

DATA SET ON GEOMORPHOLOGICAL AND SEDIMENTOLOGICAL ASSESSMENT

Activity 3.2

Task 3.2.3

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DELIVERABLE 3.2.3

PROJECT CHANGE WE CARE

<https://www.italy-croatia.eu/web/changewecare>

Work Package:	WP3 Knowledge base improvement: status and recent trends of coastal and transitional system processes
Activity:	3.2 Geological and geomorphological setting and recent history
Phase Leader:	Veneto Region
Deliverable:	3.2.3 Data set on geomorphological and sedimentological assessment. This data set will organize information collated in A3.2 into a standardized format to be conveyed into database (A3.3) and GIS (A3.5) produced in WP3.

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CONTENTS

1.	Introduction	3
1.1.	Preamble.....	3
1.2.	Steps in the data survey	3
1.2.1.	<i>Preparation of the table: steps A and B</i>	3
1.2.2.	<i>Implementation of the data set: steps C, D and E</i>	6
2.	Analysis of the data	8
3.	Conclusion	10
	ANNEX 1: AVAILABLE DATA – Geomorphological parameters	12
	ANNEX 2: AVAILABLE DATA – Sedimentological parameters	35
	ANNEX 3: DATA SET OF GEOMORPHOLOGICAL PARAMETERS –from Adriatic area to pilot scale	45
	ANNEX 4: DATA SET OF SEDIMENTOLOGICAL PARAMETERS –from Adriatic area to pilot scale	63

1. Introduction

1.1. Preamble

The activity A 3.2 draws the state-of the-art on geological and geomorphological data concerning settings and recent evolution in the coastal areas, especially in the selected pilot sites.

Three deliverables are expected from this activity:

- 3.2.1 - Geomorphological maps of the pilot areas (report);
- 3.2.2 - Technical report on sediment stocks in the alluvial coastal systems (report);
- 3.2.3 - Data set on geomorphological and sedimentological assessment (data collection file).

The data set aims at making available or quickly retrievable all the data considered useful to assess the geomorphological and sedimentological processes caused by climate changes in the North Adriatic region and in the project pilot sites.

These data will be merged into a more general consultation tool, enlarged to cover other aspects, consisting in a database (A 3.3) and a GIS (A 3.5) that will be produced for the WP 3.3.

The data have been selected based on the identified resources (texts, cartography, web portal, database, etc.) and since the first stages they have been distinguished according to these parameters:

- Description of the conveyed information, covered geographical area, scale (for maps), format;
- Owner/author, availability, eventual source link;
- Reference year.

Some of them, or their elaboration derived by the bibliography, has been used to produce the reports of the A 3.2.1 and 3.2.2.

1.2. Steps in the data survey

The data collection was carried out in five steps:

- A. Creation of a file excel containing general data as regards WP 3.
- B. Elaboration and submission of summary tables (geomorphological and sedimentological parameters) for each pilot site to each partner for data set controlling and completion.
- C. Analysis of the received data and summary in a single simplified table.
- D. Integration with additional data collected by the Veneto Region.
- E. Reorganization, data selection for the geomorphological and sedimentological study of Adriatic region and pilot sites.

1.2.1. Preparation of the table: steps A and B

The first phase involved the preparation of a table to review the data hold by the Veneto Region, with a particular focus on the geographical area of the Po Delta pilot site, collected and hold primarily by the “Genio Civile di Rovigo” of the Veneto Region.

This step consisted of a thorough survey on the geographical and cartographic data that could be useful (C.T.R., administrative borders, aerial and satellite imageries, shoreline evolution, topobathymetric surveys, DTM, etc.), together with data regarding the land use and the anthropic interventions on the coasts (land use on the coastal region, plans for the sandy shores, morphological maps, defense works, etc.), weather and sea (waves, currents, tides, winds), sedimentology and data regarding management aspects (marine state property concession).

After this first analysis, a second phase regarded the creation of a table sheet in collaboration with the Emilia Romagna Region and ISPRA, with the goal of collecting the data in a more structured way. Hence, the main categories of the territorial data were divided in sub-categories covering detailed information considered necessary to identify the geomorphological and sedimentological data (expected in WP 3.2).

In addition to these data, though not required by the Application Form, other categories were included to collect data for the implementation of the WP 3.3. “Characterization of water and sediment fluxes from the mainland” and for the WP 3.4 “Habitats and biodiversity mapping and aquatic ecological quality elements: status and trend”.

Therefore, the table was expanded, and new data-categories were added referring to:

- hydrological and hydrodynamic parameters;
- geomorphological and geological parameters;
- sedimentological parameters;
- physical-chemical parameters;
- biological parameters.

Finally, a new section was added including the data useful for the modelling activity: Modelling data for: i) river, ii) weather, iii) open boundary, and iv) lagoons. A further section (additional data) was included to specify both the measures defined in the SIC and ZPS areas, and the extension of the aquaculture and fishery areas.

Once the table was completed with the categories containing all the parameters and elements useful for WP 3.2, WP 3.3, and WP 3.4, it was sent to the partners, who were asked to fill it with the data regarding both the Adriatic region in its entirety and each of the five pilot sites.

The table structure is as follows:

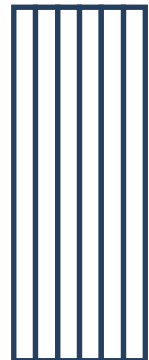
In Column:

CATEGORY TYPOLOGY (printed data, IT. data: .shp, .dwg, .tiff format, etc.)

DESCRIPTION

REFERENCE AREA (Adriatic or Local and partial or total)

DATA COLLECTED (by actual land measurements or by models)



YEARS/REFERENCE PERIOD (years, monitoring frequency)
AVAILABILITY OF THE DATA (institution, contact person, e-mail)
NOTES (regarding the maps, scale)
RELEVANT FOR (Activity/Deliverable)

In Row:

HYDROLOGICAL AND HYDRODYNAMIC PARAMETERS

- Hydroperiod
- Residence/transit time
- Water surface free level
- Flow rate
- Stress at the (river, sea, lagoon) bottom
- River flow
- Studies of special interest



GEOMORPHOLOGICAL PARAMETERS

- Bathymetry (rivers, lagoons, coastal areas)
- Topography (national, regional, and/or local cartography, GPS surveys)
- Aerial and satellite images
- Geomorphological maps
- Geological maps
- High resolution DTM (from lidar, etc.)
- Land Use maps
- Shorelines (e.g. photogrammetry, remote sensing, or site surveys)
- Information on evolutionary trends (eg. Coastal erosion maps, subsidence trends, etc.)
- Hydraulic Defense Works
- Hydraulic works (sump pumps, pumping stations, navigation basins, etc.)
- Maps of lithology, maps of sediment
- Hydraulic hazard maps, hydraulic risk maps
- Studies of special interest



SEDIMENTOLOGICAL PARAMETERS

- Maps of sediments/granulometry (rivers, lagoons, coastal areas)
- Suspended solid transport
- Solid transport at the (river, sea, lagoon) bottom
- River flow data
- Sedimentation rates: canals and shallow waters
- Sedimentation rates: sandbar/sand marshes
- Nourishment and dredging (data, volumes, etc.)
- Studies of special interest



PHYSICAL-CHEMICAL PARAMETERS

- Water temperature
- Water salinity
- Concentration N, P, C: water
- Concentration N, P, C sediment: channels, shallow waters sandbar, sand marshes
- Oxygenation
- Sediment salinity (sandbar/sand marshes)
- Studies of special interest



BIOLOGICAL PARAMETERS

- Maps of different habitats (43/92/EEC)
- Phytoplankton
- Macroalgae
- Phanerogam
- Clams

MODELLING DATA – RIVER, METEO, OPEN BOUNDARY, LAGOONS

- Water flow (daily or better hourly), 3D flow
- Water level, sea level
- Water temperature, salinity
- wind (hourly or at least three hours)
- atmospheric pressure
- humidity
- solar radiation
- air temperature at 2 m
- cloud cover



ADDITIONAL DATA

- Specific measures defined in SIC and ZPS areas
- Aquaculture (Location and extension of the areas)
- Aquaculture (Clam - Location and extension of the areas)
- Aquaculture (Mussels - Location and extension of the areas)
- Minor fishery (macrobenthic fauna in the lagoon, eg: corbola, etc.) - Location and extension of the areas



The tables filled by each partner are displayed in **annex 1** and **annex 2**.

1.2.2. Implementation of the data set: steps C, D and E

Afterwards, the data collection and data analysis for WP 3.2 was carried out by the means of the:

- C. analysis of the received data and summary in a single simplified table:

WP3 - AVAILABLE DATA - GEOMORPHOLOGICAL PARAMETERS				3.2.1 Report: Pilot areas geomorphological maps			
CATEGORY	TYOLOGY (printed data, IT data: shp, dwg, tiff format, etc.)	DESCRIPTION	REFERENCE AREA Adriatic or Local (Pilot Areas- from 5.1 to 5.6), and partial or total.	DATA COLLECTED - by actual land measurements or by models	YEARS / REFERENCE PERIOD (and, if known, indicate the monitoring frequency)	AVAILABILITY of the data (institution, contact person, e-mail)	
PILOT SITE 4: BANCO MULA DI MUGGIA - RFGV							
RFGV Bathymetry Rivers	shp-point, GeoTiff	Bathymetric data along transects collected by Consiglio Nazionale delle Ricerche, Gruppo di Studio dei Litorali, digitalization and DTM by Coastal Group UNITS	originally 54 bathymetric sections between Timavo and Tagliamento; 15 section in the Pilot area Mula di Muggia	Bathymetric surveys along transects	1968	Servizio Geologico Regione FVG (Antonio Brabuzi) Università degli Studi di Trieste Dipartimento di Matematica e Geoscienze (Giorgio Fortolan)	
RFGV Bathymetry Lagoons	shp-point, GeoTiff	Bathymetric data from Regione Autonoma Friuli Venezia Giulia, 1979 - Studio dell'assetto fluviale e costiero della Regione Friuli - Venezia Giulia - ELC - Electroconsult, Studio Volta s.n.c., 161 pp.), digitalization by Coastal Group UNITS	originally 28 bathymetric sections (until 10 m depth) between Timavo and Tagliamento, 8 section in the Pilot area Mula di Muggia,	Bathymetric surveys along transects	1978	Servizio Geologico Regione FVG (Antonio Brabuzi) Università degli Studi di Trieste Dipartimento di Matematica e Geoscienze (Giorgio Fortolan)	
RFGV Bathymetry Coastal areas	shp-point, GeoTiff	Bathymetric data from Regione Autonoma Friuli Venezia Giulia, 1965 - Studio sedimentologico e marittimo costiero dei litorali del Friuli Venezia Giulia, ipotesi di intervento per il recupero ambientale e la valorizzazione della fascia costiera. A cura di A. Brambati, Regione Autonoma Friuli Venezia Giulia	55 bathymetric sections (until -6m) between Grado and Premera, Pilot area Mula di Muggia	Bathymetric surveys along transects	1965	Servizio Geologico Regione FVG (Antonio Brabuzi) Università degli Studi di Trieste Dipartimento di Matematica e Geoscienze (Giorgio Fortolan)	

WP3 - AVAILABLE DATA - SEDIMENTOLOGICAL PARAMETERS				3.2.2 Report: Technical report on sediment stocks in the alluvial coastal systems			
CATEGORY	TYOLOGY (printed data, IT data: shp, dwg, tiff format, etc.)	DESCRIPTION	REFERENCE AREA Adriatic or Local (Pilot Areas- from 5.1 to 5.6), and partial or total.	DATA COLLECTED - by actual land measurements or by models	YEARS / REFERENCE PERIOD (and, if known, indicate the monitoring frequency)	AVAILABILITY of the data (institution, contact person, e-mail)	
PILOT SITE 4: MULA DI MUGGIA - RFGV							
RFGV	Maps of sediments/ granulometry rivers						
RFGV	Maps of sediments/ granulometry Lagoons						
	Maps of sediments/ granulometry Coastal areas	geotiff Sedimentological map of MZ (phi) from Regione Autonoma Friuli Venezia Giulia, 1965 - Studio sedimentologico e marittimo costiero dei litorali del Friuli Venezia Giulia, ipotesi di intervento per il recupero ambientale e la valorizzazione della fascia costiera. A cura di A. Brambati, Regione Autonoma Friuli Venezia Giulia, Direzione Regionale dei lavori Pubblici, Servizio idraulica, Trieste: 67 pp., 161 pp.), digitalization, and geotiff by Coastal Group UNITS	Pilot area Mula di Muggia	derived from sedimen sampling and analysis	1965	Servizio Geologico Regione FVG (Antonio Brabuzi) Università degli Studi di Trieste Dipartimento di Matematica e Geoscienze (Giorgio Fortolan)	
		pdf Morpho-sedimentological map from GORDINI E. CARESSA S., MAROCCO R., 2003) Nuova carta morfo-sedimentologica del Golfo di Trieste (Da Punta Tagliamento alla foce dell'Isorzo) Gortana. Atti Museo Friuli di Storia Nat. 5-29	Gulf of Trieste				
RFGV	Suspended solid transport						

Figure 1-1: Summary tables for each pilot site and after being reorganized by the Veneto Region

This step has involved further activities:

- reorganization of the data according to the covered geographical area (area of the “North Adriatic” in its entirety and “pilot sites”) and to the data type;
- redistribution of the information in the cells under the applicable category;
- correction of the errors;
- homogenization of the used terms;
- link verification;
- homogenization of the data in a unique table.

