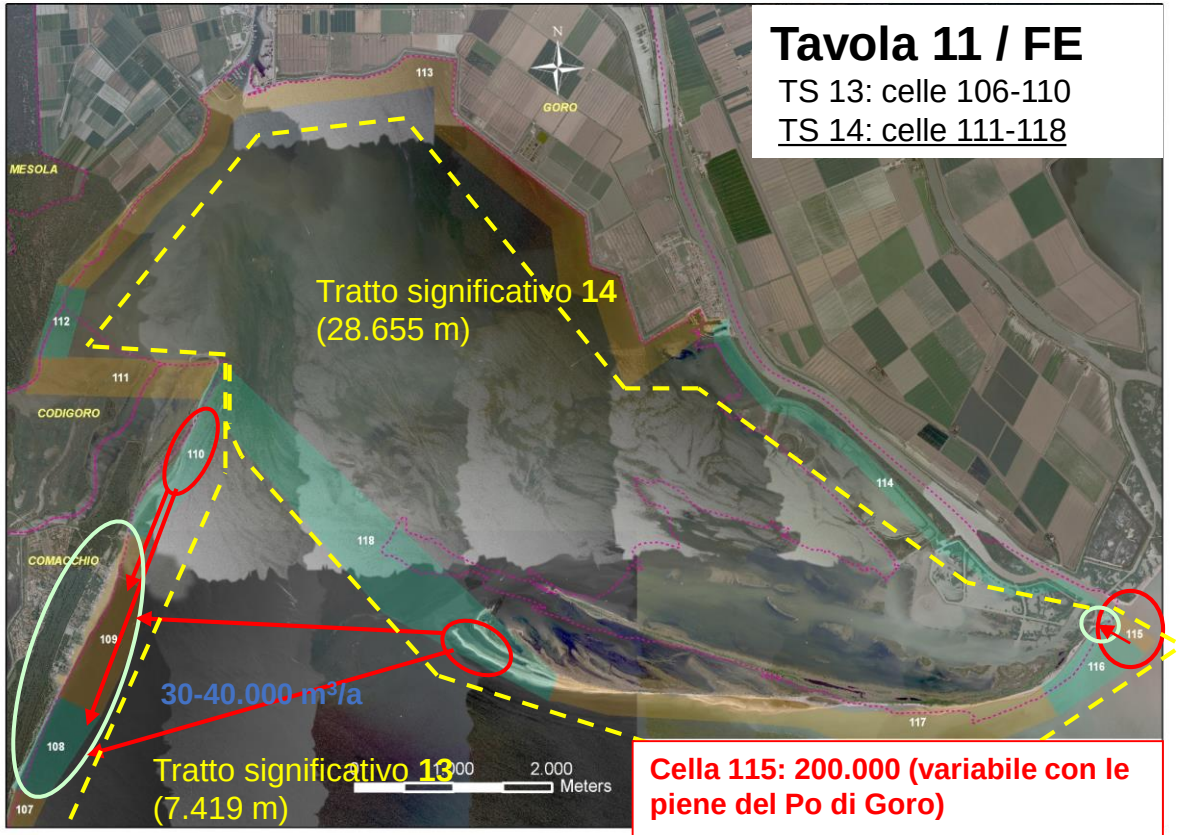
General information
Cell number
Denomination
Cell typology
Physical delimitation
Belonging Macro Cell
Geomorphologic unit and sub-unit
Extension

Morphological elements
Along shore transport
Subsidence rate in the considered period
Medium Width of emerged beach
Medium slope gradient of emerged beach
Medium slope gradient of submerged beach
Medium width of submerged beach
Dunes presence
Bathing structures presence
Back-beach urbanisation

The Littoral sediments management system - SICELL

14 “Significant stretches” for ordinary **management aims**





Port dredging sediments management dimension

The competence on authorization procedure for dredged port sediments disposal in off-shore perimetrate areas passed from the Region to ARPAE beginning 2016. In a 15 years period till 2015, about 606.000 m³ of sediments were disposed in those areas from the regional ports or river's mouth having silting problems. With costs in a range of about 8,00 to 11,00 €/m³ depending on local situation, period of dredging, etc.

Cesenatico (2005) = 24.800 m³

Bellaria (2001-2002) 59.906 + (2005-2015) 159.040 = 218.946 m³

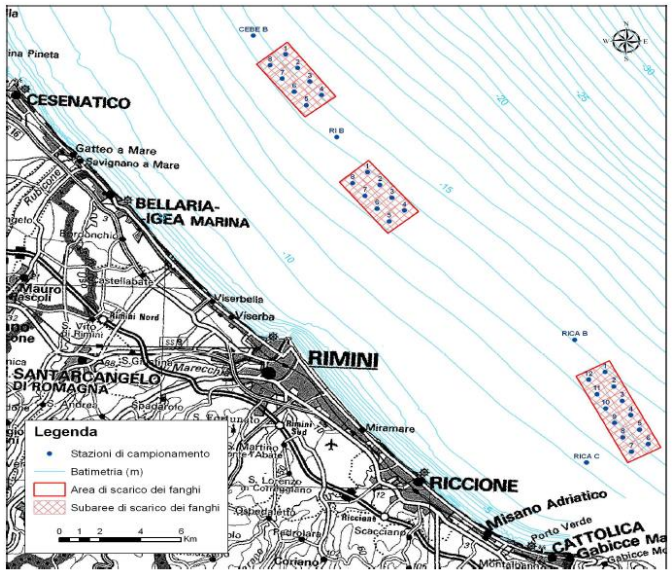
Rimini (2001) 49.330 + (2008) 1.625 = 60.505 m³

