

THE PRESTIGE AND INTERNATIONAL CO-OPERATION

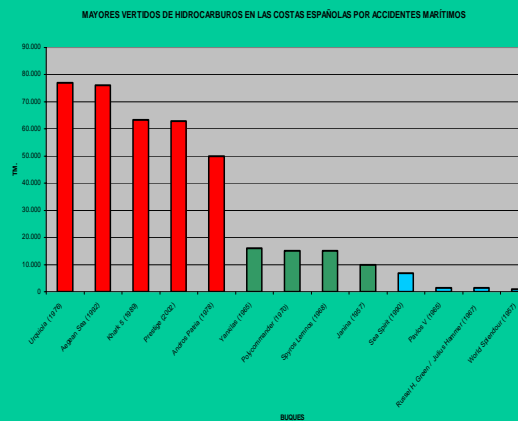
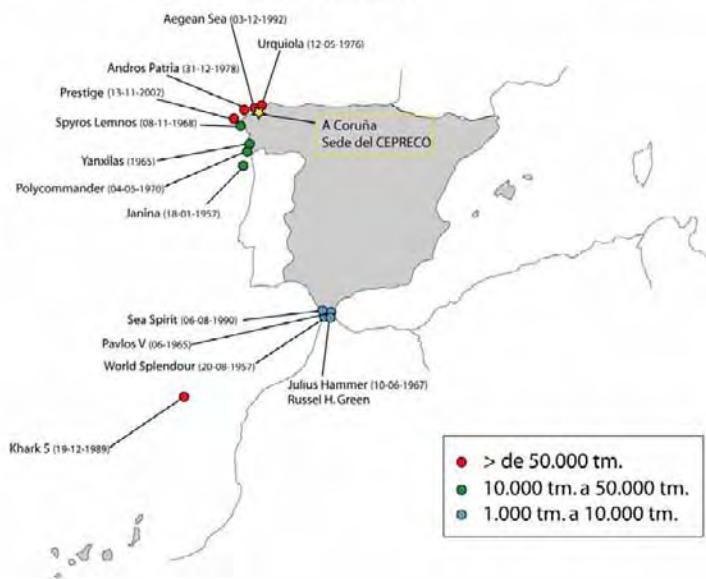
Response onshore and site restoration

Xoán Nóvoa Rodríguez

PARIS, 09-03-06

OIL SPILLS IN SPAIN

Mayores vertidos de hidrocarburos en las costas españolas por accidentes marítimos (> de 1.000 tm.)



The history of black tides in Spain is in fact the history of black tides in Galicia

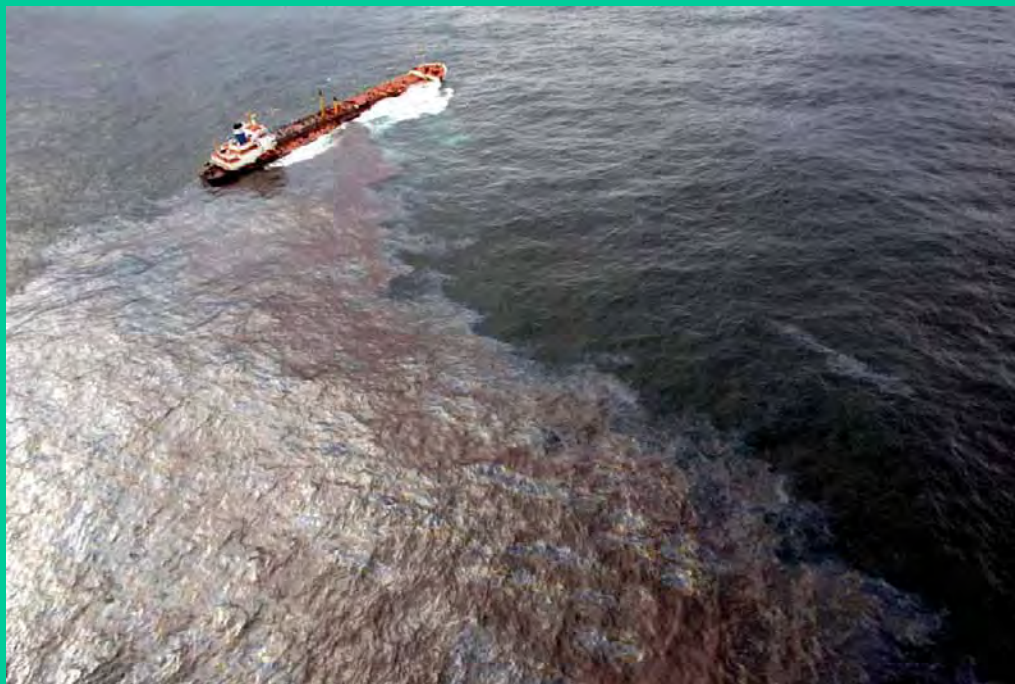


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CENTRO PARA LA PREVENCIÓN Y LUCHA
CONTRA LA CONTAMINACIÓN MARÍTIMA
Y DEL LITORAL.