Then Veneto Region proceeded with:

- D. Integration of the data set with additional data collected by the Veneto Region.
- E. Reorganization, data selection for the geomorphological and sedimentological study of Adriatic region and pilot sites.

The compilation of the data set has been accomplished simultaneously with the realization of the two reports regarding the geomorphological processes of the North Adriatic and the pilot sites (WP 3.2.1 and 3.2.2), which included the contributions by each partner. These reports have provided data that have been integrated in the data set. In particular, the Italian region has been the subject of multiple studies and reports, based on aerial and satellite imageries, historical maps and specialized maps, and surveys.

Annex 3-4 (Elaboration of summary table for Adriatic region and pilot site) show the summary table of the collected information.

The tables, available in word and excel format, have the following structure:

GEOMORPHOLOGY	YEARS/REFERENCE PERIOD	DESCRIPTION*	OWNER	DATA AVAILABILITY/ ACCESSIBILITY	LINK
Topo-bathymetric surveys					
Topography					
Aerial and satellite images, DTM					
Hydraulic Risk, Water Management, Hydraulic Defense Works					
Information on evolutionary trends					
Land use maps					
Maps of lithology, maps of sediment					
Geological and geomorphological cartography, coastlines					
Studies of special interest					
SEDIMENTOLOGY	YEARS/REFERENCE PERIODS	DESCRIPTION*	OWNER	DATA AVAILABILITY/ ACCESSIBILITY	LINK
Maps of sediments/granulometry (coast, lagoons, rivers)					
Nourishment and dredging					
River Flow Data					
Sedimentation rates: canal and shallow waters, sandbar/sand marshes; Solid transport at the bottom; Suspended solid transport					
Studies of special interest					

*This field contains as far as available: object/title of data, reference area, scale, available typology/format/file

2. Analysis of the data

Overall, the data set provides a sufficiently complete overview on the existing cartographic and numerical data, which describe all the proposed topics at different scales, starting from the North Adriatic to the site pilot level.

In general, the historical data that can be used to analyse the evolutionary trend covers a quite short and reduced temporal period. However, some of the historical cartography that dates back to the beginning of the last and previous centuries is cited as bibliography sources in the reports 3.2.1 and 3.2.3, being already published in specific studies, although it is saved in Archives having low accessibility.

The data that potentially can converge into a GIS are even more limited: the identified temporal period ranges from the beginning of the century, with the first orthophotos, to current days, with the recurrent satellite imageries.

The amount of the material available on the Croatian area appears to be narrower than what is available for the Italian region.

The analysis of the data set has revealed that the information regarding the analysis of sediments, with a main focus on the measurements involving the solid transport and the sediment stocks, are quite scarce. In this case, dedicated monitoring systems result to be necessary.

The operational points that should be faced during the implementation of the GIS (3.5.6) can be identified as follows:

- The links to the data source are updated to April 2020: they should be reviewed during the implementation phase of the GIS, as the websites to which they refer are updated continuously;
- The metadata often could not be retrieved. Therefore, some details are not precise, such as ownership, usability, ect.;
- The redundancy of some cartography is due to the historical evolution of the IT systems; from the printed documents that could be purchased only through a contract, there is now a larger availability of data, due to the digitalization, geo-referencing and visualization in web portals, in both local and national and European sites.

It is thus complex to define the accessibility of the data and the available format. The effective data availability is very variable, and regarding the cartography a matrix can be drawn:

		Visualization				
F O R M A T		Online	Geo-referenced printed map	Texts, papers including images and maps		A V A I L A B I L I T Y
	vectorial				Purchase	
	raster				Free after request	
	.pdf				Open source	

Part of the data are now available in Open Geospatial Consortium (OGC), in different available standards (es, WMS – web map service, WFS, - web feature service, WCS web coverage service, KML – keyhole markup language, etc.) and the catalogue is continuously enriched; the accessibility of the data (and their elaboration) is compared to the IT standards of the user.

3. Conclusion

The A 3.2.3 aimed at producing a dataset to make available or quickly retrievable all the data considered useful to assess the geomorphological and sedimentological processes that could be impacted by climate changes in the North Adriatic region and in the project pilot sites, which were selected on the base of their environmental value and particular strategic and economic interest.

However, during the compilation process, the partners agreed on the fact that the database could be enlarged to include all the categories of data and topics useful to produce the WP 3 outputs, by standardizing and sharing information among the partnership, and identifying existing knowledge and gaps.

Therefore, the data set was enlarged to include other categories including physical data, chemical and biological parameters, which could allow the partners responsible for the tasks of the WP 3 (A 3.1, A 3.3, A 3.4) to access and consult a unique catalogue.

The use of shared data and common methodologies aimed at improving the efficiency of the analysis that would be the base of the subsequent phases of the project.

The assessment of the hydrological, weather-marine, geological and geomorphological features of the coasts, as well as the evaluation of the water and sediment fluxes from the inland to the coastal regions, the characterization of the key ecological drivers in the transitional environments of the pilot sites in relation to the climate change scenarios and different temporal scales (WP 4) represent an important

framework to identify efficient response strategies based on local needs and socio-economic constraints.

Improving the knowledge to provide a more solid informative base for the management of the most vulnerable and precious territories is fundamental, especially at a local level, and it allows for an holistic and interdisciplinary approach that leads to the formulation of adaptation strategies and measures that increase the resilience against climate changes.

These strategies will be considered in the formulation of the proposals for the adaptation plans for the pilot sites (WP 5).

ANNEX 1: AVAILABLE DATA – Geomorphological parameters

WP3 - AVAILABLE DATA – GEOMORPHOLOGICAL PARAMETERS							
3.2.1 Report on Pilot areas geomorphological maps							
CATEGORY	TYOLOGY (printed data, IT. data: .shp, .dwg, .tiff format, etc.)	DESCRIPTION	REFERENCE AREA Adriatic or Local (Pilot Areas- from 5.1 to 5.6), and partial or total	DATA COLLECTED – by actual land measurements or by models	YEARS / REFERENCE PERIOD (and, if known, indicate the monitoring frequency)	AVAILABILITY of the data (institution, contact person, e-mail)	NOTES regarding the maps, please specify the scale
PILOT SITE 5: PO RIVER DELTA – DATA FROM RDV - VENETO REGION							
Bathymetry Rivers							
Bathymetry Lagoons	.dwg; x,y,z	Sacca degli Scardovari 2018, Sacca del Canarin 2018, Laguna di Caleri 2018, Laguna di Barbamarco 2018	Lagoons		2018	guido.selvi@regione.veneto.it	
Bathymetry Areas Costal	.dwg; x,y,z	N° 57 crossing (every 1 km), 2005 – more frequent near costal works	Entire coast of Rovigo district		2005	guido.selvi@regione.veneto.it	

	.dwg; x,y,z	N° 57 crossing (every 1 km), 2008 – more frequent near costal works	Entire coast of Rovigo district		2008	guido.selvi@regione.veneto.it	
	.dwg; x,y,z	Crossing every 200 m, from Adige to Po di Levante, year 2012	Rosolina shoreline		2012	guido.selvi@regione.veneto.it	
	.dwg; x,y,z	Crossing every 1 km, from Po di Levante to Po di Goro, year 2014	From Po di Levante to Po di Goro		2014	guido.selvi@regione.veneto.it	
Topography (national, regional and/or local cartography, GPS surveys)	.tiff;.dwg; dxf	Regional technical maps	Total Area of Veneto region			Veneto Region - Territorial Planning Direction	1:5.000 - 1:10.000
Aerial and satellite images							
Geomorphological maps	.pdf	Geomorphological map of Po River Delta derived from aerial photo surveys (Flights GAI 1954-55 and Terraltaly NR 2003)	Total Area of Veneto delta		1954-2003	Veneto Region - Soil Defense Directorate (difesasuolo@regione.veneto.it) (MONITOR project)	1:60.000
	.shp	Geomorphological map of Rovigo Province (from PTCP: Provincial territorial Coordination Plan)	Total Area of Veneto delta		2009	Veneto Region - Soil Defense Directorate (difesasuolo@regione.veneto.it)	
	paper	Geomorphological map of Veneto region	Total Area of Veneto region		1987	Veneto Region - Soil Defense Directorate (difesasuolo@regione.veneto.it)	1:250.000
Geological maps	paper	Geological map of Veneto region	Total Area of Veneto region		1988	Veneto Region - Soil Defense Directorate (difesasuolo@regione.veneto.it)	1:250.000

High resolution DTM (from lidar, etc.)	x,y,z ; asc	Lidar 2006; Lidar 2009; Lidar 2012 - (grid 0,5 m), Lidar 2018	Entire coast of Rovigo district (2018 including lagoons)		2018	guido.selvi@regione.veneto.it	
Land Use maps							
Shorelines (e.g. photogrammetries, remote sensing, or site surveys)							
Information on evolutionary trends (eg. Coastal erosion maps, subsidence trends, etc.)	.shp	Shore-line variation 2006-2009 and 2009-2012 2012-2018 (from Lidar). Countour lines (0,25 m), n. 57 crossing land-sea	Entire coast of Rovigo district				
	inform.	Subsidence analysis (Achilli Menin Fabbris) measures 2016 and 2018 PODELTANET	Entire delta area		2016 and 2018	guido.selvi@regione.veneto.it	
Hydraulic Defense Works	.shp	Information on costal defence works	Entire coast of Rovigo district		2018	guido.selvi@regione.veneto.it	
Hydraulic works (sump pumps, pumping stations, navigation basins, etc.)	.shp; .dwg	Pumping installation localisation Consorzio di Bonifica Delta del Po	Entire delta area			Po Delta remediation Consortium	
Maps of lithology, maps of sediment	.shp	Lithological map of Rovigo Province (from PTCP: Provincial territorial Coordination Plan)	Total Area of Veneto delta		2009	Veneto Region - Soil Defense Directorate (difesasuolo@regione.veneto.it)	
Hydraulic hazard maps, hydraulic risk maps	PDF	"Flood risk assessment and management plan - Area at significant risk of flooding - monographic records in the coastal marine area of Veneto"	Total Area of Veneto delta		2016	Padan District	
Studies of special interest	inform. (PDF; shp; .dwg)	Erosion precesses analisys and technical proposals – Trieste University, DiSGAM, year 2007 and new revision	Rosolina shoreline		2007	guido.selvi@regione.veneto.it	
	inform. (PDF; shp; .dwg)	Evolution trend of Po di Maistra mouth and nearest area – Ferrara University - Dipartimento Scienze della Terra, Year 2007	Po di Maistra mouth area		2007	guido.selvi@regione.veneto.it	

	inform. (PDF; shp; .dwg)	Sacca di Scardovari sand bar, morphological evolution – Ferrara University - Dip. Scienze della Terra. Year 2008	From Po di Tolle to Po di Goro		2006	guido.selvi@regione.veneto.it	
	inform. (PDF; shp; .dwg)	Rosolina e Scardovari litoral morphological evolution. Ipros- Ingegneria Ambientale srl. Year 2013	Rosolina shoreline end from Po di Tolle to Po di Gnocca		2013	guido.selvi@regione.veneto.it	
	inform. (PDF; shp; .dwg)	Operation strategy for the Po river delta litorals. Hydrosol srl. Year 2013	Rosolina shoreline end from Po di Tolle to Po di Gnocca		2013	guido.selvi@regione.veneto.it	
	inform. (PDF; shp; .dwg)	Delta Po geodatabase – University of Trieste. Math. and Geoscience Dept. - Anno 2014	Entire coast of Rovigo district		2014	guido.selvi@regione.veneto.it	
	inform. (PDF; shp; .dwg)	P. Ruol, L. Martinelli, C. Favaretto, Integrated management of the coastal area - Study and monitoring for costal defence from erosion in regione Veneto. Guidelines. Padova University, Dip. ICEA, 2016 -	Entire coast of Rovigo district		2016	guido.selvi@regione.veneto.it	