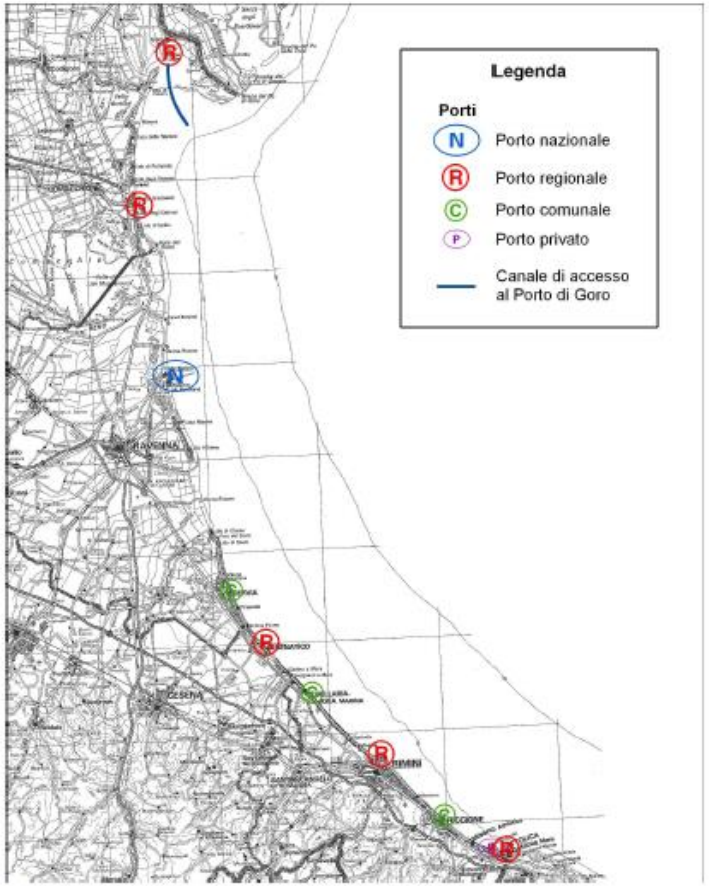
Riccione (2005-2015) 28.645 + (1999-2003) 24.150 = 52.795 m³

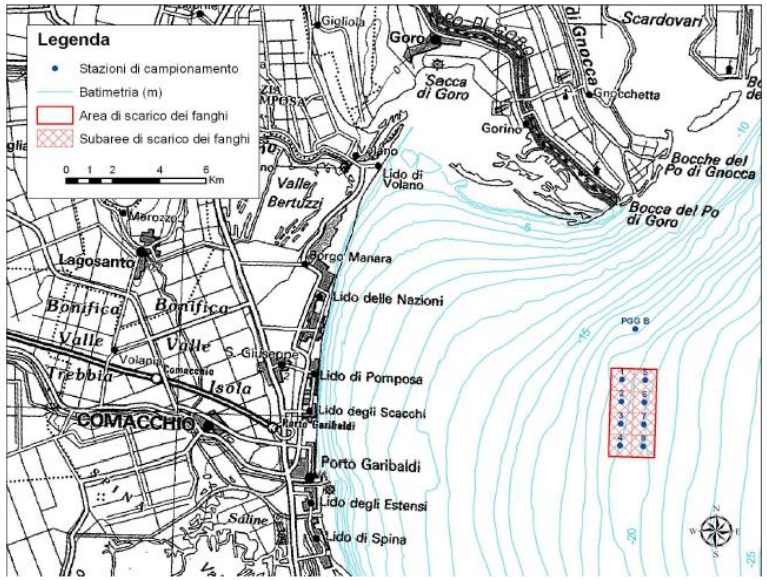
T. Ventena (1999-2003) 42.890 + (2008-2014) 82.858 = 125.748 m³

