

# HAZRUNOFF

PROJECT

Integration of sensing and modelling technologies for early detection and follow-up of hazmat and flood hazards in transitional and coastal waters

Final Workshop 27<sup>th</sup> May 2020

Learning from past incidents; preparing for the future

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CEDRE



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and Humanitarian Aid

# content

Characterisation of spills in estuaries and inland waters over the 20 last years, from Cedre database data

learnt lessons from two past experiences :

- Oil spill in Loire estuary
- Flood in Parisian Basin



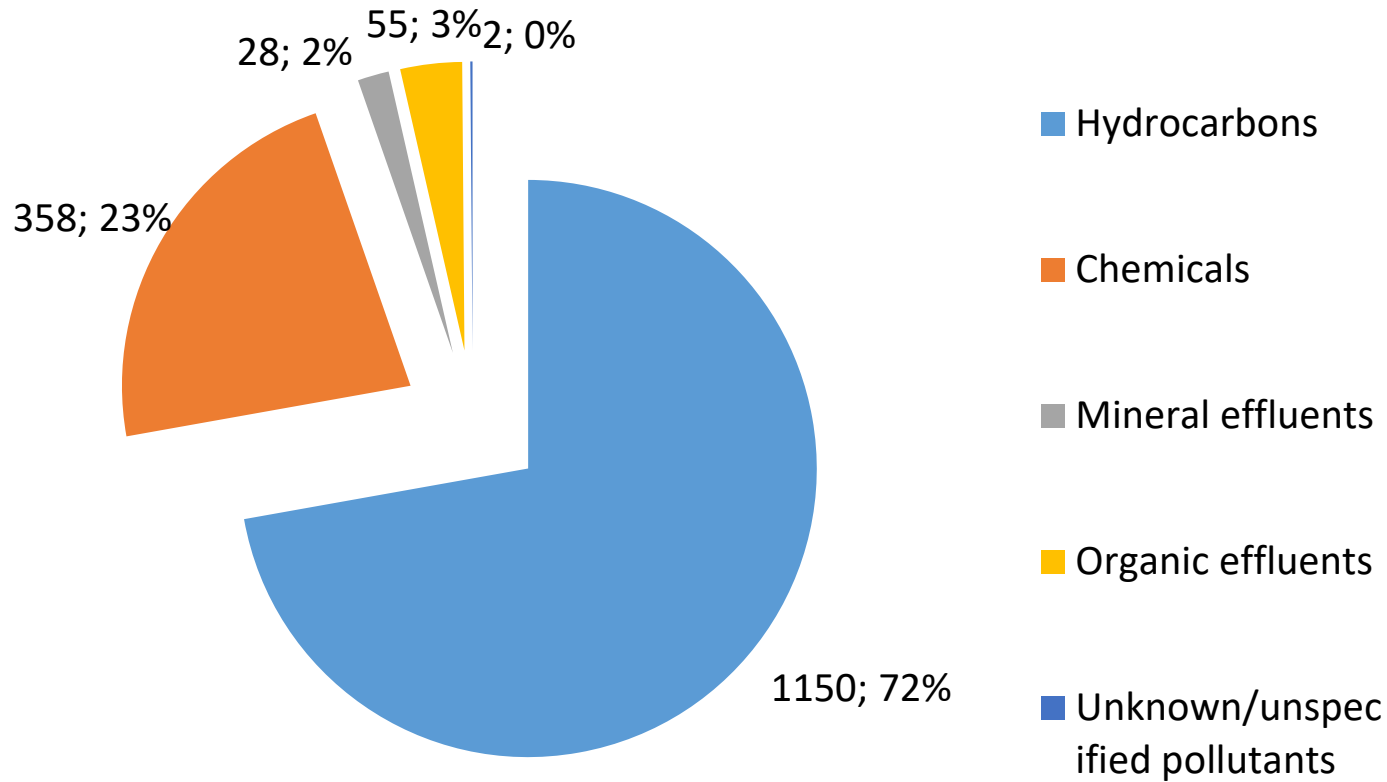
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# Characterisation of spills in estuaries and inland waters