PILOT SITE 5: PO RIVER DELTA – DATA FROM RER - EMILIA ROMAGNA REGION

Bathymetry Rivers	shp	Topo-bathymetric survey of about 163 cross sections of the Po Delta Reaches	Po Delta	by actual land measurements	1990, 2005 (only Po di Venezia and Po di Goro), 2018	http://geoportale.agenziapo.it/cms/ (2018 survey is not yet available, but it will be upload in June 2019)	
Bathymetry Lagoons	shp (point)	Topo-bathymetric survey	SS		2013, 2012, 2008, 2007	RER-SGSS	coverages of the various years not coincident
Bathymetry Coastal areas	shp (point, polyline), grid	Topo-bathymetric survey	SS		2012 2006 2000	RER-SGSS	
Topography (national, regional and/or local cartography, GPS surveys)	Raster, .tiff, wms	Regional topographic map at different scale (1:250000; 1:5000); topographic data base	SS			RER Geoportal	https://geoportale.regione.emilia-romagna.it/it
Aerial and satellite images	Raster, wms	Aerial photos: 1996, 1994, 1998, 2002, 2005,2006,2008,2011,2014 (regional coverage); raf (1943-45), 1954 (GAI), 1976-78, 1982, 1991, 1992, 2005, 2010 (partial coverage, coast); satellite images: quickbird, landsat	SS		1996, 1994, 1998, 2002, 2005,2006,2008,2011, 2014, raf (1943-45), 1954 (GAI), 1976-78, 1982, 1991, 1992, 2005, 2010	RER Geoportal; RER-SGSS	
Geomorphological maps	shp	Geological cartography, CARG project; coastal geomorphological maps; Geological Po Plain Map of RER, 1:250.000 scale	SS		1943, 1982, 1998, 2005	RER-SGSS	coastal geomorphological maps from photointerpretation
Geological maps	shp	Geological cartography, CARG project; coastal geomorphological maps; Geological Po Plain Map of RER 1:250.000 scale	SS		1943, 1982, 1998, 2005	RER-SGSS	coastal geomorphological maps from photointerpretation

High resolution DTM (from lidar, etc.)	grid	1. Lidar survey of the coast (2004, 2010) and PNT (2008), DTMSGSS2012 2. DTM Po river (2005) 3. DTM 2015 of the river Po and of the Delta reaches	1. SS 2. river corridor scale 3. Po river and Delta region SS		1. 2004, 2008, 2010 2. 2005 3. 2015	1. RER- SGSS; National Geoportal (MATTM) 2. District basin authority of the Po River 3. AIPo Geoportal	1. Coverages of the various years not coincident; http://www.pcn.minambiente.it/mattm/ 2. http://www.adbpo.it/download/dtm_po_2004_2005/ 3. http://geoportale.agenziapo.it/cms/
Land Use maps	shp, wms	Coastal zone: 1943, 1982, 1998, 2005; entire region: 1954, 1976, 2003, 2008, 2014	SS		1943, 1982, 1998, 2005; 1954, 1976, 2003, 2008, 2014	RER Geoportal; RER-SGSS	Coverages of the various years not coincident
Shorelines (e.g. photogrammetries, remote sensing, or site surveys)	shp	From photointerpretation; from GPS survey (2006, 2012)	SS		1943, 1982, 1996, 1998, 2005, 2011, 2014; 2006;2012	RER-SGSS	Two data sets: from photointerpretation, from gps survey
Information on evolutionary trends (eg. Coastal erosion maps, subsidence trends, etc.)	shp	Analysis of the evolution of the coastal depositional systems from 10000 years ago to today; shoreline and sea-bottom changes analysis, subsidence monitoring by interferometry and assestimeter (one in Gorino)	SS		Interferometry: 1992-2000; 2006-2011; 2011-2016; assestimeter working since 2013; historical shoreline analysis (since XIX sec), period:1943-2014, 2000-2014; sea-bottom: 1901, 1950, 2000, 2006, 2012	RER-SGSS	
Hydraulic Defense Works	shp	1. From photointerpretation and information from ex STB 2. 2015 topographic survey of the levees elevation (both along the river Po and the coast)	SS		1. 1943, 1982, 1996, 2000, 2005, 2011 2. 2014-2018	1. RER-SGSS 2. AIPo Geoportal (http://geoportale.agenziapo.it/cms/)	Last period is 2014 with local update (from googlemap) until 2018
Hydraulic works (sump pumps, pumping stations, navigation basins, etc.)	pdf: other		SS			Reclamation Consortium "Plain of Ferrara"; web-gis: http://www.bonificaferrara.it/index.php/it/sit1/collegarsi-al-sistema-informativo-territoriale pdf maps: http://www.bonificaferrara.it/index.php/it/sit1/cartografie-scaricabili	

Maps of lithology, maps of sediment	shp	Sedimentological map CNR 1982; granulometric analysis ARPA 2006, 2012; study of sediments in the Sacca di Goro 1998	SS			RER-SGSS	
Hydraulic hazard maps, hydraulic risk maps	shp; pdf	Flood Directive Maps	SS		2015	RER; ADBPO: https://pianoalluvioni.adbpo.it/mappe-del-rischio-2/download-mappe/ ; web-gis: https://servizimoka.regione.emilia-romagna.it/mokaApp/apps/DA/index.html?null	
Studies of special interest	pdf; ppt; other	1. Publications, presentations, maps and sections, geological and thematic 3D models of the subsoil. 2. "Studio di fattibilità degli interventi di gestione dei sedimenti alluvionali dell'alveo del fiume Po nel tratto confluenza Arda - mare" (the study also involves the area until Incile del Po di Goro)	1. SS 2. River reach scale		2. 2008	1. RER-SGSS 2. Authority of the Po river district basin	

**PILOT SITE 5: PO RIVER DELTA –
DATA FROM CNR - ISMAR**

Bathymetry Rivers							
Bathymetry Lagoons							
Bathymetry Coastal areas							
Topography (national, regional and/or local cartography, GPS surveys)							
Aerial and satellite images							
Geomorphological maps							
Geological maps	.shp, .pdf, tiff	a) Geological cartography of the Adriatic Sea, CARG project b) Historical map of Delta Po. Map of Ing. Stella 1877. Digitized and georeferenced map. Shape of coastline and point of bathymetry	a) Italian Adriatic Sea; b) Delta Po		a) 2001; b) 1877 coast of 1530, 1592, 1645.1685, 1736, 1820	ISMAR-CNR anna.correggiari@bo.ismar.cnr.it	a) Foglio NL 33-10. scala 250,000 b) 100.000
High resolution DTM (from lidar, etc.)							
Land Use maps							
Shorelines (e.g. photogrammetries, remote sensing, or site surveys)							
Information on evolutionary trends (eg. Coastal erosion maps, subsidence trends, etc.)							
Hydraulic Defense Works							

Hydraulic works (sump pumps, pumping stations, navigation basins, etc.)							
Maps of lithology, maps of sediment	.shp	a) Lithologic map, 7 class; data merged into the EMODNET Geology portal, b) Sedimentological map of north Adriatic Sea, Brambati et al 1988	a) Adriatic Sea b) north Adriatic Sea		b)1988	a) EMODNET Geology portal b) ISMAR-CNR anna.correggiari@bo.ismar.cnr.it	b) 1:250.000
Hydraulic hazard maps, hydraulic risk maps							
Studies of special interest	.jpg	Volume of scanno Goro's sand, fast calculation through the interpretation of chirp seismic profile, in collaboration with SSGS-RER	Scanno di Goro		2014	ISMAR-CNR anna.correggiari@bo.ismar.cnr.it	

PILOT SITE 5: PO RIVER DELTA – DATA FROM ISPRA							
Bathymetry Rivers							
Bathymetry Lagoons							
Bathymetry Coastal areas							
Topography (national, regional and/or local cartography, GPS surveys)							
Aerial and satellite images							
Geomorphological maps							
Geological maps	raster	CARG	Adriatic region			http://portalesgi.isprambiente.it/it/elen-co-base-dati/10	1:50.000
High resolution DTM (from lidar, etc.)							
Land Use maps		Land use land cover	Adriatic region			http://sgi2.isprambiente.it/mapviewer/	
Shorelines (e.g. photogrammetries, remote sensing, or site surveys)							
Information on evolutionary trends (eg. Coastal erosion maps, subsidence trends, etc.)							
Hydraulic Defense Works		Hydraulic defence works – Rendis database (Repertorio Nazionale degli interventi per la Difesa del suolo)	Adriatic region			http://dati.isprambiente.it/dataset/il-rendis/	

Hydraulic works (sump pumps, navigation basins, etc.)							
Maps of lithology, maps of sediment	raster	Data base of the lithology in the Adriatic Region	Adriatic region			http://sgi2.isprambiente.it/mapviewer/	1:100,000
Hydraulic hazard maps, hydraulic risk maps		National Tiling (Mosaiculture Nazionali) ISPRA, hydraulic and landslide hazards	Adriatic region		the update is not guaranteed	http://www.sinanet.isprambiente.it/it/sia-ispra/download-mais/mosaicature-nazionali-ispra-pericolosita-frane-alluvioni	
Studies of special interest							
Mups of Sinkholes		National database sinkholes	Adriatic region			http://sgi1.isprambiente.it/sinkholeweb/viewer/index.html	
marine geological data		Emodnet	Adriatic Sea			https://www.emodnet-geology.eu/services/	
sea geological map	wms format	Italian sea geological map	Adriatic Sea			http://sgi2.isprambiente.it/mapviewer/	1:250,000

PILOT SITE 1: NERETVA RIVER – DATA FROM PIDNC							
Bathymetry Rivers							
Bathymetry Lagoons							
Bathymetry Coastal areas							
Topography (national, regional and/or local cartography, GPS surveys)	printed data	Map of Neretva River Delta	Neretva River Delta, partial	land measurments	2019	Public Institution for the management of protected natural areas of Dubrovnik Neretva County	
Aerial and satellite images							
Geomorphological maps							
Geological maps	printed data, IT data	Draft of Management Plan of Neretva River Delta	Neretva River Delta, partial	land measurments	2018	Public Institution for the management of protected natural areas of Dubrovnik Neretva County	
High resolution DTM (from lidar, etc.)							
Land Use maps							
Shorelines (e.g. photogrammetries, remote sensing, or site surveys)							
Information on evolutionary trends (eg. Coastal erosion maps, subsidence trends, etc.)	printed data, IT data	Physical features (geomorphology, hydrology, sediment fluxes, ...) of Neretva Delta River - short report	Neretva River Delta, total	land measurments, models	1998, 2007	Public Institution for the management of protected natural areas of Dubrovnik Neretva County	
Hydraulic Defense Works							
Hydraulic works (sump pumps, pumping stations, navigation basins,							
Maps of lithology, maps of sediment							

Hydraulic hazard maps, hydraulic risk maps							
Studies of special interest							

PILOT SITE 2: JADRO RIVER

Bathymetry Rivers							Hrvatske vode
Bathymetry Lagoons	screen printed view,	Topographic map	PA 2, Jadro delta	Land measurements	2017.	https://geoportal.dgu.hr/	1:25.000
Bathymetry Coastal areas	screen printed view,	Topographic map	PA 2, Jadro delta	Land measurements	2017.	https://geoportal.dgu.hr/	1:25.000
Topography (national, regional and/or local cartography, GPS surveys)	shp, .dwg	National Topographic data 1:25000	Adriatic	Actual measurements land		https://dgu.gov.hr/podaci-topografske-izmjere/168	Državna geodetska uprava
Aerial and satellite images							
	.tiff	National ortophoto (1:5000-1:2000)	Adriatic	Actual measurements land		https://dgu.gov.hr/proizvodi-i-usluge/sluzbene-drzavne-karte-i-ostale-karte/167	Državna geodetska uprava
Geomorphological maps							
Geological maps	.tiff, printed, WEBGIS	Basic Geological Map 1:100.000, sheet Split				.tiff, printed, WEBGIS	Basic Geological Map 1:100.000, sheet Split
High resolution DTM (from lidar, etc.)	dgn, .dwg, xyz, txt	1:25.000 (the best Croatia has on national level)	Adriatic	actual measurements land		https://dgu.gov.hr/podaci-topografske-izmjere/168	Državna geodetska uprava
Land Use maps							
	shp, .dwg	Spatial and urban plans (1:25000 - 1:5000)	Local				Municipality Solin and Kaštela (spatial plans)
Shorelines (e.g. photogrammetries, remote sensing, or site surveys)	shp, .dwg	ZOP data (zaštićeni obalni pojasi)	Adriatic	Actual measurements land		https://dgu.gov.hr/podaci-topografske-izmjere/168	Državna geodetska uprava
Information on evolutionary trends (eg. Coastal erosion maps, subsidence trends, etc.)							Hrvatske vode