CEPRECO

2002.- PRESTIGE



On November 13th 2002, the single-hull oil tanker Prestige, laden with 77,000 tons of heavy fuel oil underwent a failure off the coasts of Galicia



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On November 19th 2002, after the ship broke in two, it sank 130 NM off Cap Finisterre

CONSEQUENCES ON THE SHORELINE



17/11/02



18/11/02

Huge quantities of fuel oil grounded on the shoreline of Galicia, and, due to slick drift, on the whole coastline of Northern Spain and then in France

CONSEQUENCES ON THE SHORELINE



This oil spill caused what might be one of the biggest ecological disasters in the history of Spain



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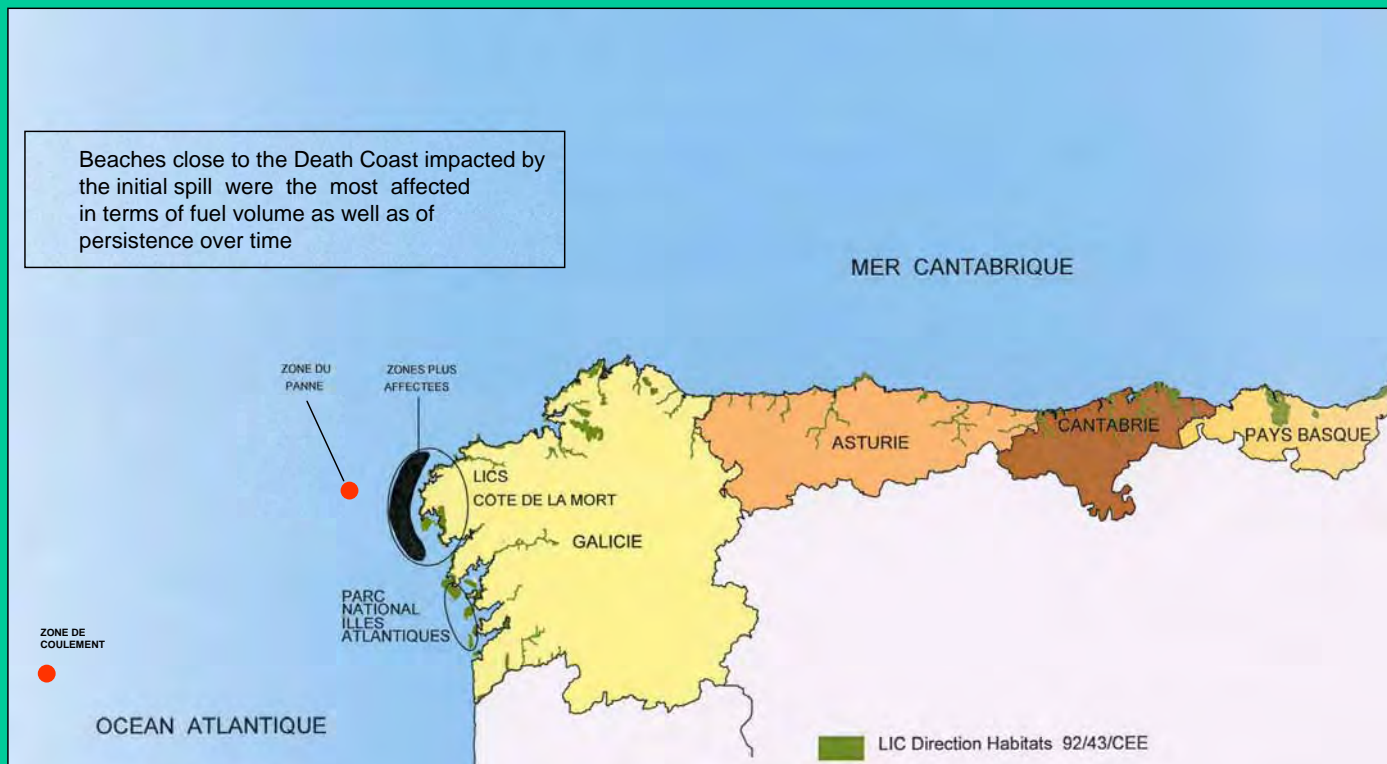
SOCIAL CONSEQUENCES

A considerable social movement started as a reaction to these recurring disasters and to the pollution of a coastline as rich as that of Galicia



Una pecharra con el lema «Nunca máis» durante a manifestación do 1 de decembro de 2002 en A Coruña

CONSEQUENCES ON THE SHORELINE



THE FIRST RESPONSE

- ➡ Quick mobilization of workforce and implementation of a shoreline clean-up plan
- ➡ Implementation of first manual recovery operations
- ➡ Consultation of international experience in similar disasters (EXXON VALDEZ, ERIKA, AEGEAN SEA).
- ➡ Consultation with specialists (CEDRE, NOAA, OSRL, ITOPF).
- ➡ Drafting of procedures for specialized operations



- ➡ Co-operation with groups involved in the response (fishermen, ecology groups)