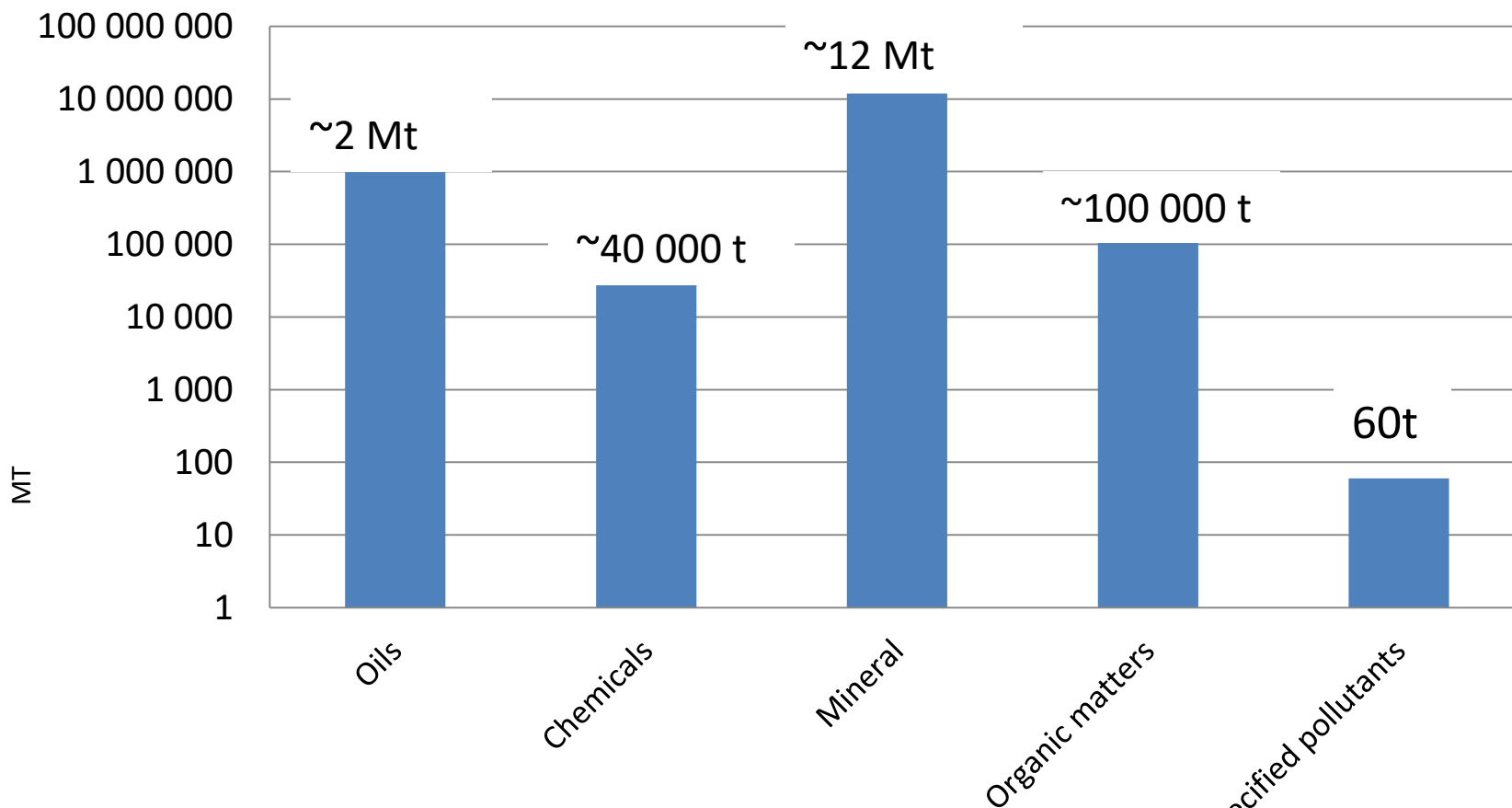
Distribution : Number of spills and % by type of products; 1998-2018 ; any volume



Source Cedre database : worldwilde data , from bibliography, media, specialized websites and newsletter, FIPOI etc...