Hydraulic Works	Defense						Hrvatske vode
Hydraulic works (sump pumps, navigation basins, etc.)							Hrvatske vode
Maps of lithology, maps of sediment							Hrvatske vode
Hydraulic hazard maps, hydraulic risk maps							Hrvatske vode
Studies of special interest							Hrvatske vode

PILOT SITE 3: NATURE PARK VRANSKO JEZERO – DATA FROM VRANPARK

Bathymetry Rivers								
Bathymetry Lagoons								
Bathymetry Coastal areas	printed data		Bathymetric measurement of TheVransko Lake	5.4. total	land measurements	2012.	Public institution Vransko lake Nature Park	
Topography (national, regional and/or local cartography, GPS surveys)	IT DATA, shp. printed data		Map of Nature park Vransko lake	5.4. total	land measurements	2019 - 2020.	Public institution Vransko lake Nature Park	
Aerial and satellite images								
Geomorphological maps	IT DATA, shp. printed data		Geomorphological characteristics of Vransko lake 2018.	5.4. total	land measurements	2018.	Public institution Vransko lake Nature Park	
Geological maps	IT DATA, shp. printed data		Geological map of Vransko lake	5.4. total	land measurements	2018.	Public institution Vransko lake Nature Park	
High resolution DTM (from lidar, etc.)								
Land Use maps								
Shorelines (e.g. photogrammetries, remote sensing, or site surveys)								
Information on evolutionary trends (eg. Coastal erosion maps, subsidence trends, etc.)								
Hydraulic Defense Works								
Hydraulic works (sump pumps, navigation basins, etc.)	IT DATA, shp. printed data		Aquifers, water flux tracing, resource vulnerability, Hidrogeological survey of Vransko lake Nature park	5.4. total	Land measurements	2011.	Public institution Vransko lake Nature Park	

Maps of lithology, maps of sediment							
Hydraulic hazard maps, hydraulic risk maps							
Studies of special interest							

**PILOT SITE 4: BANCO MULA DI MUGGIA
DATA FROM RFVG – FRIULI VENEZIA GIULIA REGION**

Bathymetry Rivers							
Bathymetry Lagoons							
Bathymetry Coastal areas	shp -point; GeoTiff	Bathymetric data along transects collected by National Research Council (CNR), Coastal study group; digitalization and DTM by Costal Group UniTS	originally 54 bathymetric sections between Timavo and Tagliamento; 15 sections in the Pilot area Mula di Muggia.	Bathymetric surveys along transects	1968	Geological service FVG (Antonio Bratus) Trieste University, Department of Mathematics and Geoscience (Giorgio Fontolan)	data in GIS
Coastal areas	shp -point; GeoTiff	Bathymetric data from Friuli Venezia Giulia autonomous Region, 1979 - Studio dell'assetto fluviale e costiero della Regione Friuli – Venezia Giulia. ELC – Electroconsult, Studio Volta s.n.c., 161 pp.); digitalization by Costal Group UniTS	originally 28 bathymetric sections (uniti 10 m depht) between Timavo and Tagliamento, 8 sections in the Pilot area Mula di Muggia.	Bathymetric surveys along transects	1978	Geological service FVG (Antonio Bratus) Trieste University, Department of Mathematics and Geoscience (Giorgio Fontolan)	data in GIS
	shp -point; GeoTiff	Bathymetric data from Friuli Venezia Giulia autonomous Region, 1985. "Studio sedimentologico e marittimo costiero dei litorali del Friuli Venezia Giulia, ipotesi di intervento per il recupero ambientale e la valorizzazione della fascia costiera." By A. Brambati. Regione Autonoma Friuli Venezia Giulia, Direzione Regionale dei lavori Pubblici, Servizio dell'Idraulica, Trieste: 67 pages; 161 pp.); digitalization and DTM by Costal Group UniTS	35 bathymetric sections (until -6m) between Grado and Primero, Pilot area Mula di Muggia	Bathymetric surveys along transects	1985	Geological service FVG (Antonio Bratus) Trieste University, Department of Mathematics and Geoscience (Giorgio Fontolan)	data in GIS

	shp -point; Ggeotiff	Bathymetric data from Vector Project (activities for "Definizione della vulnerabilità e del rischio da mareggiata nel tratto di litorale compreso tra Grado e Monfalcone", collaboration between UniTS and O.G.S. DTM from Fontolan G., Fattor F., Bratus A., Bezzi A., Casagrande G., Martinucci D., Pillon S., Tondello M. (2018) "Studio di assetto morfologico e ambientale del Banco della Mula di Muggia. Accordo attuativo di collaborazione con Regione Autonoma"	Pilot area Mula di Muggia	Bathymetric surveys along transects	2007	Geological service FVG (Antonio Bratus) Trieste University, Department of Mathematics and Geoscience (Giorgio Fontolan)	data in GIS
Topography (national, regional and/or cartography, surveys)	printed and geotiff	IGM Topographical Map 40IISE1917 Grado	Pilot area Mula di Muggia	cartographic data	1915-1917	IUAV Venice	1:25000
	printed and geotiff	IGM Topographical Map 40IISE1927 Grado	Pilot area Mula di Muggia	cartographic data	1927 (survey from 1896-97)	IUAV Venice	1:25000
	printed and geotiff	IGM Topographical Map, 1938, 40IISO Foce dell'Isonzo and 40IISE1938 Grado	Pilot area Mula di Muggia	cartographic data	1936 and 1896-97	IUAV Venice	1:25000
	printed and geotiff	IGM Topographical Map 40IISE1949 Grado and 40IISO Foce dell'Isonzo	Pilot area Mula di Muggia	cartographic data	1896-97 and 1937	IUAV Venice	1:25000
	printed and geotiff	Tavoletta IIM (Istituto Idrografico della Marina) Marina di Grado 1927	Pilot area Mula di Muggia	cartographic data	1927	FVG Region	1:12000
	printed and geotiff	Tavoletta IIM (Istituto Idrografico della Marina) Marina di Grado 1939	Pilot area Mula di Muggia	cartographic data	1927 and 1939	FVG Region	1:12000
	printed and geotiff	Tavoletta IIM (Istituto Idrografico della Marina) Marina di Grado 1949	Pilot area Mula di Muggia	cartographic data	1927 and 1949	FVG Region	1:12000

	printed and geotiff	Tavoletta IIM (Istituto Idrografico della Marina) Marina di Grado 1959	Pilot area Mula di Muggia	cartographic data	1927 and 1959	FVG Region	1:12000
Aerial and satellite images	printed and geotiff	1954 flight GAI (Gruppo Aereo Italiano)	Pilot area Mula di Muggia	aerial photo	1954	Trieste University, Department of Mathematics and Geoscience (Giorgio Fontolan)	1:35000
	printed and geotiff	1978 flight CGR (Compagnia Generale Riprese-aeree) for CNR (Consiglio Nazionale delle Ricerche)	Pilot area Mula di Muggia	aerial photo	1978	Trieste University, Department of Mathematics and Geoscience (Giorgio Fontolan)	
	printed and geotiff	1990 flight CGR, Regione Autonoma Friuli Venezia Giulia.	Pilot area Mula di Muggia	aerial photo	1990	FVG Region georeferred by Trieste University, Department of Mathematics and Geoscience (Giorgio Fontolan)	
	geotiff	2007 - 2008 digital orto-photo on http://www.pcn.minambiente.it/mattm/servizio-wms/ .	Pilot area Mula di Muggia	aerial photo	2007-2008	http://www.pcn.minambiente.it/mattm/servizio-wms/ .	
	geotiff	2014 digital ortho photos by AgEA (Agenzia per le Erogazioni in Agricoltura regione Autonoma Friuli venezia Giulia)	Pilot area Mula di Muggia	aerial photo	2014	FVG Region	
Geomorphological maps	shp polygon and polyline	Geomorphological map from Fontolan G., Fattor F., Bratus A., Bezzi A., Casagrande G., Martinucci D., Pillon S., Tondello M. (2018): "Studio di assetto morfologico e ambientale del Banco della Mula di Muggia. Accordo attuativo di collaborazione con Regione autonoma Friuli Venezia Giulia, Direzione centrale ambiente ed energia." Final report– February, 2018	Pilot area Mula di Muggia	Derived from aerial photo interpretation and bathymetric data	1954	Geological service FVG (Antonio Bratus) Trieste University, Department of Mathematics and Geoscience (Giorgio Fontolan)	data in GIS
	shp polygon and polyline	Geomorphological map from Fontolan G., Fattor F., Bratus A., Bezzi A., Casagrande G., Martinucci D., Pillon S., Tondello M. (2018): "Studio di assetto morfologico e ambientale del Banco della Mula di Muggia. Accordo	Pilot area Mula di Muggia	Derived from aerial photo interpretation and bathymetric data	1978	Geological service FVG (Antonio Bratus) Trieste University, Department of Mathematics and Geoscience (Giorgio Fontolan)	data in GIS

		attuativo di collaborazione con Regione autonoma Friuli Venezia Giulia, Direzione centrale ambiente ed energia.” Final report– February, 2018					
	shp polygon and polyline	Geomorphological map from Fontolan G., Fattor F., Bratus A., Bezzi A., Casagrande G., Martinucci D., Pillon S., Tondello M. (2018): “Studio di assetto morfologico e ambientale del Banco della Mula di Muggia. Accordo attuativo di collaborazione con Regione autonoma Friuli Venezia Giulia, Direzione centrale ambiente ed energia.” Final report– February, 2018	Pilot area Mula di Muggia	Derived from aerial photo interpretation and bathymetric data	2007	Geological service FVG (Antonio Bratus) Trieste University, Department of Mathematics and Geoscience (Giorgio Fontolan)	data in GIS
	shp polygon and polyline	Geomorphological map from Fontolan G., Fattor F., Bratus A., Bezzi A., Casagrande G., Martinucci D., Pillon S., Tondello M. (2018): “Studio di assetto morfologico e ambientale del Banco della Mula di Muggia. Accordo attuativo di collaborazione con Regione autonoma Friuli Venezia Giulia, Direzione centrale ambiente ed energia.” Final report– February, 2018	Pilot area Mula di Muggia	Derived from aerial photo interpretation and bathymetric data	2014	Geological service FVG (Antonio Bratus) Trieste University, Department of Mathematics and Geoscience (Giorgio Fontolan)	data in GIS
	.pdf	Morphosedimentological map from GORDINI E., CARESSA S., MAROCCO R., 2003. “Nuova carta morfo-sedimentologica del Golfo di Trieste (From Punta Tagliamento to the Isonzo mouth). Gortania”, Atti Museo Friul. di Storia Nat., 5-29.	Gulf of Trieste	Derived from sedimentological, geophysical and bathymetric data			
Geological maps	.shp	Geological map from CGT project	Local area RAFVG	scale survey 1:2000	2008	Geological service FVG (Antonio Bratus)	data in GIS

High resolution DTM (from lidar, etc.)	.asc	DTM having a grid of 1 m	RAFVG	data are from the Lidar survey of 2008	2008	http://irdat.regione.fvg.it/consultatore-dati-ambientali-territoriali/search	
	.xyz	Lidar	RAFVG	mcp data derived from original survey, the original data are available too	2008	Geological service FVG (Antonio Bratus)	
Land Use maps							
Shorelines (e.g. photogrammetries, remote sensing, or site surveys)	.shp and KML - KMZ	Shoreline photogrammetries from	Costal area of RAFVG	Derived from ortophoto. Digitalized 1:2000	2011	http://irdat.regione.fvg.it/consultatore-dati-ambientali-territoriali/search	
Information on evolutionary trends (eg. Coastal erosion maps, subsidence trends, etc.)	GeoTiff	Map of the altimetric differences, 1968-2007 from Fontolan G., Fattor F., Bratus A., Bezzi A., Casagrande G., Martinucci D., Pillon S., Tondello M. (2018) "Studio di assetto morfologico e ambientale del Banco della Mula di Muggia. Accordo attuativo di collaborazione con Regione autonoma Friuli Venezia Giulia, Direzione centrale ambiente ed energia." Final report, February, 2018	Pilot area Mula di Muggia	Derived from DTM elaboration	1968-2007	Geological service FVG (Antonio Bratus) Trieste University, Department of Mathematics and Geoscience (Giorgio Fontolan)	
Hydraulic Defense Works	.shp	database of defense work from CGT project	Local area RAFVG	scale survey 1:2000	2008	Geological service FVG (Antonio Bratus)	data in GIS
Hydraulic works (sump pumps, pumping stations, navigation basins, etc.)							
Maps of lithology, maps of sediment	.shp	dabase of lithology and sediments from CGT project	Local area RAFVG	scale survey 1:2000	2008	Geological service FVG (Antonio Bratus)	data in GIS
Hydraulic hazard maps, hydraulic risk maps	.pdf	hydraulic hazard maps from PAIR (Piano stralcio per l'Assetto Idrogeologico dei bacini Regionali)	Local area RAFVG		2017	https://www.regione.fvg.it/rafvg/cms/RAFVG/ambiente-territorio/pianificazione-gestione-territorio/FOGLIA209/	