CONSEQUENCES ON THE SHORELINE



Total beaches: 1.064 km

Oiled beaches: 786 km

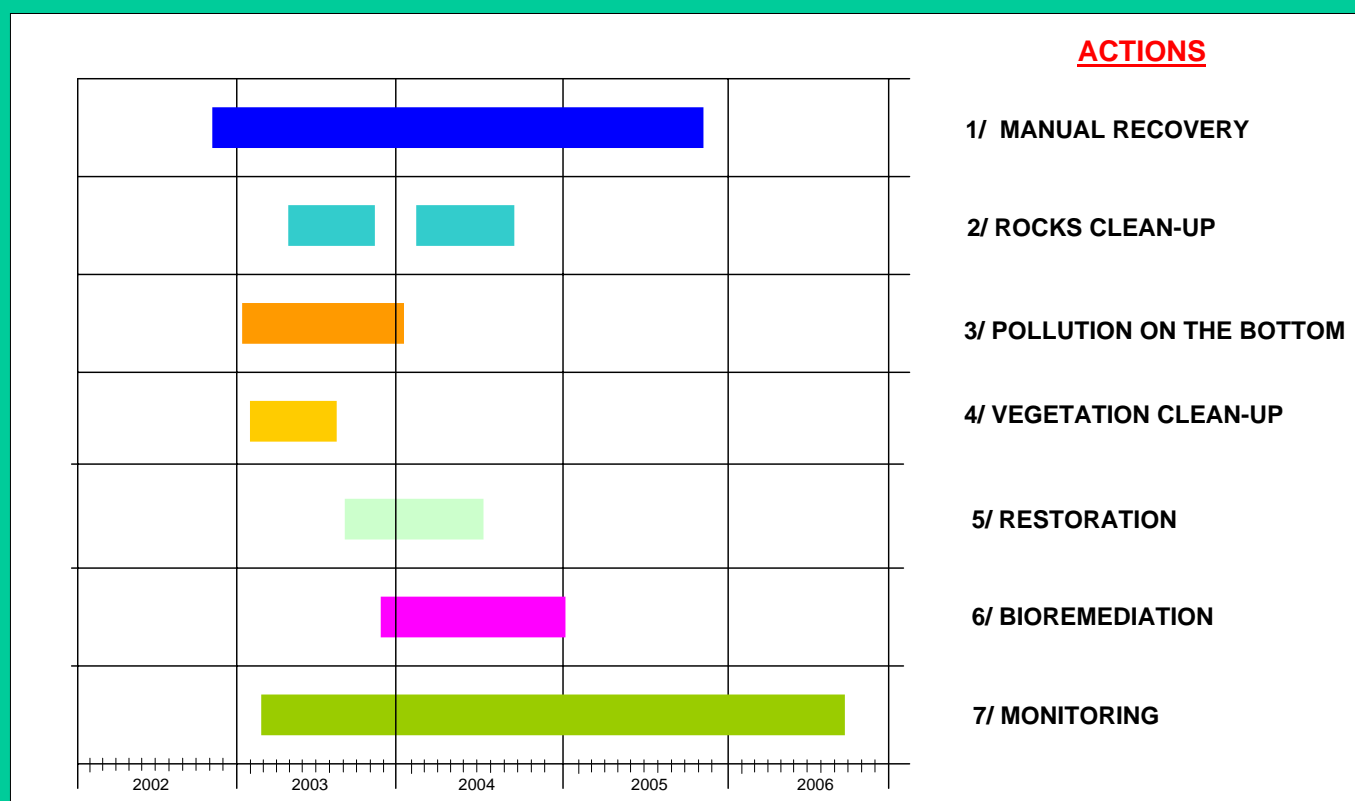
Galicia:

Total beaches: 723 km

Oiled beaches: 505 km

We implemented a plan of response to the disaster, carrying out operations step by step according to a precise process