# Characterisation of spills in estuaries and inland waters

Spilled quantities (cumulative quantities for the period 1998-2018 ; MT) by type of products;



Typical spill / type of pollutant	Oil	chemicals	Mineral	Organic matters	unspecified pollutants
Median quant. (Metric Tons)	11	5	9 463	38	N/A

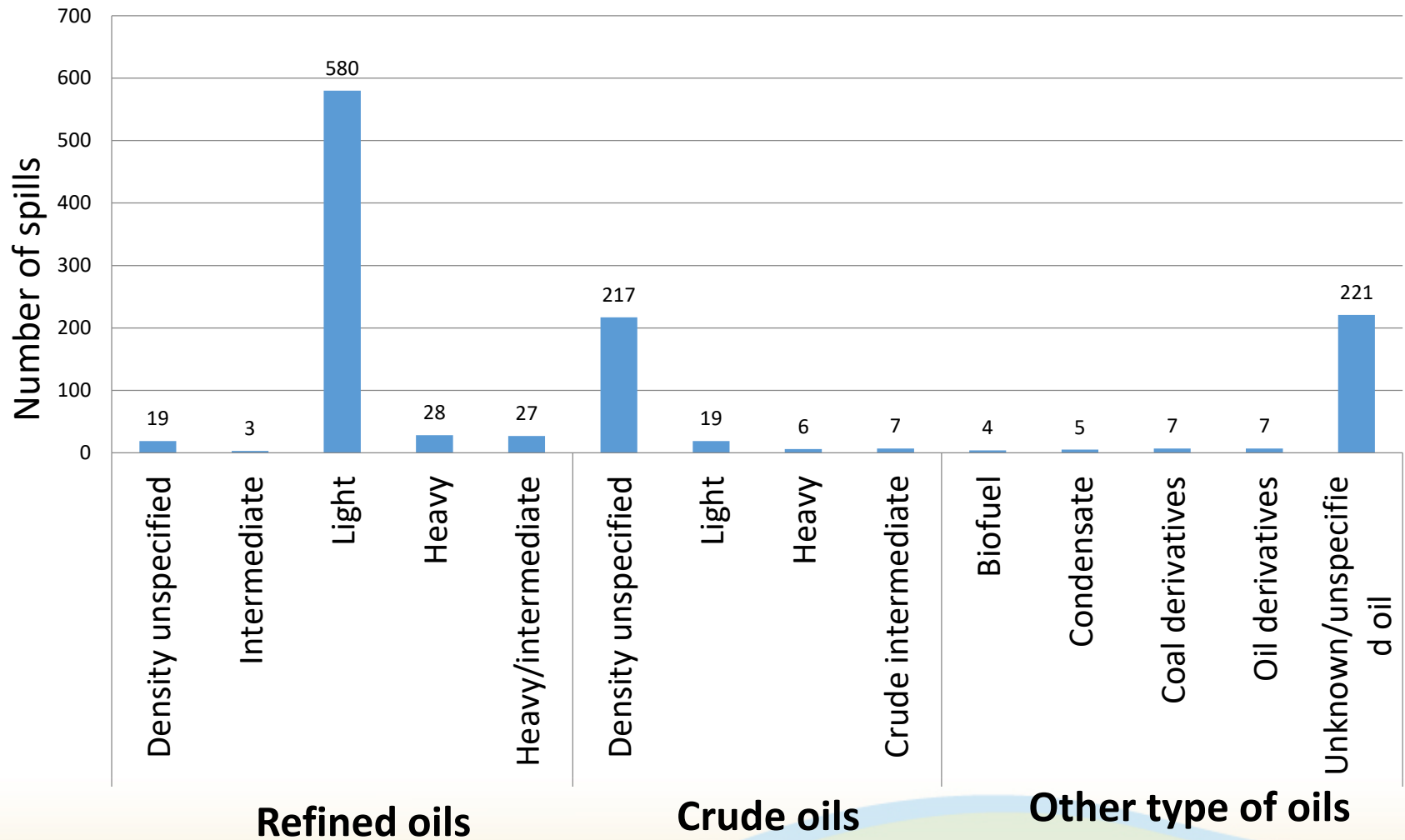
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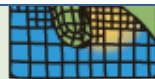
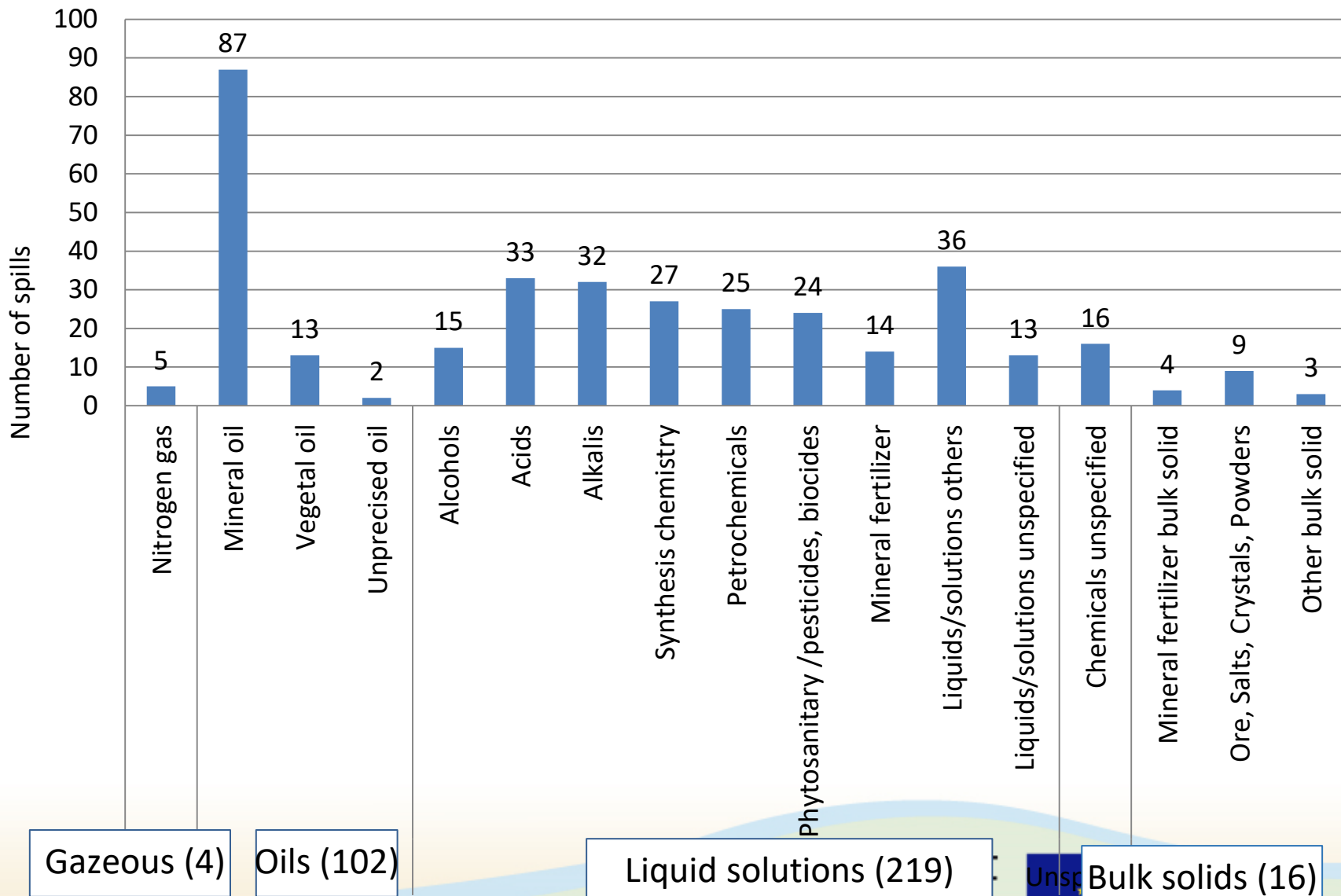
# Characterisation of spills in estuaries and inland waters