Studies of special interest						
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ANNEX 2: AVAILABLE DATA – Sedimentological parameters

WP3 - AVAILABLE DATA - SEDIMENTOLOGICAL PARAMETERS							
3.2.2 Technical report on sediment stocks in the alluvial coastal systems							
CATEGORY	TYOLOGY (printed data, IT. data: .shp, .dwg, .tiff format, etc.)	DESCRIPTION	REFERENCE AREA Adriatic or Local (Pilot Areas- from 5.1 to 5.6), and partial or total.	DATA COLLECTED – by actual land measurements or by models	YEARS / REFERENCE PERIOD (and, if known, indicate the monitoring frequency)	AVAILABILITY of the data (institution, contact person, e-mail)	NOTES regarding the maps, please specify the scale
PILOT SITE 5: PO RIVER DELTA – DATA FROM RDV - VENETO REGION							
Maps of sediments/ granulometry							
Rivers							
Lagoons							
Coastal areas	shp.	Characterization of Delta Po costal area. year 2005 (particularly Adige mouth; Caleri mouth; busa Tramontana; Scardovari)	Entire coast of Rovigo district (sea only)			guido.selvi@regione.veneto.it	
Suspended solid transport							
Solid transport at the (river, sea, lagoon) bottom	inform.	measurements	ARPAV		2018	guido.selvi@regione.veneto.it	
River flow data							

Sedimentation rates: canals and shallow waters							
Sedimentation rates: sandbar/sand marshes							
Nourishment and dredging (data, volumes, etc)	inform.	beach nourishment information forms	Entire coast of Rovigo district			guido.selvi@regione.veneto.it	
Studies of special interest	inform. (PDF;shp;.dwg)	Grain size Characterization of costal area. year 2005 (particularly Adige mouth; Caleri mouth; busa Tramontana; Scardovari). M. Gallo, V. Marinese, "Caratterizzazione della fascia costiera mediante campagna di prelievi e analisi dei sedimenti in prossimità delle foci fluviali e di altre zone di accumulo dei sedimenti in prossimità delle foci fluviali e di altre zone di accumulo per utilizzo degli stessi per ripascimenti dei tratti di litorale in erosione"	Entire coast of Rovigo district		2005	guido.selvi@regione.veneto.it	

PILOT SITE 5: PO RIVER DELTA – DATA FROM CNR - ISMAR							
Maps of sediments/ granulometry							
Rivers							
Lagoons							
Coastal areas	.shp; .pdf	Lithologic map, 7 class; data merged into the EMODNET Geology portal	Adriatic Sea			EMODNET Geology Portal	
Suspended solid transport		Data from EURODELTA Project				anna.correggiari@bo.ismar.cnr.it	
Solid transport at the (river, sea, lagoon) bottom							
River flow data		Data from EURODELTA Project				anna.correggiari@bo.ismar.cnr.it	
Sedimentation rates: canals and shallow waters							
Sedimentation rates: sandbar/sand marshes							
Nourishment and dredging (data, volumes, etc)							
Studies of special interest	.txt	Radionuclidi, ²¹⁰ Pb sedimentation rate. Data in paper Frignani et al. 2005 and merged in EMODNET Chemistry	Delta Po and Italian Adriatic Sea		2005	EMODNET Chemistry Portal	

**PILOT SITE 5: PO RIVER DELTA –
DATA FROM ISPRA**

Maps of sediments/ granulometry							
Rivers							
Lagoons							
Coastal areas							
Suspended solid transport							
Solid transport at the (river, sea, lagoon) bottom							
River flow data							
Sedimentation rates: canals and shallow waters							
Sedimentation rates: sandbar/sand marshes							
Nourishment and dredging (data, volumes, etc)							
Studies of special interest							
others							

**PILOT SITE 5: PO RIVER DELTA –
DATA FROM RER – EMILIA ROMAGNA REGION**

Maps of sediments/ granulometry							
Rivers							
Lagoons							
Coastal areas							
Suspended solid transport							
Solid transport at the (river, sea, lagoon) bottom							
River flow data							
Sedimentation rates: canals and shallow waters							
Sedimentation rates: sandbar/sand marshes							
Nourishment and dredging (data, volumes, etc)	shp, grid	Regional database	nourishment SS			from the 80s to today	RER-SGSS
Studies of special interest	pdf	1. solid transport at Foce Reno publication 2004. 2. "Studio di fattibilità degli interventi di gestione dei sedimenti alluvionali dell'alveo del fiume Po nel tratto confluenza Arda - mare" (the study also includes the emissary of Po di Goro)	2. reach river scale			2. 2008	2. Authority of the Po river district

PILOT SITE 1: NERETVA RIVER – DATA FROM PIDNC

Maps of sediments/ granulometry	printed data, IT data	Draft of Management Plan of Neretva River Delta	Neretva River Delta, total	Land measurements	2018	Public Institution for the management of protected natural areas of Dubrovnik Neretva County	
Rivers							
Lagoons							
Coastal areas							
Suspended solid transport	printed data, IT data	Physical features (geomorphology, hydrology, sediment fluxes, ...) of Neretva Delta River - short report	Neretva River Delta, total	Land measurements	2013	Public Institution for the management of protected natural areas of Dubrovnik Neretva County	
Solid transport at the (river, sea, lagoon) bottom	printed data, IT data	Physical features (geomorphology, hydrology, sediment fluxes, ...) of Neretva Delta River - short report	Neretva River Delta, total	Land measurements	2013	Public Institution for the management of protected natural areas of Dubrovnik Neretva County	
River flow data	printed data, IT data	Physical features (geomorphology, hydrology, sediment fluxes, ...) of Neretva Delta River - short report	Neretva Delta River, total	Land measurements/models	1998, 2000, 2012	Public Institution for the management of protected natural areas of Dubrovnik Neretva County	
Sedimentation rates: canals and shallow waters							
Sedimentation rates: sandbar/sand marshes							
Nourishment and dredging (data, volumes, etc)							
Studies of special interest							

PILOT SITE 2: JADRO RIVER

Maps of sediments/ granulometry	screen view (web service)	Overview map of seabed substrate	Adriatic Sea	models		https://www.emodnet-geology.eu/map-viewer/?p=seabed_substrate	overview
Rivers							
Lagoons							
Coastal areas							
Suspended solid transport							
Solid transport at the (river, sea, lagoon) bottom							
River flow data							
Sedimentation rates: canals and shallow waters							
Sedimentation rates: sandbar/sand marshes							
Nourishment and dredging (data, volumes, etc)							
Studies of special interest							

PILOT SITE 3: NATURE PARK VRANSKO JEZERO – DATA FROM VRANPARK

Maps of sediments/ granulometry							
Rivers							
Lagoons							
Coastal areas	printed data	Paleolimnology, granulometry, Paleolimnological analysis of Vransko lake Phase I and II.	5.4. total	land measurements	2013, 2015.	Public institution Vransko lake Nature Park	
Suspended solid transport							
Solid transport at the (river, sea, lagoon) bottom							
River flow data							
Sedimentation rates: canals and shallow waters							
Sedimentation rates: sandbar/sand marshes	printed data	Paleolimnological analysis of Vransko lake Phase I and II.	5.4. total	land measurements	2013, 2015.	Public institution Vransko lake Nature Park	
Nourishment and dredging (data, volumes, etc)							
Studies of special interest							

PILOT SITE 4: BANCO MULA DI MUGGIA - DATA FROM RFVG

Maps of sediments/ granulometry							
Rivers							
Lagoons							
Coastal areas	geotiff	Sedimentological map of MZ (phi) by Friuli Venezia Giulia Autonomous Region, 1985. "Studio sedimentologico e marittimo costiero dei litorali del Friuli Venezia Giulia, ipotesi di intervento per il recupero ambientale e la valorizzazione della fascia costiera." By A. Brambati. Regione Autonoma Friuli Venezia Giulia, Direzione Regionale dei lavori Pubblici, Servizio dell'Idraulica, Trieste: 67 pp; 161 pp.; digitalization and geotiff by Costal Group UniTS	Pilot area Mula di Muggia	derived from sedimen sampling and analysis	1985	Geological service FVG (Antonio Bratus) Trieste University, Department of Mathematics and Geoscience (Giorgio Fontolan)	
Coastal areas	.pdf	Morpho-sedimentological map from GORDINI E., CARESSA S., MAROCCO R., 2003. "Nuova carta morfo-sedimentologica del Golfo di Trieste" (from Punta Tagliamento to Isonzo mouth). Gortania, Atti Museo Friul. di Storia Nat., 5-29.	Gulf of Trieste				
Suspended transport	solid						

Solid transport at the (river, sea, lagoon) bottom							
River flow data							
Sedimentation rates: canals and shallow waters							
Sedimentation rates: sandbar/sand marshes							
Nourishment and dredging (data, volumes, etc)							
Studies of special interest							

ANNEX 3: DATA SET OF GEOMORPHOLOGICAL PARAMETERS –from Adriatic area to pilot scale

WP3 - AVAILABLE DATA - GEOMORPHOLOGICAL PARAMETERS				
YEARS/REFERENCE PERIOD	DATA DESCRIPTION (reference area, scale, typology)	OWNER	DATA AVAILABILITY/ ACCESSIBILITY	LINK
CATEGORY: Topo-bathymetric surveys				
2018	Topo-bathymetric survey, lagoons of Po Delta, (Scardovari, Caleri, Canarin, Barbamarco); .dwg, xyz	Veneto Region - Soil Defense Directorate		Being published on the geoportal of Veneto Region
2013, 2012, 2008, 2007	Topo-bathymetric survey, lagoons; shp (point)	Emilia Romagna Region - Geological Service		
2012 2006 2000	Topo-bathymetric survey, coastal; shp (point, polyline), grid	Emilia Romagna Region - Geological Service		
2005, 2008	57 cross-sections every 1 km along the Po Delta coast (Rovigo district), between the Adige mouth and Po di Gnocca; .dwg, x,y,z more frequent near costal works	Veneto Region - Soil Defense Directorate	In: "Gestione integrata della zona costiera"; P. Ruol e T. Pinato, Regione Veneto, 2016 (*)	Being published on the geoportal of Veneto Region
2012	Cross-sections every 200 m along the shoreline of Rosolina from Adige to Po di Levante; .dwg, x,y,z	Veneto Region - Soil Defense Directorate	In: "Gestione integrata della zona costiera"; P. Ruol e T. Pinato, Regione Veneto, 2016 (*)	Being published on the geoportal of Veneto Region
2014	Cross-sections every 1 km from Po di Levante and Po di Goro; .dwg, x,y,z	Genio Civile di Rovigo Veneto Region - Soil Defense Directorate	In: "Gestione integrata della zona costiera"; P. Ruol e T. Pinato, Regione Veneto, 2016 (*)	Being published on the geoportal of Veneto Region
2000, 2006, 2012	Topo-bathymetric survey of Delta Po shoreline; shp and grid	Emilia Romagna Region		
1990, 2005, 2018	Topo-bathymetric survey of about 163 cross sections of the Po Delta Reaches	Emilia Romagna Region - Geological Service		http://geoportale.agenziapo.it/cms/ (2018 survey is not yet available, but it will be upload in June 2019)