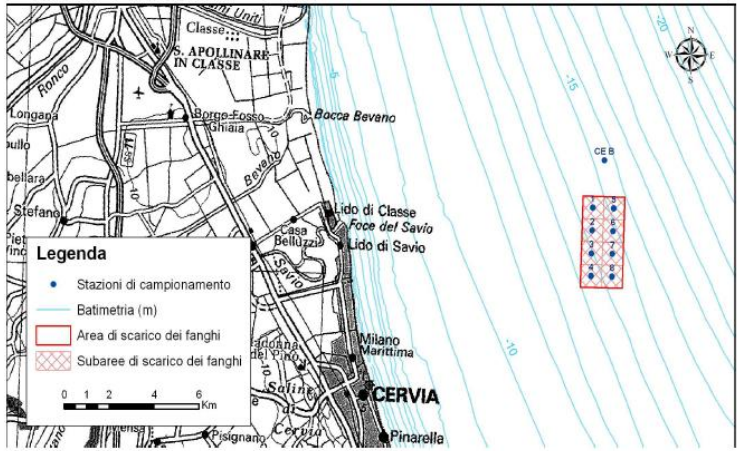
Cattolica (1999-2003) 52.990 + (2004-2015) 70.990 = 123.980 m³

+ **Ravenna national port** (2002-2017) = **1.020.000** m³









Examples of application of sediments management on RER coasts

the permanent sand pipeline in Riccione (RN) - 2013

The plant consists of two systems of underground pipelines on average deep of 0.95 m below the ground surface of the beach, for a length of 3.300 m southward from Riccione port and 550 m northward, completed by 25 cockpit of derivation/inspection

Examples of application sediments management on RER coasts

the temporary sand pipeline in Goro (FE) - 2014

Up to 6 hectares of the sandbank top was dredged (124.000 m^3) and the mixture of sand-water nourished, by a marine pipeline (4,5 km) and land pipeline (3,5 km), a stretch of 2.500m beach in Lido di Volano.

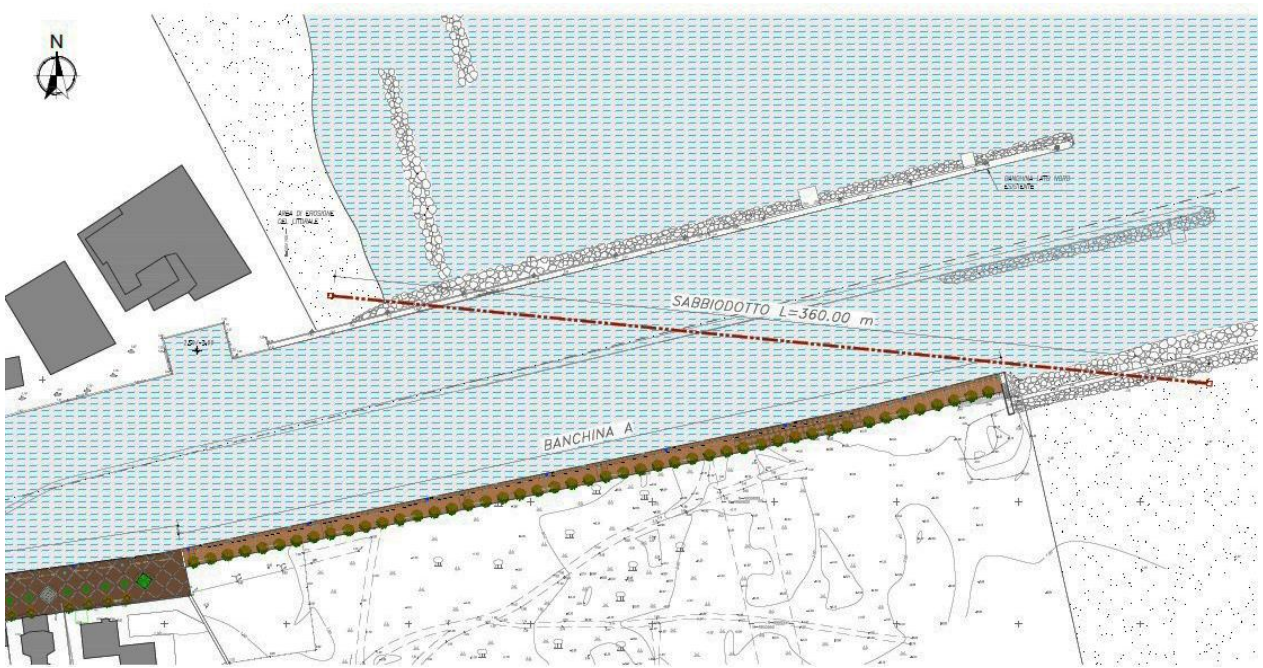
Il sabbiodotto marino di Goro

The Goro sandbank is the biggest littoral sand deposit in Emilia-Romagna region; it's nourished by the Po river south branches it moving westward of **240.000 m^3/y**.

Examples of application sediments management on RER coasts

the permanent bypass of Porto Garibaldi (FE) - 2015

Sand pipeline under the port channel bed, realized with HCD technology (horizontal controlled drilling)
Maximum depth 5 m under seabed, pipeline in PEAD 315 mm
Substituting the former pipeline of 280 mm laying on the seabed, installed in 2004 e removed during the enlarging of the port channel
Feeding the northern beaches affected by erosion with sands from the accumulation beach zone southward of the port



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THANKS FOR YOUR ATTENTION!…

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RegioneEmilia-Romagna
Soil and Coast Protection and Land Reclamation Service
Directorate General for Territory and Environment Care