Distribution : Number of spills by type of oil 1998-2018 ; any volumes



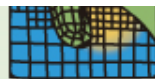
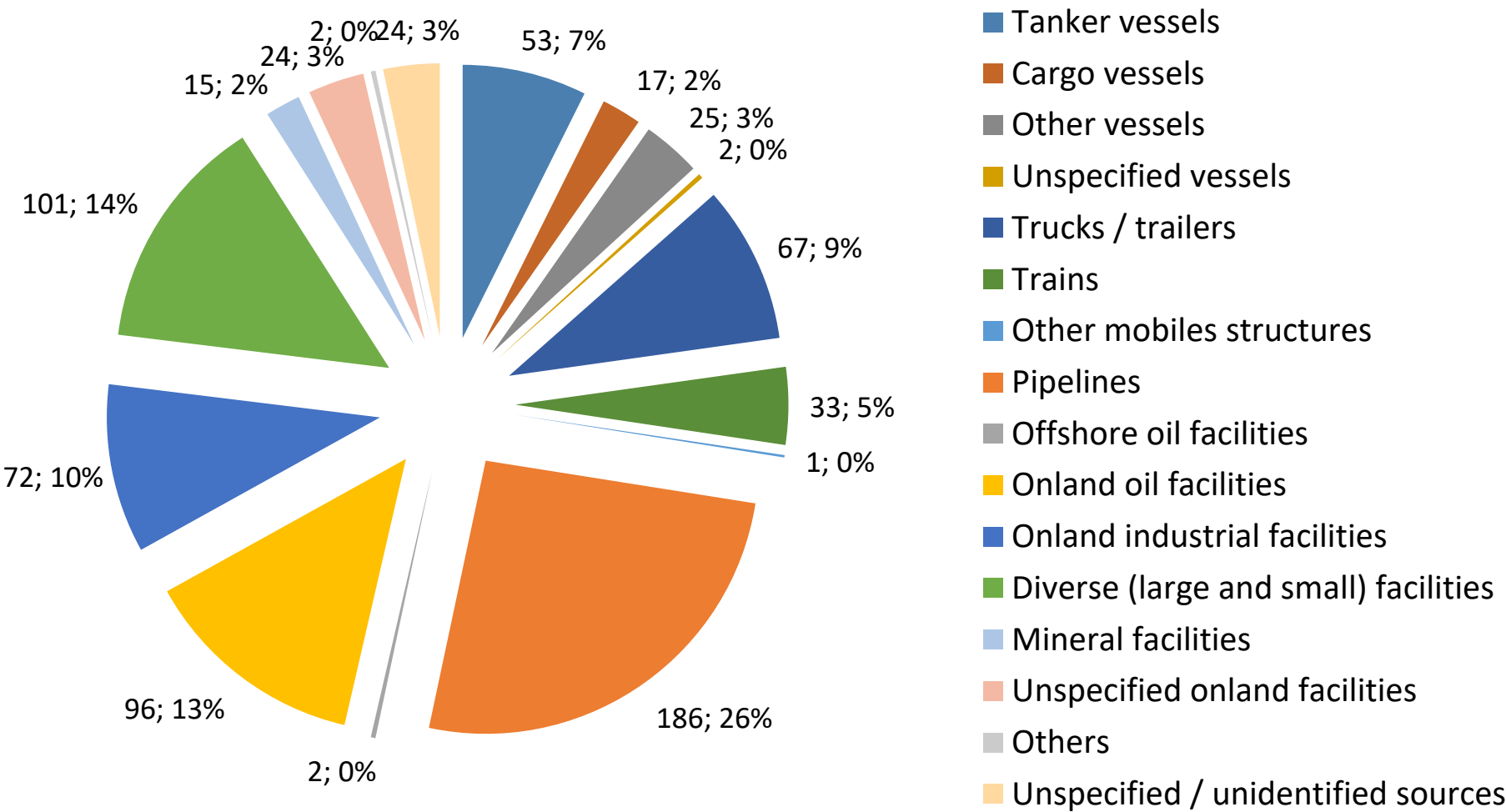
# Characterisation of spills in estuaries and inland waters