1968	Bathymetric data along transects: 54 bathymetric cross-sections between Timavo and Tagliamento; 15 sections in the Pilot area Mula di Muggia; shp -point, GeoTiff	National Research Council (CNR), Coastal Study Group	CNR, Friuli Venezia Giulia Autonomuos Region - Geological service, Trieste University	
1978	Bathymetric surveys along transects, along the coast: 28 bathymetric sections (until 10 m depth) between Timavo and Tagliamento; 8 sections in the Pilot area Mula di Muggia; shp -point, GeoTiff	National Research Council (CNR), Coastal Study Group	Friuli Venezia Giulia Autonomous Region - Geological service, Trieste University	In "Regione Autonoma Friuli Venezia Giulia, 1979 - Studio dell'assetto fluviale e costiero della Regione Friuli – Venezia Giulia"
1985	Bathymetric surveys along transects, along the coast: 35 bathymetric sections (until -6m) between Grado and Primero and Pilot area Mula di Muggia; shp -point, Geotiff	Friuli Venezia Giulia Autonomous Region - Geological service, Trieste University		In "Regione Autonoma Friuli Venezia Giulia, 1985. Studio sedimentologico e marittimo costiero dei litorali del Friuli Venezia Giulia,".
2007	Bathymetric surveys along transects: Pilot area Mula di Muggia; shp -point, Geotiff	Friuli Venezia Giulia Autonomous Region - Geological service, Trieste University	From "Vector Project"	AA VV (2018) Studio di assetto morfologico e ambientale del Banco della Mula di Muggia.
2012	Bathymetric measurement of The Vransko Lake, land measurements; printed data	Public institution Vransko lake Nature Park	Public institution Vransko lake Nature Park	
CATEGORY: Topography				
	Micro-survey of the Veneto plain	Veneto Region		https://idt2.regione.veneto.it/idt/downloader/download
	Contour map of the Veneto Region	Veneto Region		https://idt2.regione.veneto.it/idt/downloader/download
Different years until 2005	Regional technical maps (CTR), available for each Municipality of Veneto Region, urban plan, 1:5.000 - 1:10.000; .tiff, dxf, shp	Veneto Region		https://idt2.regione.veneto.it/idt/downloader/download

	Hydrographic basin of Burana Volana: altimetric map, 1 m equidistance; pdf	SIT Ferrara Reclamation Consortium		http://www.bonificaferrara.it/index.php/servizi/sistema-informativo-territoriale/177-cartografi-scaricabili
2018, 1998-2000	Regional topographic map at different scale (1:250.000- 1:5.000); raster, .tiff, wms	Emilia Romagna Region		https://geoportale.regione.emilia-romagna.it/it
2008, 2014	DBTR (topografic regional database), 1:50.000 – 1:25.000; .tiff, pdf	Emilia Romagna Region		http://geoportale.regione.emilia-romagna.it/it/catalogo/dati-cartografici/cartografia-database/carte-topografiche
1915-1917	Topographical Map IGM 1:25.000, 40IISE1917 Grado; printed, geotiff	IUAV University, Venice		
1927 (survey from 1896-97)	Topographical Map IGM 1:25.000, 40IISE1917 Grado; printed, geotiff	IUAV University, Venice		
1936 e 1896-97	Topographical Map IGM 1:25.000, 40IISO Foce dell'Isonzo and 40IISE1938 Grado; printed, geotiff	IUAV University, Venice		
1896-97 e 1937	Topographical Map IGM 1:25.000, 40IISE1949 Grado and 40IISO Foce dell'Isonzo; printed, geotiff	IUAV University, Venice		
1927, 1939, 1949, 1959	Tavoletta IIM (Istituto Idrografico della Marina), Marina di Grado, 1:12.000; printed, geotiff	Friuli Venezia Giulia Autonomuos Region		
2019	Map of Neretva River Delta, partial, land measurements; printed data		Public institution for the management of protected natural areas of Dubrovnik-Neretva county	
2019 - 2020	Map of Nature park Vransko lake IT DATA; shp, printed data, land measurements		Public institution Vransko lake Nature Park	
	National Topographic data 1:25000, Adriatic area; shp, .dwg, actual land measurements		Državna geodetska uprava	https://dgu.gov.hr/podaci-topografske-izmjere/168
CATEGORY: Aerial and satellite images, DTM				

1943-1945	1943-45 RAF flights (royal Air Force), Po Delta area (partial), index map; printed	National Aerial Photographic Archive	Consultation: Centro per la Cartografia della Regione del Veneto. Material request: PEC: pianificazioneterritoriale@pec.regione.veneto.it	Viewer: https://idt2.regione.veneto.it/portfolio/aereofototeca/
1978, 1983, 1990, 19999, 2008, 2009	Reven flights, Po Delta area, index map, "Regione del Veneto – L.R. n. 28/76 Formazione della Carta Tecnica Regionale"; jpg	Veneto Region	Consultation: Centro per la Cartografia della Regione del Veneto. Material request: PEC: pianificazioneterritoriale@pec.regione.veneto.it	Viewer: https://idt2.regione.veneto.it/portfolio/aereofototeca/
1929-1938, 1949	IGM flights, Delta Po region; index map	Italian Military Geographical Institute	Consultation: Centro per la Cartografia della Regione del Veneto. Material request: PEC: pianificazioneterritoriale@pec.regione.veneto.it	Viewer: https://idt2.regione.veneto.it/portfolio/aereofototeca/
2007, 2012, 2015	Ortophoto, Veneto Region	Veneto Region		Viewer: https://idt2.regione.veneto.it/portfolio/aereofototeca/ Layer: https://idt2.regione.veneto.it/idt/downloader/download
05-March- 2020	Satellite imageries Sentinel 1-2-3, North Adriatic area (elaboration of particular interest: Sentinel bathymetric, Sentinel Geology)	European space agency	Veneto Region geoportal	https://idt2.regione.veneto.it/portfolio/webgis-dei-dati-satellitari/
May-September 2014	Ortophoto 50 cm © 2014 Consorzio TeA. Four-band imagery, display in natural colors (RGB), with a resolution of 50 cm for pixel	Emilia Romagna Region		https://geoportale.regione.emilia-romagna.it/it/catalogo/it
May-June 2011	Orthophotos, four-band imagery, display in natural colors (RGB) or color near infrared, with a resolution of 50 cm for pixel	Emilia Romagna Region		https://geoportale.regione.emilia-romagna.it/it/catalogo

June-August 2008	Orthophotos, four-band imagery, display in natural colors (RGB) or color near infrared, with a resolution of 50 cm for pixel	Emilia Romagna Region		https://geoportale.regione.emilia-romagna.it/it/catalogo
1994, 1996, 1998, 2002, 2005, 2006, 2008, 2011, 2014	Aerial photos, regional coverage; raster, wms	Emilia Romagna Region		http://geoportale.regione.emilia-romagna.it/it
1943	Aerial photos Raf, regional coverage; raster, wms	Emilia Romagna Region		http://geoportale.regione.emilia-romagna.it/it
1954	Aerial photos GAI, regional coverage; raster, wms	Emilia Romagna Region		http://geoportale.regione.emilia-romagna.it/it
1976, 1978, 1982, 1991, 1992, 2005, 2010	Quickbird and Landsat images, partial coverage coast; raster, wms	Emilia Romagna Region		http://geoportale.regione.emilia-romagna.it/it
2006; 2009; 2012 - (grid 0,5 m)	DTM high resolution from Lidar, Entire coast of Rovigo district; xyz, asc	Veneto Region	In: "Gestione integrata della zona costiera"; P. Ruol e T. Pinato, Regione Veneto, 2016 (*)	Being published on the geoportal of Veneto Region
2018- (grid 0,5 m)	DTM high resolution from Lidar, Entire coast of Rovigo district including lagoons; xyz, asc	Veneto Region		Being published on the geoportal of Veneto Region
2012	DTM from lidar survey of the coast (2004, 2010) and PNT (2008); grid	Ministry of the Environment and Protection of the Territory and the Sea	Emilia Romagna Region Geological Service;	http://www.pcn.minambiente.it/mattm/
2005	DTM Po River (river corridor scale); grid	District basin authority of the River Po		http://www.adbpo.it/download/dtm_po_2004_2005
2015	DTM 2015 of the river Po and of the Delta reaches; grid	Interregional Agency for the River Po (AIPO)		http://geoportale.agenziapo.it/cms/
1954	Aerial photo flightGAI (Gruppo Aereo Italiano), Mula di Muggia, 1:35.000; printed, geotiff	Trieste University – Mathematics and Geosciences Dept.		
1978	Aerial photo flightCGR (Compagnia Generale Riprese-aeree), area Mula di Muggia; printed, geotiff	Trieste University – Mathematics and Geosciences Dept.		

1990	Aerial photo flight CGR georeferenced by Trieste University – Department of Mathematics and Geoscience; printed, geotiff	Friuli Venezia Giulia Autonomous Region, Trieste University		
2007-2008	Digital orthophoto area Mula di Muggia; geotiff			http://www.pcn.minambiente.it/mattm/servizio-wms/
2014	Digital orthophotos by AgEA, area Mula di Muggia; geotiff	Friuli Venezia Giulia Autonomous Region		
2008	DTM having a grid of 1 m, .asc, data are from the Lidar survey of 2008	Friuli Venezia Giulia Autonomous Region		http://irdat.regione.fvg.it/consultatore-dati-ambientali-territoriali/search
2008	Lidar, mkp data derived from original survey; xyz	Friuli Venezia Giulia Autonomous Region - Geological Service		the original data are available too
	Adriatic area, high resolution DTM, 1:25.000 (the best Croatia has on national level), actual land measurements; dgn, .dwg, xyz, txt		Državna geodetska uprava	https://dgu.gov.hr/podaci-topografske-izmjere/168
	Adriatic area, National orthophoto (1:5000-1:2000), actual land measurements; .tiff		Državna geodetska uprava	https://dgu.gov.hr/proizvodi-i-usluge/sluzbene-drzavne-karte-i-ostale-karte/167
CATEGORY: Hydraulic Risk, Water Management, Hydraulic Defense Works				
	Flood hazard map in the Fissero-Tartaro-Canalbianco catchment	Veneto Region		https://idt2.regione.veneto.it/idt/downloader/download
2007	Flooded areas during the floods on the 26th September 2007	Veneto Region		https://idt2.regione.veneto.it/idt/downloader/download
	Alert areas for the hydrological and hydraulic risks; shp	Veneto Region		https://idt2.regione.veneto.it/idt/downloader/download
	Number of “rigid” defense works along the coastline; c0402020_NumDifesaLitoralR; shp	Veneto Region		https://idt2.regione.veneto.it/idt/downloader/download

	Coastal area with "soft" defense works; c0402010_SupSpiaggeDifesaM; shp	Veneto Region		https://idt2.regione.veneto.it/idt/downloader/download
	Area with mechanical drainage, Veneto Region; shp	Veneto Region	PTRC on force, Viewer: https://idt2.regione.veneto.it/portfolio/webgis-del-piano-territoriale-regionale-di-coordinamento-ptrc-vigente/	Layer: https://idt2.regione.veneto.it/idt/search/searchPage
	Delta Po pumping installation localization, Consorzio di bonifica Delta del Po, shp and .dwg	Po Delta remediation consortium		Viewer in: https://deltapo.g6.arcadiasit.com/g6/web/G6DeltaPo/
	Hydraulic works, webGIS Consorzio di bonifica Pianura di Ferrara; Pdf, other	Reclamation Consortium "Plain of Ferrara"	Disponibile su contratto	http://www.bonificaferrara.it/index.php/servizi/sistema-informativo-territoriale
	Hydrographic basin of Burana Volano: network of the drainage channels and pumping stations (Rete dei Canali di Bonifica e Impianti Idrovori), pdf	Reclamation Consortium "Plain of Ferrara"		http://www.bonificaferrara.it/index.php/servizi/sistema-informativo-territoriale/177-cartografi-scaricabili
2009, 2018	Defense works along the Rovigo coast; shp information	Veneto Region	In "Gestione integrata della zona costiera" Veneto Region	Being published on the geoportal of Veneto Region
1943, 1982, 1996, 2000, 2005, 2011, last period is 2014 with local update (from google map) until 2018	Delta Po, Hydraulic defense works from photointerpretation and information from ex STB; shp	Emilia Romagna Region Geologicalservice		http://geoportale.agenziapo.it/cms/
2014-2018	Topographic survey of the levees elevation (both along the river Po and the coast); shp	Interregional Agency for the River Po (AIPO)		
2008	Database of defense works from CGT project, Local area RAFVG, scale survey 1:2000; shp	Friuli Venezia Giulia Autonomous Region - Geological service		