FIRST RESPONSE



ACTIONS

1/ MANUAL RECOVERY

2/ ROCKS CLEAN-UP

3/ POLLUTION ON THE BOTTOM

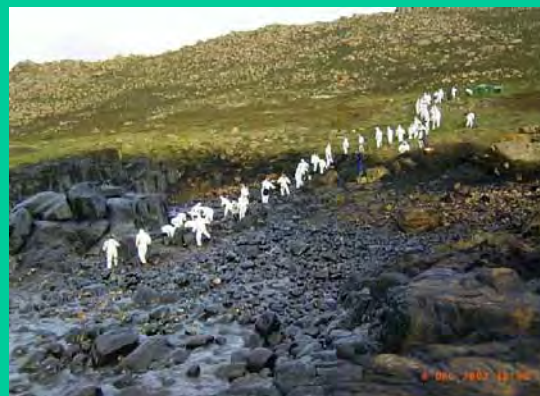
4/ VEGETATION CLEAN-UP

5/ RESTORATION

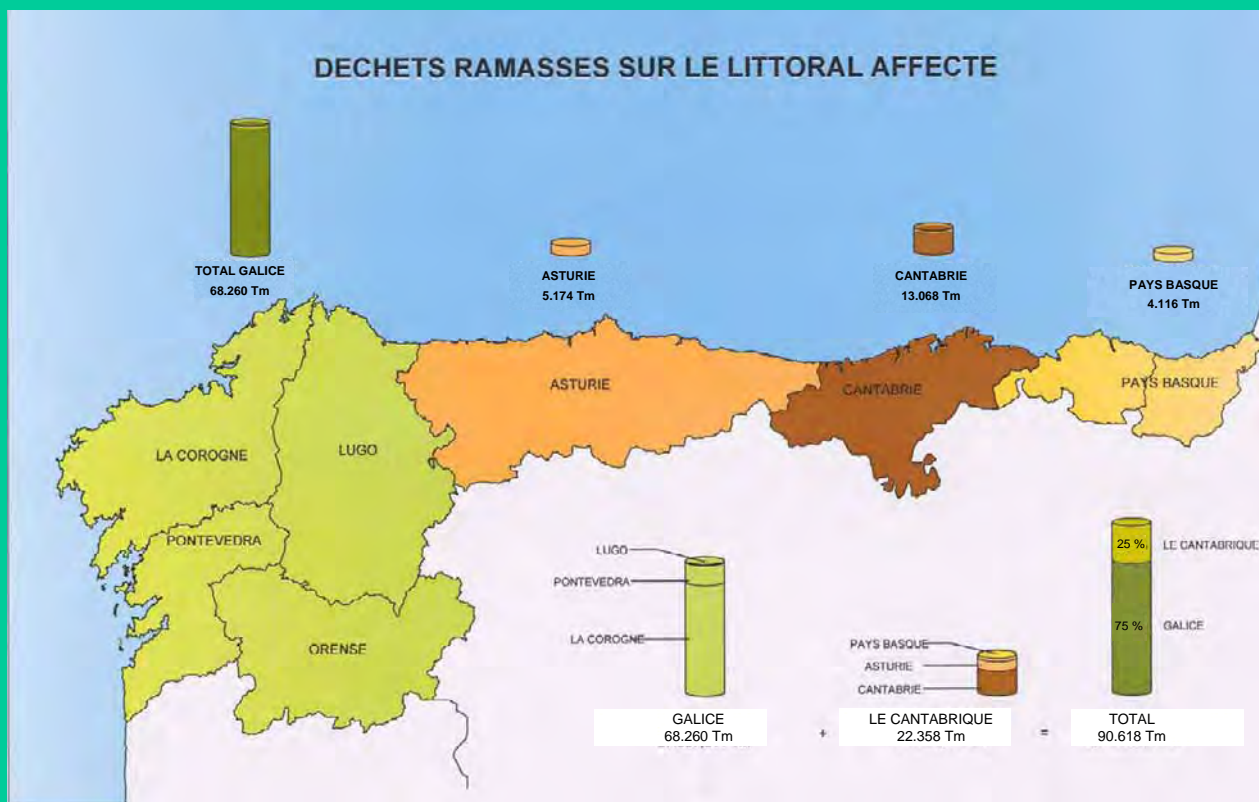
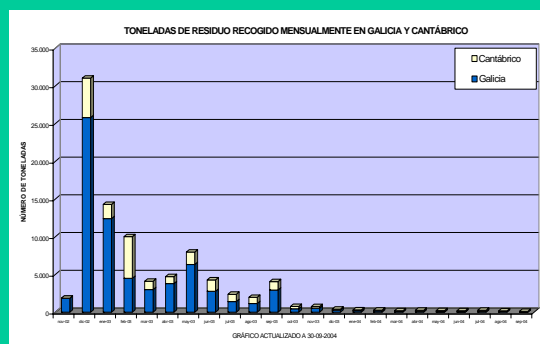
6/ BIOREMEDIATION

7/ MONITORING

1. Sharing out of the oil shoreline into areas:



2. Creation of co-ordination centres for the management of workforce and equipment
3. Plan for monitoring, information transmission and data management
4. Operations on 786 beaches, in some cases repeated
5. More than 90.000 Tm of waste collected





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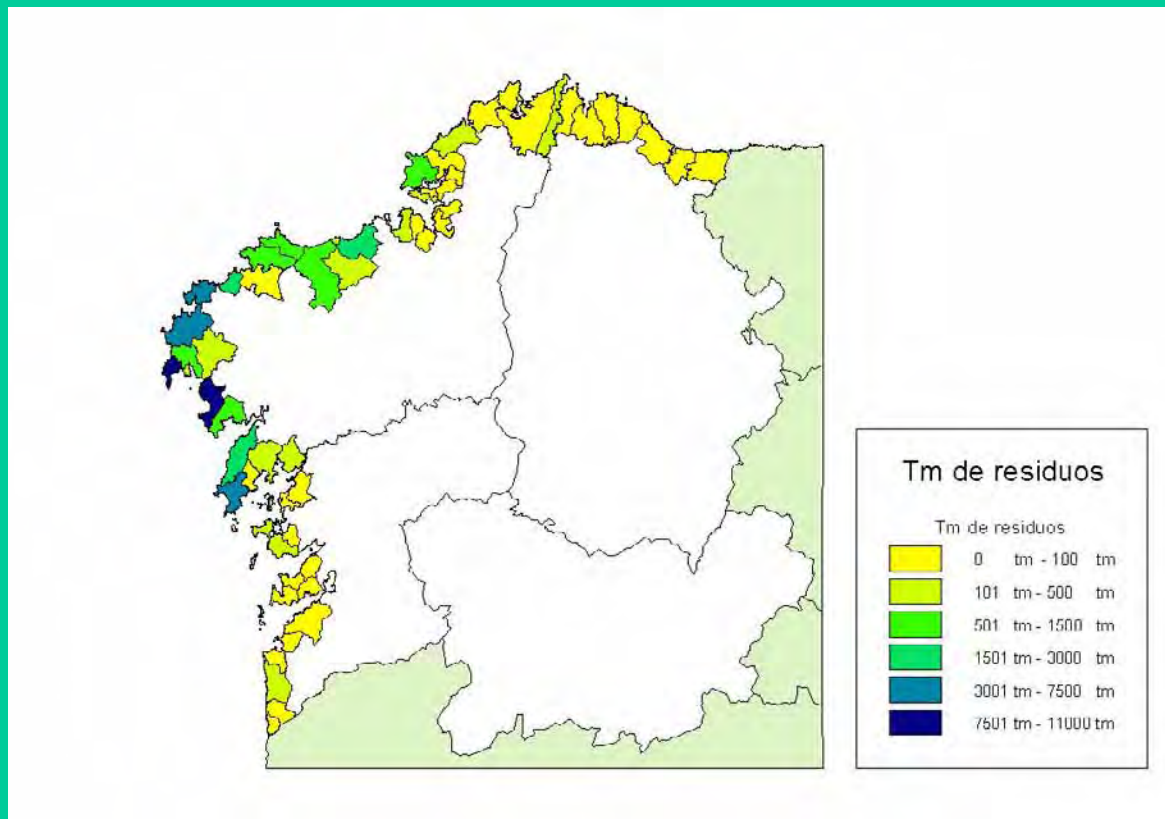
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CONSEQUENCES ON THE SHORELINE