Distribution : Number of spills by types of chemicals; 1998-2018 ; any volumes



# Characterisation of spills in estuaries and inland waters

Spill sources : number of spills **all pollutants** ; quantity > 10mt ; 1998-2018



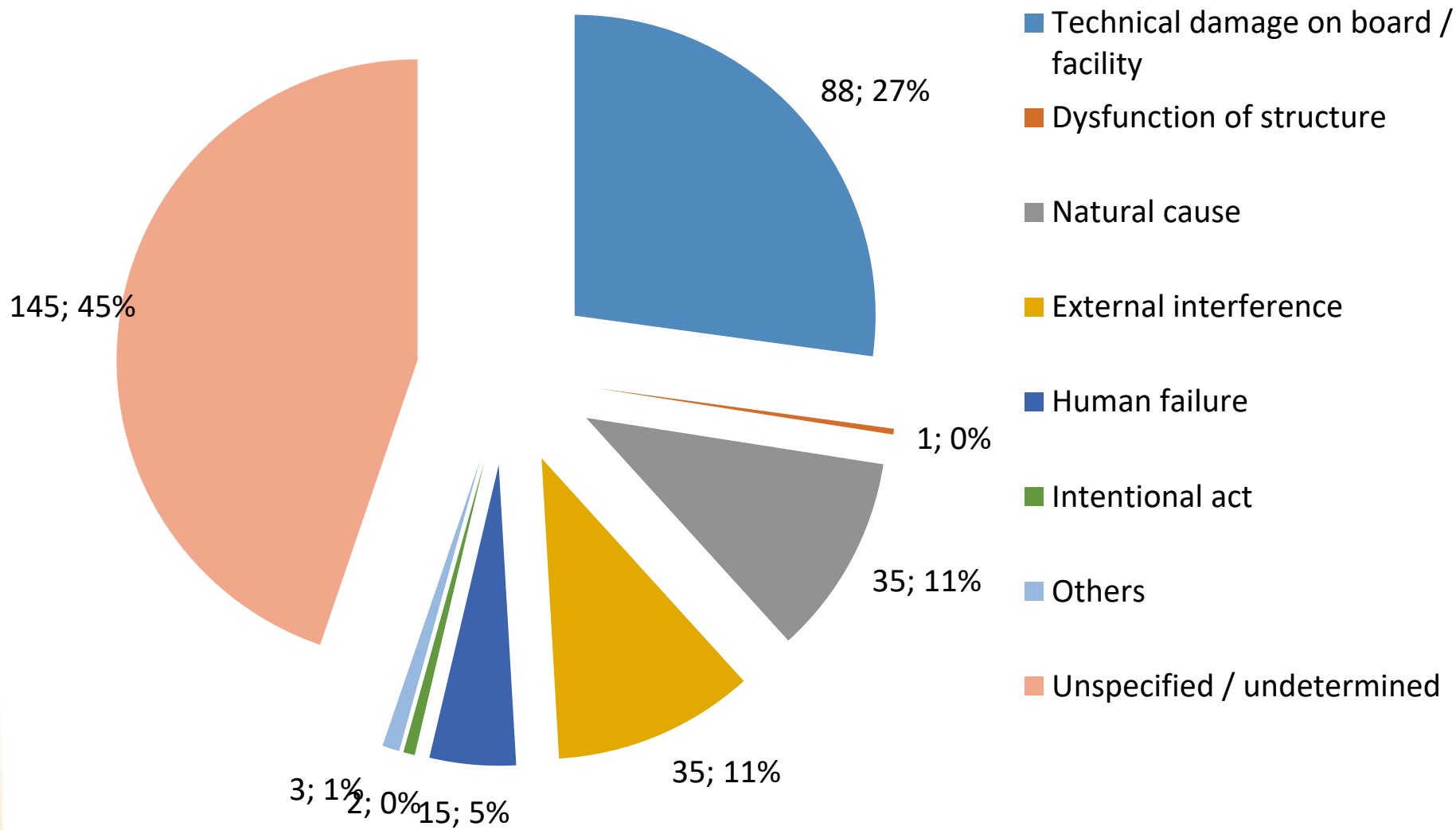
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# Characterisation of spills in estuaries and inland waters