2017	Hydraulic hazard maps, Local area, Friuli Venezia Giulia; pdf	Friuli Venezia Giulia Autonomous Region - Geological service	from PAIR (Piano stralcio per l'Assetto Idrogeologico dei bacini Regional)	https://www.regione.fvg.it/rafv/cms/RAVFG/ambiente-territorio/pianificazione-gestione-territorio/FOGLIA209/
2011	Aquifers, water flux tracing, resource vulnerability, Hydrogeological survey Of Vransko lake Nature park, land measurements, IT DATA; shp, printed data		Public institution Vransko lake Nature Park	
	National Tiling (Mosaicature Nazionali) ISPRA, hydraulic and landslide hazards, Adriatic region	ISPRA		http://www.sinanet.isprambiente.it/it/sia-ispra/download-mais/mosaicature-nazionali-ispra-pericolosita-frane-alluvioni
	Hydraulic defense works – Rendis database (Repertorio Nazionale degli interventi per la Difesa del Suolo)	ISPRA		http://dati.isprambiente.it/dataset/il-rendis/
2013	Veneto Region, Emilia Romagna Region, Flood Directive Maps (Direttiva alluvioni); shp, pdf	Veneto Region Emilia Romagna Region	Piano di gestione del rischio alluvioni	https://pianoalluvioni.adbpo.it/mappe-del-rischio-2/download-mappe https://servizimoka.regione.emilia-romagna.it/mokaApp/apps/DA/index.html?null
CATEGORY: Information on evolutionary trend				
	Coastal areas with a retreat trend, Veneto Region; shp	Veneto Region	PTRC on force, Viewer: https://idt2.regione.veneto.it/portfolio/webgis-del-piano-territoriale-regionale-di-coordinamento-ptrc-vigente/	Layer: https://idt2.regione.veneto.it/idt/downloader/download

	Coastal areas with a progradation trend, Veneto Region; shp	Veneto Region	PTRC on force, Viewer: https://idt2.regione.veneto.it/portfolio/webgis-del-piano-territoriale-regionale-di-coordinamento-ptrc-vigente/	Layer: https://idt2.regione.veneto.it/idt/downloader/download
	Coastal areas subject to subsidence, Veneto Region; shp	Veneto Region	PTRC on force, Viewer: https://idt2.regione.veneto.it/portfolio/webgis-del-piano-territoriale-regionale-di-coordinamento-ptrc-vigente/	Layer: https://idt2.regione.veneto.it/idt/downloader/download
periods 1992-2000 e 2002-2010	Subsidence rate (mm/year) computed through SAR technique, using satellite data ERS and ENVISAT Original data: PST_ERS_T122_F2691_CL003_VENEZIA; PST_ERS_T122_F2709_CL002_PORTO_TOLLE; PST_ERS_T122_F2709_CL001_COMACCHIO; PST_ERS_T351_F2691_CL001_TRIESTE; PST_ERS_T122_F2691_CL001_PONTE_DI_PIAVE PST2009_ENVISAT_T122_F2709_CL001_RAVENNA; PST2009_ENVISAT_T351_F2691_CL001_TRIESTE; PST2009_ENVISAT_T394_F2691_CL002_ROVIGO; PST2009_ENVISAT_T122_F2691_CL002_CHIOGGIA; PST2009_ENVISAT_T122_F2691_CL001_JESOLO	Elaborations from the agency: Tele Rilevamento Europa (TRE srl)	Results accessible in "Gestione integrata della zona costiera"; P. Ruol e T. Pinato, Regione Veneto, 2016 (*)	Original data from: https://earth.esa.int/eogateway/
2006-2009, 2009-2012, 2012-2018	Po Delta, Rovigo district, shoreline variation from Lidar, Contours (0,25 m), n. 57 crossing land-sea; shp	Veneto Region	In: "Gestione integrata della zona costiera"; P. Ruol e T. Pinato, Regione Veneto, 2016 (except for the last period) (*)	Being published on the geoportal of Veneto Region
2016-2018	Delta Po, subsidence analysis (Achilli Menin Fabbris), measures PODELTANET	Veneto Region		Being published on the geoportal of Veneto Region

from 10000 years ago to today	Delta Po, analysis of the evolution of the coastal depositional systems; shp	Emilia Romagna Region - Geological service		
1943-2014, 2000-2014	Delta Po, historical shoreline analysis (since XIX sec); shp	Emilia Romagna Region - Geological service		
1901, 1950, 2000, 2006, 2012	Delta Po, sea-bottom changes analysis; shp	Emilia Romagna Region - Geological service		
interferometry: 1992-2000; 2006-2011; 2011-2016; assestimeter working since 2013	Subsidence monitoring by interferometry and assestimeter (one in Gorino)	Emilia Romagna Region - Geological service		
1968-2007	Pilot area Mula di Muggia, Map of the altimetric differences during the period 1968-2007; GeoTiff, Derived from DTM elaboration	Geological Service Region FVG, University of Trieste - Department of Mathematics and Geosciences		AAVV Studio di assetto morfologico e ambientale del Banco della Mula di Muggia. Accordo attuativo di collaborazione con Regione autonoma Friuli Venezia Giulia, 2018
1998, 2007	Physical features (geomorphology, hydrology, sediment fluxes, ...) of Neretva Delta River - short report, Neretva River Delta, total, land measurements, models, printed data, IT data		Public institution for the management of protected natural areas of Dubrovnik-Neretva county	
1998, 2007	Neretva River Delta, total, Physical features (geomorphology, hydrology, sediment fluxes,...) of Neretva Delta River - short report, land measurements, models, printed data, IT data		Public institution for the management of protected natural areas of Dubrovnik-Neretva county	

CATEGORY: Land use maps				
1954, 1976, 2003, 2008, 2014	Region Emilia Romagna, land use maps; shp wms	Emilia Romagna Region	Emilia Romagna Region - Geological Service	http://geoportale.regione.emilia-romagna.it/it/mappe/pianificazione-e-catasto/uso-del-suolo
1943, 1982, 1998, 2005	Coastal zone Emilia Romagna, land use maps; shp, wms	Emilia Romagna Region	Emilia Romagna Region - Geological Service	http://geoportale.regione.emilia-romagna.it/it/mappe/pianificazione-e-catasto/uso-del-suolo
2012	Land use Veneto Region (Corine Land Cover)	Veneto Region		https://idt2.regione.veneto.it/idt/webgis/viewer?previewLayerId=432
	Adriatic region, land use land cover	ISPRA		http://portalesgi.isprambiente.it/it http://sgi2.isprambiente.it/mapviewer/
	Jadro river, Spatial and urban plans (1:25000 - 1:5000); shp, .dwg		Municipality Solin and Kaštela (spatial plans)	
2005-2019	RETE NATURA 2000 of Veneto Region	Veneto Region		https://www.regione.veneto.it/web/vas-via-vinca-nuvv/vinca
CATEGORY: Maps of lithology, maps of sediment				
	Map of the texture and skeleton of the soil in the first 100 m, Veneto, 1:50.000, 1:250.000; shp	Veneto Region		https://idt2.regione.veneto.it/idt/downloader/download
	Soil Map of the hydrological group "Gruppo Idrologico USDA", 1:50.000; shp	Veneto Region		https://idt2.regione.veneto.it/idt/downloader/download
	Soil map of the Veneto Region, 1:50.000; shp	Veneto Region		https://idt2.regione.veneto.it/idt/downloader/download

	Map of the texture and skeleton of the soil in the first 50 cm, Veneto, 1:50.000, 1:250.000 ; shp	Veneto Region		https://idt2.regione.veneto.it/idt/downloader/download
	Map of the depth of the first aquifer in the soil; shp	Veneto Region		https://idt2.regione.veneto.it/idt/downloader/download
	Database with different classes of lithology composing the Veneto Region, 1:250.000, c0501 – Litologia; shp	Veneto Region		https://idt2.regione.veneto.it/idt/downloader/download
	Lithology of the Rovigo Province; shp	Veneto Region – Rovigo Province		http://www.pianificazione.provincia.rovigo.it/nqcontent.cfm?a_id=2438
	Width of the shoreline, c0402030_AmpiezzaSpiagge; shp	Veneto Region		https://idt2.regione.veneto.it/idt/downloader/download
	Veneto Region, maps of Soil and Subsoil; shp: ARPAV_suoli50k_unitacartografiche ARPAV_suoli50k_distretti ARPAV_tessuoli50k50cm ARPAV_idrosuoli50k ARPAV_suoli50k_unitaPaesaggio ARPAV_tessuoliven50cm ARPAV_suoli250k_unitacartografiche ARPAV_metmetalloidi ARPAV_suoli50k_sovraUnitaPaesaggio ARPAV_suoli250k_sistemiSuoli ARPAV_idrosuoliveneto ARPAV_tessuoli50k100cm ARPAV_permsuoli50k ARPAV_suoli250k_regioniSuoli ARPAV_permsuoliveneto ARPAV_suoli250k_provinceSuoli	ARPAV	Veneto Region	https://idt2.regione.veneto.it/idt/webgis/viewer?webgisId=47
2009	Lithological map of Rovigo Province (from PTCP: Provincial territorial Coordination Plan); shp	Veneto Region, Rovigo Province	PTCP: Provincial territorial Coordination Plan	http://www.pianificazione.provincia.rovigo.it/nqcontent.cfm?a_id=2438
1982	Sedimentological map; shp	CNR	Emilia Romagna Region servizio geologico	

2006, 2012	Granulometric analysis, Delta del Po; shp	ARPA	Emilia Romagna Region	
1998	Study of sediments in the Sacca di Goro	Emilia Romagna Region, Geological service		
1998	Adriatic Sea, Lithologic map, 7 class; 1:250.000; shp	CNR	Emodnet geoportal	http://www.emodnet.eu/geoviewer/#/
	Data base of the lithology in the Adriatic Region, 1:100.000, ISPRA; raster	ISPRA		http://sgi2.isprambiente.it/mapviewer/
2008	Database of lithology and sediments from CGT project, Local area Friuli Venezia Giulia Region, scale survey 1:2000; shp	Geological Service of the Region, FVG		
CATEGORY: Geological and geomorphological cartography, coastlines				
	Geological map, 1:10.000, Emilia Romagna Region	Emilia Romagna Region		http://geoportale.regione.emilia-romagna.it/it/mappe/informazioni-geoscientifiche/geologia/
	Different soil maps and derived maps, Emilia Romagna Region	Emilia Romagna Region		http://geoportale.regione.emilia-romagna.it/it/mappe/informazioni-geoscientifiche/suoli/tematismi-dei-suoli-e-carte-derivate
1988	Geological map of Veneto region, 1:250.000; paper	Veneto Region		Veneto Region, Soil Defense Directorate
	Geological map of Italy, 1:50.000, (partial coverage of the Adriatic area); published online	ISPRA (CARG project)		http://portalesgi.isprambiente.it/it/elenco-base-dati/10 Viewer: http://sgi2.isprambiente.it/mapviewer/ http://www.isprambiente.gov.it/Media/carg/emilia.html

1943, 1982, 1998, 2005	geological cartography CARG project; coastal geomorphological maps; Geological Po Plain Map of RER 1:250000, from photointerpretation	Emilia Romagna Region - Geological service		
Concluded in February 1976	Geological cartography of Italy, 1:100.000	Geological service of Italy	ISPRA	http://portalesgi.isprambiente.it/it/elenco-base-dati/10 http://193.206.192.231/carta_geologica_italia/cartageologica.htm
2001	Geological cartography of the Adriatic Sea, CARG project, 1:250.000, fg. NL-33-7 (Venezia), NL-33-10 (Ravenna), surface and subsoil, paper, .shp, .pdf,..tiff Available as wms on ispra site	ISPRA-CARG project	ISMAR-CNR	http://portalesgi.isprambiente.it/it/elenco-base-dati/10 http://sgi2.ispraambiente.it/mapviewer/
	Area Consorzio Bonifica Ferrara "Evoluzione del territorio e della fascia costiera", video mp4 and maps jpeg	Reclamation Consortium of Ferrara		http://www.bonificaferrara.it/index.php/servizi/sistema-informativo-territoriale/181-evoluzione-del-territorio-e-della-fascia-costiera
1877 coast of 1530, 1592, 1645, 1685, 1736, 1820	Historical map of Delta Po. Map of Ing. Stella 1877. Digitized and georeferenced map, 1:100.000, Shape of coastline and point of bathymetry	ISMAR-CNR		
1954 - 2003	Geomorphological map of Po River Delta derived from aerial photo surveys (Flights GAI 1954-55 and Terraltaly NR 2003), 1:60,000; pdf	Veneto Region		annex to MONITOR project
2009	Geomorphological map of Rovigo Province, from PTCP; shp	Veneto Region, Rovigo Province	from PTCP: Provincial territorial Coordination Plan	http://www.pianificazione.provincia.rovigo.it/nqcontent.cfm?a_id=2438
1987	Geomorphological map of Veneto region, 1:250.000; paper	Veneto Region		Veneto Region, Soil Defense Directorate
1943, 1982, 1996, 1998, 2005, 2011, 2014; 2006, 2012	Shoreline of Delta del Po, two data sets: from photointerpretation; from GPS survey (2006, 2012); shp	Emilia Romagna Region - Geological Service		