MANUAL RECOVERY

DISTRIBUTION OF COLLECTED WASTE BY MUNICIPALITY IN GALICIA



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PARTICIPATION

SHORELINE CLEAN-UP

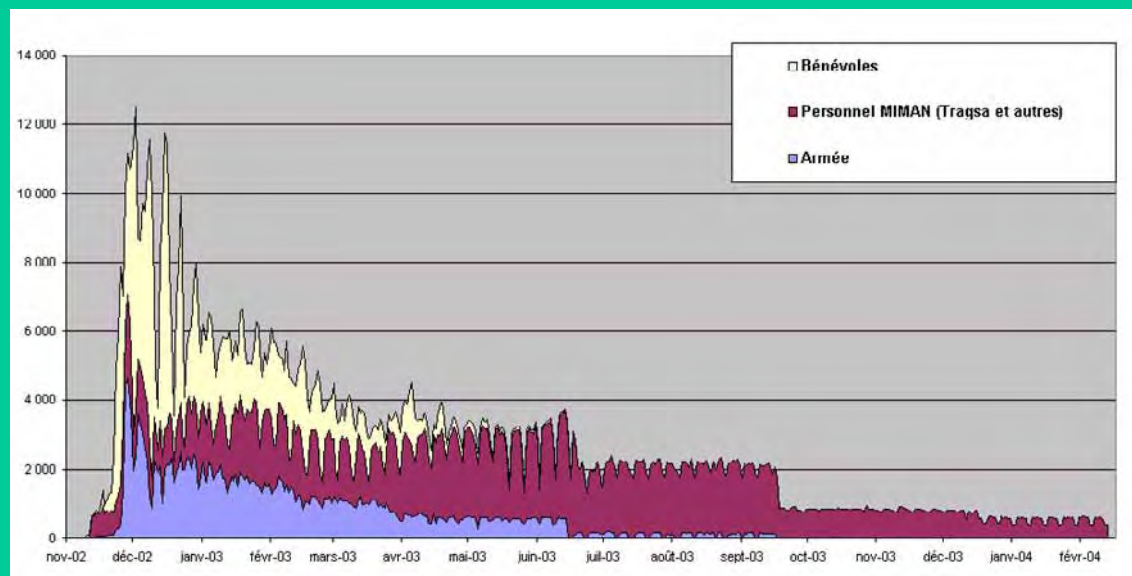
TOTAL: 1.830.000 DAYS

55,8% Clean-up personnel

18,6 % Army

GALICIA: 1.010.000 DAYS

25,6% Volunteers





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EXAMPLES



FURNA DE MÓRDOMO (COM. of LAXE)



O ROSTRO (COM. of FISTERRA)



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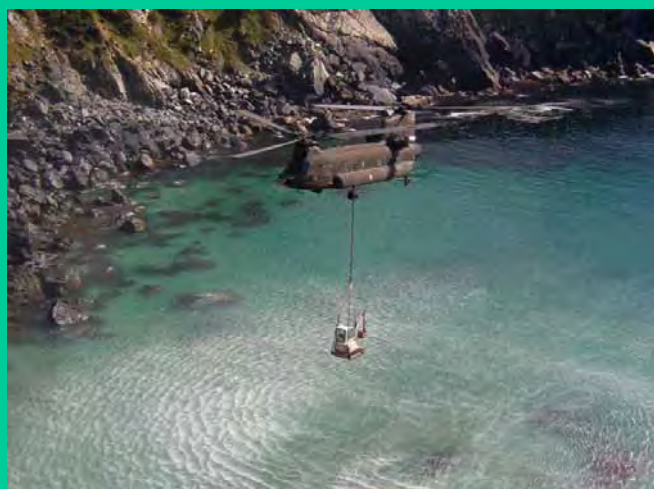
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CONSEQUENCES ON THE SHORELINE

MANUAL RECOVERY

EXAMPLES



O GRAXAL (COM. of VALDOVIÑO)