Spill causes: Number of spills by type of causes ; all pollutants ; quantity > 10mt ; 1998-2018





# Feed back on past accidents

## Oil spill in the Loire estuary (France) from a pipeline in an oil refinery

16 of march 2008



500 tons of intermediate fuel oil spilled (IFO 380), 200 t

Oil extension in the estuary : 32 km



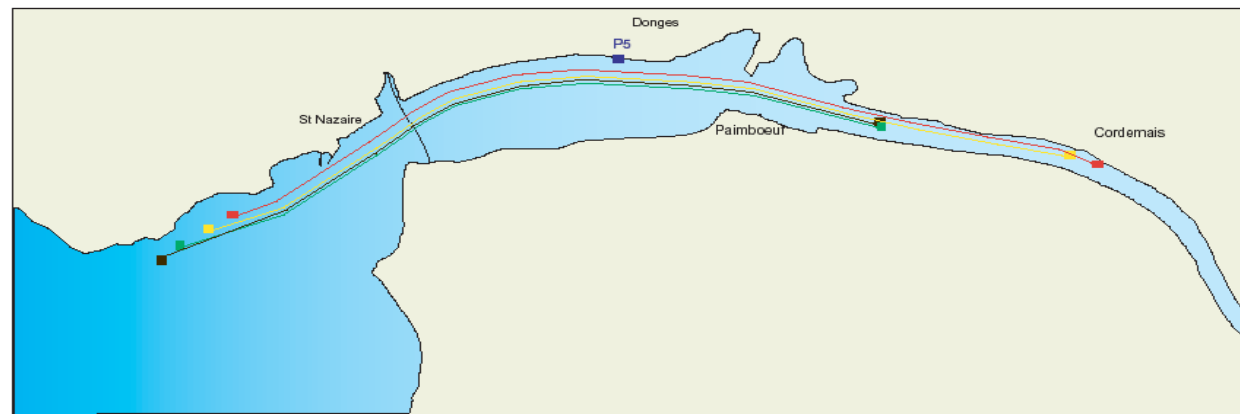
# Available model for oil slick drift forecast in the estuary

- **Hydrodynamic model : 3 to 4 days were needed to run the model and get results .....**
- **In the Contingency Plan : trajectory simulations were prepared in advance**
  - Four scenarios were chosen (48 maps with different hypotheses of wind, currents and tide)
  - Model results compared to 3 floaters trajectories dropped in the estuary
- **A synthetic map was elaborated which shows the extreme points reached by the oil in the estuary (global results were OK)**

Lâcher du flotteur : DONGES (appontement P5)

Figure A 3

Conditions de lâcher du flotteur (déversement) : Coefficient de marée 60, Q module = 850 m<sup>3</sup>/s (sans référence à la pleine mer)



# Evolution of oiling conditions

## First days :

Due to neap tide and river flow, oil remains on water and on low part of the banks



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## On the fourth day after the spill :

Water overflow in the floodplain (4 000 ha of marshes and meadows submerged and potentially contaminated)

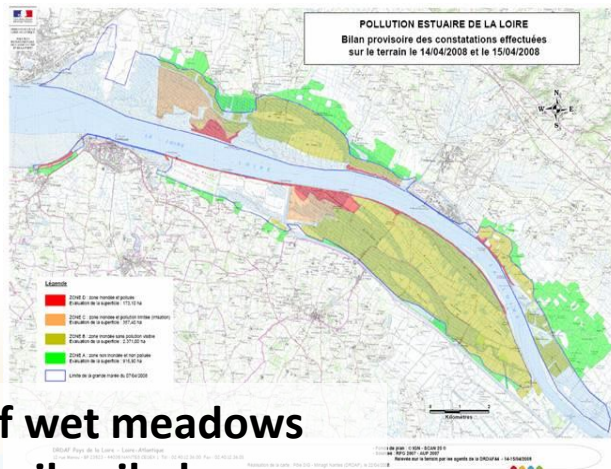
Oil penetrates into small creeks and overflows spreading oil into meadows and wetlands