	Coastal area, PTRC in force, Veneto Region; shp	Veneto Region	Viewer: https://idt2.regione.veneto.it/portfolio/webgis-del-piano-territoriale-regionale-di-coordinamento-ptrc-vigente/	Layer: https://idt2.regione.veneto.it/idt/search/searchPage
	Coastal flood areas (for storm surges), PTRC in force, Veneto Region; shp	Veneto Region	Viewer: https://idt2.regione.veneto.it/portfolio/webgis-del-piano-territoriale-regionale-di-coordinamento-ptrc-vigente/	Layer: https://idt2.regione.veneto.it/idt/search/searchPage
	Hydraulic map (for fluvial floods), PTRC in force, Veneto Region; shp	Veneto Region	Viewer: https://idt2.regione.veneto.it/portfolio/webgis-del-piano-territoriale-regionale-di-coordinamento-ptrc-vigente/	Layer: https://idt2.regione.veneto.it/idt/search/searchPage
	Regional hydrographic network: Elementi Idrici. c0401024 - Grafo Idrografia; shp			https://idt2.regione.veneto.it/idt/downloader/download
	Coastline of the Veneto Region, c0401101_BaciniSBacin10; shp			https://idt2.regione.veneto.it/idt/downloader/download
	Adriatic shoreline, ZOP data (zaštićeni obalni pojas), actual land measurements; shp, .dwg		Državna geodetska uprava	https://dgu.gov.hr/podaci-topografske-izmjere/168
2018	Neretva River Delta, partial, Draft of Management Plan of Neretva River Delta, land measurements; printed data, IT data		Public institution for the management of protected natural areas of Dubrovnik-Neretva county	
2018	Geomorphological characteristics of Vransko lake land measurements IT DATA; shp. printed data		Public institution Vransko lake Nature Park	
2018	Geological map of Vransko lake. land measurements IT DATA; shp. printed data		Public institution Vransko lake Nature Park	

1954, 1978, 2007, 2014	Geomorphological map, area Mula di Muggia, derived from aerial photo interpretation and bathymetric data; shp polygon and polyline	Friuli Venezia Giulia Autonomous Region, University of Trieste - Department of Mathematics and Geosciences		AAVV (2018) Studio di assetto morfologico e ambientale del Banco della Mula di Muggia.
2003	Morpho-sedimentological map, Gulf of Trieste, derived from sedimentological, geophysical and bathymetric data; pdf			AAVV, 2003. Nuova carta morfosedimentologica del Golfo di Trieste
2008	Geological map from CGT project, Local area RAFVG, scale survey 1:2000; shp	Friuli Venezia Giulia Autonomous Region, Geological Service		
2011	Shoreline from photogrammetry, Coastal area of RAFVG, derived from orthophoto. Digitalized 1:2000; .shp and KML - KMZ	Friuli Venezia Giulia Autonomous Region, Geological Service		http://irdat.regione.fvg.it/consul-tatore-dati-ambientali-territoriali/search
1978 and 2018	Draft of Management Plan of Neretva River Delta, Neretva River Delta, partial Neretva River Delta (land), land measurements, total printed data, IT data Basic Geological Map 1:100.000, sheet Ploče		Public institution for the management of protected natural areas of Dubrovnik-Neretva county	http://www.hgi-cgs.hr/ogk100.html
CATEGORY: Studies of special interest				
	Publications, presentations, maps and sections, geological and thematic 3D models of the subsoil; pdf, ppt; other	Emilia Romagna Region - Geological Service		
2008	"Studio di fattibilità degli interventi di gestione dei sedimenti alluvionali dell'alveo del fiume Po nel tratto confluenza Arda - mare" (the study also involves the area until Incile del Po di Goro), river reach scale; pdf ppt; other	Autorità di bacino distrettuale del fiume Po		
2014	Volume of scanno Goro's sand, fast calculation through the interpretation of chirp seismic profile, in collaboration with SSGS-RER.jpg	ISMAR-CNR anna.correggiari@bo.ismar.cnr.it		

	Marine geological data emodnet, adriatic sea	ISPRA		https://www.emodnet-geology.eu/services/
	National database sinkholes, adriatic region	ISPRA		http://sgi1.isprambiente.it/sinkholeweb/viewer/index.html
2016	"Flood risk assessment and management plan - Area at significant risk of flooding - monographic records in the coastal marine area of Veneto" (total Delta Po area); pdf		Padan District	
2007	Erosion processes, analysis and technical proposals - Università di Trieste-DiSGAM. Anno 2007 and new revision (Rosolina shoreline); pdf	Veneto Region - Soil Defence Directorate		
2007	Evolution trend of Po di Maistra mouth and nearest area - Università di Ferrara-Dipartimento Scienze della Terra. (Po di Maistra mouth area); pdf	Veneto Region - Soil Defence Directorate		
2008	Sacca di Scardovari sand bar morphological evolution - Università di Ferrara - Dip. Scienze della Terra (from Po di Tolle to Po di Goro); pdf	Veneto Region - Soil Defence Directorate		
2013	Rosolina e Scardovari litoral morphological evolution. Ipros- Ingegneria Ambientale srl. (Rosolina shoreline end from Po di Tolle to Po di Gnocca); pdf	Veneto Region - Soil Defence Directorate		
2013	Operation strategy for the Po river delta litorals. Hydrosoil srl. (Rosolina shoreline end from Po di Tolle to Po di Gnocca), pdf	Veneto Region - Soil Defence Directorate		
2014	Delta Po geodatabase – Trieste University, Department of Mathematics and Geoscience– (Entire coast of Rovigo district), pdf	Veneto Region - Soil Defence Directorate		
2016	P. Ruol, L. Martinelli, C. Favaretto, Integrated management of the coastal area. Study and monitoring for the definition of coastal defense interventions in the Veneto Region. Guidelines. Padova University, Dip. ICEA, 2016. Area costiera di Rovigo (*)	Veneto Region - Soil Defence Directorate		

2018	Modellazione numerica a supporto delle attività di monitoraggio e della progettazione e realizzazione degli interventi nella sacca del Canarin sul Delta del Po – Ipros Ingegneria Ambientale S.r.l	Veneto Region- Genio Civile di Rovigo		
2019	Studio di fattibilità degli interventi per il riequilibrio morfologico ambientale della sacca del Canarin. Indagine preliminare. Ipros Ingegneria Ambientale S.r.l	Veneto Region- Genio Civile di Rovigo		

ANNEX 4: DATA SET OF SEDIMENTOLOGICAL PARAMETERS –from Adriatic area to pilot scale

WP3 - AVAILABLE DATA - SEDIMENTOLOGICAL PARAMETERS				
YEARS/REFERENCE PERIOD	DATA DESCRIPTION (reference area, scale, typology)	OWNER	DATA AVAILABILITY/ACCESSIBILITY	LINK
CATEGORY: Maps of sediments/ granulometry				
2005	Characterization of Delta Po costal area (sea only) (particularly Adige mouth; Caleri mouth; Busa Tramontana; Scardovari); .shp	Veneto Region - Soil Defense Directorate, Genio Civile di Rovigo	In "Caratterizzazione della fascia costiera mediante campagna di prelievi e analisi dei sedimenti in prossimità delle foci fluviali e di altre zone di accumulo dei sedimenti in prossimità delle foci fluviali e di altre zone di accumulo per utilizzo degli stessi per ripascimenti dei tratti di litorale in erosione", M. Gallo, V. Marinese, 2007	Being published on the geoportal of Veneto Region
1998	Adriatic Sea, Lithologic map, 7 class, 1:250.000; shp, .pdf	CNR	Geoportal EMODNET	http://www.emodnet.eu/geoviewer/#/
2013, 2015	Paleolimnology, granulometry, Paleolimnological analysis of Vransko lake Phase I and II. Printed data.	Public institution Vransko lake Nature Park		
	Adriatic Sea, overview map of seabed substrate. Models. screen view (web service). Entire Jadro River e Neretva area.			https://www.emodnet-geology.eu/map-viewer/?p=seabed_substrate
2018	Draft of the management plan for the Neretva river. Filed data. Printed data, IT data	Public institution for the management of protected Natural Areas of Dubrovnik-Neretva county (PIDNC)		

1985	Map of the sediments, Mula di Muggia, derived from sediment sampling and analysis; geotiff,	Geological Service of the FVG Region, University of Trieste - Department of Mathematics and Geosciences; digitalization and geotiff by Costal Group UniTS	Sedimentological map of MZ (phi) from Regione Autonoma Friuli Venezia Giulia, 1985. Studio sedimentologico e marittimo costiero dei litorali del Friuli Venezia Giulia, ipotesi di intervento per il recupero ambientale e la valorizzazione della fascia costiera	
2003	Morpho-sedimentological map of the Gulf of Trieste; pdf		Morpho-sedimentological map from GORDINI E., CARESSA S., MAROCCO R., 2003. "Nuova carta morfo-sedimentologica del Golfo di Trieste" (from Punta Tagliamento to the Isonzo mouth). Gortania, Atti Museo Friul. di Storia Nat., 5-29. Pdf.	
2018	Neretva river delta, Map of sediment; printed data, IT data	Public institution for the management of protected natural areas of Dubrovnik-Neretva county		Draft of Management Plan of Neretva River Delta
CATEGORY: Nourishment and dredging				
	Entire coast of Rovigo district, beach nourishment information forms; inform.	Veneto Region - Soil Defense Directorate	In: "Gestione integrata della zona costiera"; P. Ruol e T. Pinato, Regione Veneto, 2016 (*)	Being published on the geoportal of Veneto Region
1980-today	Emilia Romagna Region (Po Delta area) regional nourishment database; shp, grid	Emilia Romagna Region - Geological Service		

CATEGORY: River Flow Data				
2013	Data from EURODELTA Project	CNR ISMAR		anna.correggiari@bo.ismar.cnr.it
1998, 2000, 2012	Physical features (geomorphology, hydrology, sediment fluxes, ...) of Neretva Delta River - short report, land measurements/models; printed data, IT data	Public institution for the management of protected Natural Areas of Dubrovnik-Neretva county (PIDNC)		
CATEGORY: Sedimentation rates: canals and shallow waters, sandbar/sand marshes; Solid transport at the bottom; Suspended solid transport				
2013, 2015	Sedimentation rates. Paleolimnological analysis of Vransko lake Phase I and II, land measurements, printed data	Public institution Vransko lake Nature Park		
12/11/2018	Solid transport at the bottom, measurements, inform.	Environmental Protection Agency of the Veneto Region (ARPAV)		
2013	Solid transport at the bottom, Physical features (geomorphology, hydrology, sediment fluxes, ...) of Neretva Delta River - short report, land measurements, printed data, IT data	Public institution for the management of protected Natural Areas of Dubrovnik-Neretva county (PIDNC)		
	Suspended solid transport. Data from EURODELTA Project	CNR ISMAR		anna.correggiari@bo.ismar.cnr.it
2013	Suspended solid transport. Physical features (geomorphology, hydrology, sediment fluxes, ...) of Neretva Delta River - short report, land measurements, printed data, IT data	Public institution for the management of protected Natural Areas of Dubrovnik-Neretva county (PIDNC)		

CATEGORY: Studies of special interest				
	Q-Alive Project - Quality of coastal environment in Veneto	Veneto Region and CNR		
2016	P. Ruol, L. Martinelli, C. Favaretto, Integrated management of the coastal area. Study and monitoring for the definition of coastal defense interventions in the Veneto Region. Guidelines. Padova University, Dip. ICEA, 2016 (*) (covered area entire coastline in Veneto)	Veneto Region - Soil Defence Directorate		
2011	Analysis of sediment samples in the Po delta, 2011. In: Monitoring of water bodies affected by the spill of hydrocarbons in Lambro. Delta del Po, parziale. Field surveys.	Veneto Region -Soil Defence Directorate		
2005-2007	M. Gallo, V. Marinese , Caratterizzazione della fascia costiera mediante campagna di prelievi e analisi dei sedimenti in prossimità delle foci fluviali e di altre zone di accumulo dei sedimenti in prossimità delle foci fluviali e di altre zone di accumulo per utilizzo degli stessi per ripascimenti dei tratti di litorale in erosione, 2007 (covered area: Adige mouth, Bocca di Caleri, Busa Tramontana, Scardovari).	Veneto Region - Soil Defense Directorate, Genio Civile di Rovigo		
2005	Delta Po and italian adriatic Sea Radionuclidi, 210Pb sedimentation rate. Data in paper Frignani et al. 2005, txt	CNR	merged in EMODNET Chemistry	https://www.emodnet-chemistry.eu/marinelitter
	MARINA project. Modello integrato ad alta risoluzione del nord Adriatico	Veneto Region by CNR		
2008	"Studio di fattibilità degli interventi di gestione dei sedimenti alluvionali dell'alveo del fiume Po nel tratto confluenza Arda - mare" (the study also involves the area until Incile del Po di Goro), river reach scale; pdf ppt; other	District Po river basin authority		