MENDIA EN ASTURIAS

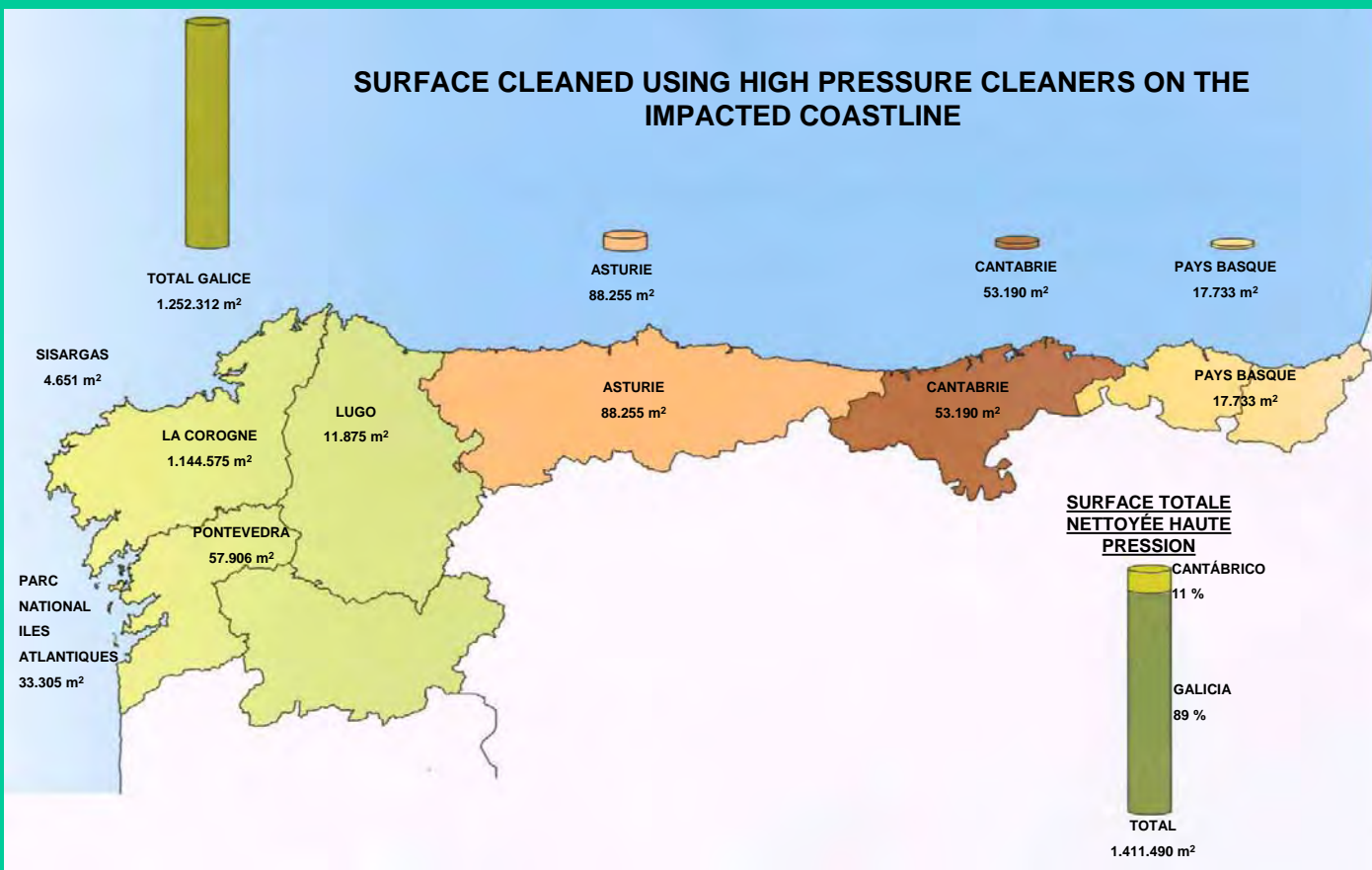
ROCKS CLEAN-UP

- ✓ In February 2003, drafting of the rocks clean-up plan is completed
- ✓ Three phases of operations from March to September 2004
- ✓ A specific operation procedure
- ✓ 655 pressure cleaners implemented
- ✓ More than 1.411.000 m² pressure cleaned



ROCKS CLEAN-UP

SURFACE CLEANED USING HIGH PRESSURE CLEANERS ON THE IMPACTED COASTLINE



ROCKS CLEAN-UP

EXAMPLE 1: PUNTA DO BOI (CAMARIÑAS)



ROCKS CLEAN-UP

EXAMPLE 2: PORTOCHAS (ARTEIXO)



03-01-2003



20-09-2005

EXAMPLE 3: CARROFEITO (CAMARIÑAS)



04-12-2002



20-09-2005

- **Pebbles and boulders** beaches are geomorphological formations quite common on the Atlantic coast. These are marine deposits created in high energy areas
- They are of great scientific and cultural importance
- Rubbing linked to pebble movement helps natural clean-up
- In lower energy areas, clean-up is very difficult due to porosity
- Most often, there is oil under the beach surface...
- We worked out specific procedures for each case with the collaboration of geomorphologists



CLEAN-UP OF BOULDER SHORES

EXAMPLE 1 MÓRDOMO (LAXE)



1.- Difficult access area. Manual
clean-up and moving of boulders
06-12-2002



2.- After action of wave energy
20-09-2005

DIFFICULT ACCESS AREA AND HIGH ENERGY

CLEAN-UP OF BOULDER SHORES

EXEMPLE 2 COENDAS (CAMARIÑAS)



1.- Manual clean-up and moving of boulders
to the surf zone using heavy machinery
06-12-2002



2.- Natural rebuilding of the beach slope
after action of wave energy
20-09-2005

EASY ACCESS AREA AND HIGH ENERGY

CLEAN-UP OF BOULDER SHORES

EXAMPLE 3 XIMPRON (CARNOTA)



1.- Initial situation. Upper part of the beach soaked in fuel



2.- Transfer of boulders using a vehicle



3.- Boulders dumped in the surf zone



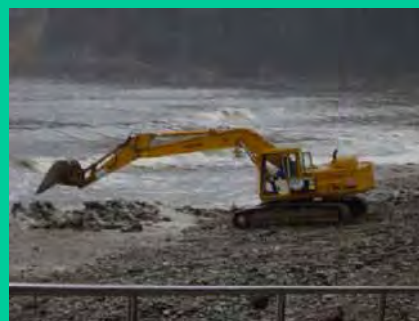
4.- After wave action

CLEAN-UP OF BOULDER SHORES

EXAMPLE 4 C.ARTEDO (CUDILLERO)



1.- Initial situation. Beach with oiled boulders on the upper part



2.- Moving of the boulders to the surf zone using a tracked mechanical shovel



3.- After three or four iterated displacement operations, the beach is clean thanks to wave energy

CLEAN-UP OF PEBBLE SHORES

EXAMPLE 5 BAHINAS (CASTRILLÓN)



1.- Pebble beach soaked with fuel



2.- After a few weeks' immersion in water
in a skip, high pressure clean-up of the
softened oil

CLEAN-UP OF PEBBLE SHORES

EXAMPLE 6 REIRA (CAMARIÑAS)



1.- Initial situation initiale. Pebbles soaked in fuel



2.- Building of a small dam using heavy machinery



3.- Waterproofing of the bottom of the dam
with a plastic liner



4.-Filling in of the dam with pebbles and water
to soften the fuel after deployment of a sorbent liner

CLEAN-UP OF PEBBLE SHORES

EXAMPLE 6 REIRA (CAMARIÑAS)



5.- After a few weeks, pressure clean-up of softened fuel on the surface of pebbles



6.- Cleaned pebbles are put back into place and the beach slope rebuilt

BURIED OIL

TRIALS AND SAND ANALYSIS CAMPAIGN

Characteristics:

- Drafting up of an operation protocol
- We started when drifting slicks began to disappear
- Trials according to the gridding defined in the protocol:
 - Visual analysis
 - Hydrocarbon analysis at PETROFLAG



BURIED OIL

RESULTS

•TRIALS CARRIED OUT:



GALICIA 4.507

CANTABRIA 2.253

OILED BEACHES:



50 (48 on the Atlantic coast of Coruña)



DRAFTING UP OF A CLEAN-UP PROCEDURE



BURIED OIL



CALDEBARCOS (COM. of CARNOTA)



DONIÑOS (COM. of FERROL)



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BURIED OIL



RAZO (COM. of CARBALLO)



A FROUXEIRA (COM. of VALDOVIÑO)



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BURIED OIL



O ROSTRO (COM. of FISTERRA)



O ROSTRO (COM. of FISTERRA)

Based on research works on oil biodegradation processes

Bioremediation is a slow process, useful when mechanical recovery techniques are not or no more efficient

- **Application:** Areas which were not pressure cleaned
 - When oil removed from the rocks cannot be recovered
 - Areas to which access is difficult

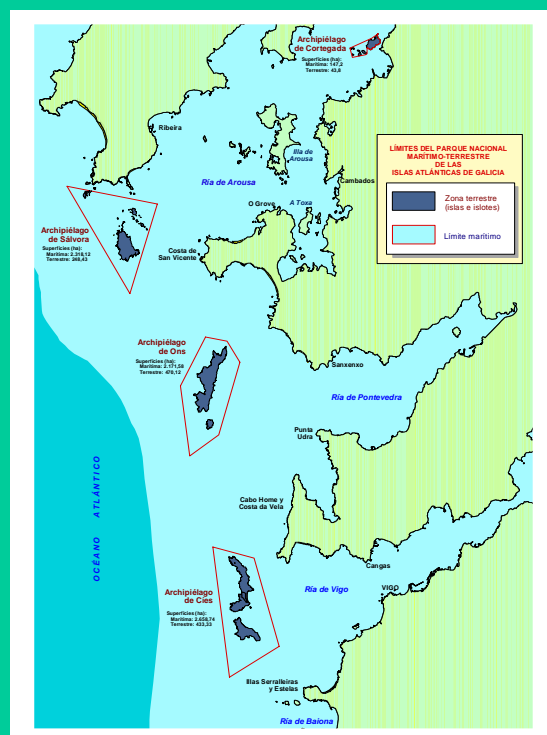
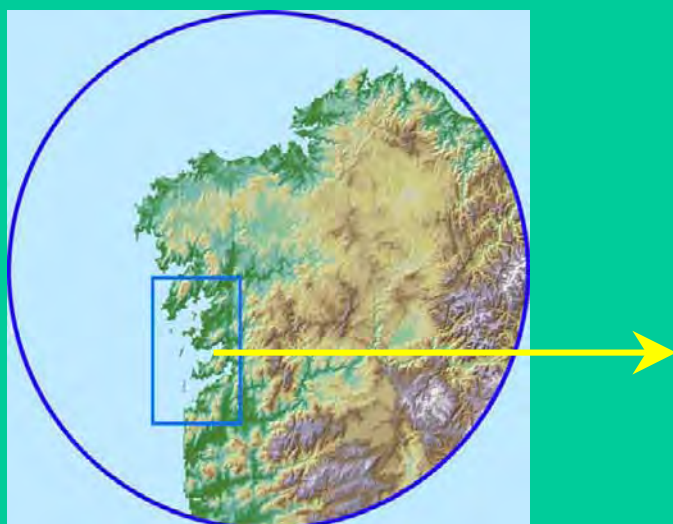
After an experimentation in the National Park validating several nutriment combinations to assess the progress of biodegradation in the natural environment, and selecting the most efficient

- Areas:**
- National Park: 16.000 m².
 - Death Coast: 60.000 m².
 - Cantabria Coast: 4.000 m².

Supervision: Application is being supervised by the Marine Research Institute of Vigo (C.S.I.C.).



MARINE-LAND NATIONAL PARK OF GALICIAN ATLANTIC ISLANDS





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CONSEQUENCES ON THE SHORELINE

MARINE-LAND NATIONAL PARK OF GALICIAN ATLANTIC ISLANDS



The first slicks touched the shoreline on December 3rd 2002
That same day the Action Plan prepared by OAPN (MMA) was activated

Phases:

- Manual collection on sandy beaches
- High pressure clean-up in intertidal rocky areas and supralittoral areas
- Pumping of fuel from marine bottoms
- Natural recovery in coastal rocky areas (intertidal and supralittoral)
- Regeneration and restoration of impacted ecosystems



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RESTORATION

• Preliminary actions:

Creation of ENVIRONMENT TEAMS:

- Personnel trained by specialists
- The main objective was to restore sand dune areas

• Objectives of projects:

Actions on beaches and bays where clean-up operations altered the site because new access paths had to be opened

Localization of most affected areas on the Death Coast

We take advantage of post-spill restoration operations to restore some sites

Drafted by an interdisciplinary team

• Projects drafted: 13

• Contents:

Restoration of temporary access paths, open for fuel collection

Restoration of sand dunes areas

Signposting and display of educational posters on the environment



EXAMPLE 1: CALBOA (CEE)



March 2003



June 2004

EXAMPLE 2: BOAL (MUXÍA)



05-2003



06-2004

EXAMPLE 3: ARNELA (FISTERRA)



1.-Clean-up works damaging sand dunes
and building of an access road



2.-Restoration of sand dunes and
elimination of the provisional access road



EXAMPLE 3: ARNELA (FISTERRA)



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RESTORATION

EXAMPLE 4: SEIRUGA (MALPICA)



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ASSESSMENT AND MONITORING

STUDY ON ASSESSMENT AND MONITORING OF DAMAGE CAUSED BY THE SPILL ON THE NATIONAL PARK OF ATLANTIC ISLANDS AND OTHER PROTECTED AREAS OF COMMUNITY IMPORTANCE

- **Duration:** 3 years
- **Objectives:** Studies of the impact on main species including marine birds and mammals
- **Sites:** Emerged areas under marine influence, intertidal and infralittoral areas up to 35 m. All the submerged surface of the NP



- **Results:** Recovery measures to regenerate damaged ecosystems and species
Environmental monitoring over 10 years
Preventive measures for future situations

- **Team** Pluridisciplinary team, including scientists from universities of all affected regions

**STUDY OF THE IMPACT OF THE SPILL ON OUTER BEACHES
BETWEEN CAPES TOURIÑÁN AND FINISTERRE**

Touriñán



• **Environment:**

Beaches of Nemiña, O Rostro, Arnela and Mar de Fora.
Very particular hydrodynamic characteristics and wave energy

• **Oiling:**

They were oiled at the very beginning of the spill, getting massive quantities of fuel

The huge quantity of fuel and the mixing effect which caused an alteration of beach slope increased the persistence of the pollution

We had difficulties localizing oil buried under the beach of O Rostro (2 km long), where a million km³ of sand are displaced over a winter-summer cycle

O Rostro beach was the most oiled by the spill and this is from there that the largest quantity of waste was removed



**STUDY OF THE IMPACT OF THE SPILL ON OUTER BEACHES
BETWEEN CAPES TOURIÑÁN AND FINISTERRE**

• **Studies:**

Prepared in collaboration with Cantabria and Vigo universities

• **Objective:**

Assessment of beaches location in relation to the spill site

Morphodynamic studies and beach monitoring

Studies of maritime conditions of the days before and after the spill in order to assess the situation



STUDY OF THE IMPACT OF THE SPILL ON OUTER BEACHES
BETWEEN CAPES TOURIÑAN AND FINISTERRE



EXAMPLE :
ROSTRO (FINISTERRE)

STUDY OF THE IMPACT OF THE SPILL ON OUTER BEACHES
BETWEEN CAPES TOURIÑAN AND FINISTERRE



EXAMPLE :
ROSTRO (FINISTERRE)
19-11-2005



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CONSEQUENCES ON THE SHORELINE FIGURES

1. Waste collected on shore
2. Waste collected at sea (emulsion)
3. Pressure clean-up
4. Bioremediation:
5. Trials / sand analysis
6. Restoration actions

TOTAL	GALICIA
90.500 tonnes	68.000 tonnes
50.000 tonnes	27.100 tonnes
1.410.000 m ²	1.252.000 m ²
74.000 m ²	70.000 m ²
7.083	4.548
14	14