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**200 ha of wet meadows were heavily oiled**

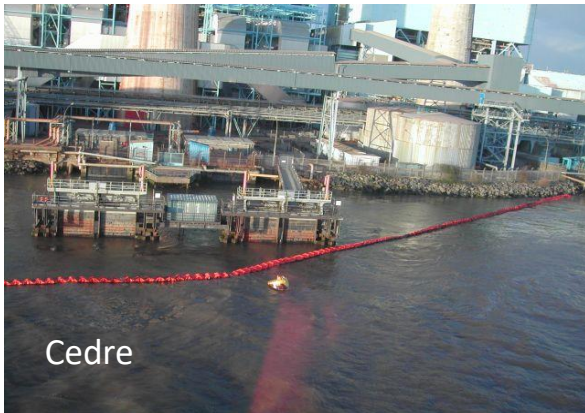


# Response operations: protection by boom deployment

Attempt to protect sensitive areas and strategic resources in the estuary

- Anchoring difficulties
- **Strong currents, over the limit of booms efficiency**

➤ As expected, a limited efficiency



Water intake of the power station



Anchorage in a meadow

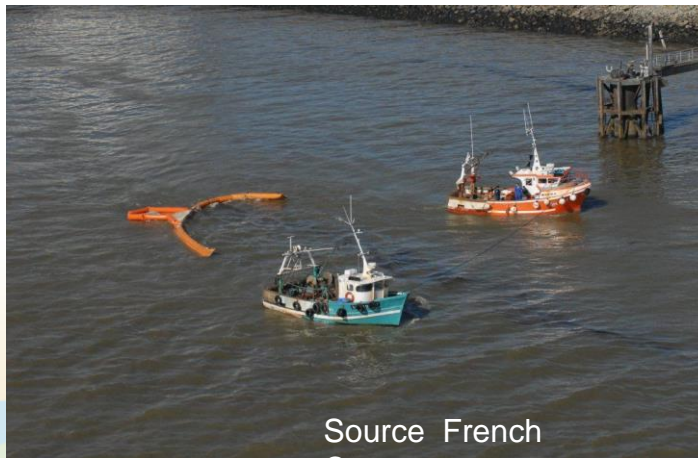
# Response operations : recovery of floating oil

**Very short time opportunity : floating oil only during 4 days :**

- Navy *OSRV Argonaute* (with *Thomsea* trawlnet)
  - Mobilisation of small **fishing boats**
  - Moored *Thomsea* **trawl nets** in small creeks
  - Few skimming barges suited for shallow waters, but none available in the area
- **Most of the floating oil was in very shallow waters close to the banks**
- **High currents limited efficiency of booms**
- **Very low quantity recovered**



BSAD Argonaute Source French Customs



Source French Customs



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# As a result : 3 months of cleanup operations on banks (25 000 man days)



# Lessons learnt and new developments

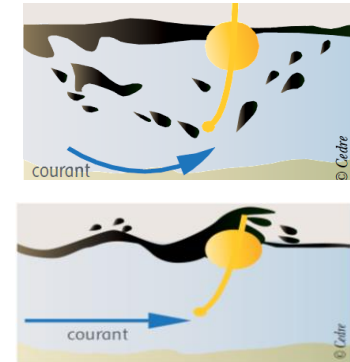
- **Model improvement and faster transmission of forecast results** (French authorities and Hazrunoff project);
- **New tools as UAV to help oil spill extension assessment** (test in the frame of Hazrunoff project);
- **Prototype of hovercraft for operations on mudflats and in shallow waters** was developed by Italian partners in the framework of a European project;
- **Better adapted equipments for recovery in fast currents** : since 2013 Cedre, partners and manufacturers organise tests of the capabilities of these new equipments in the Loire estuary, with Harbour teams and vessels;
- .





# Test of equipment adated to high-currents

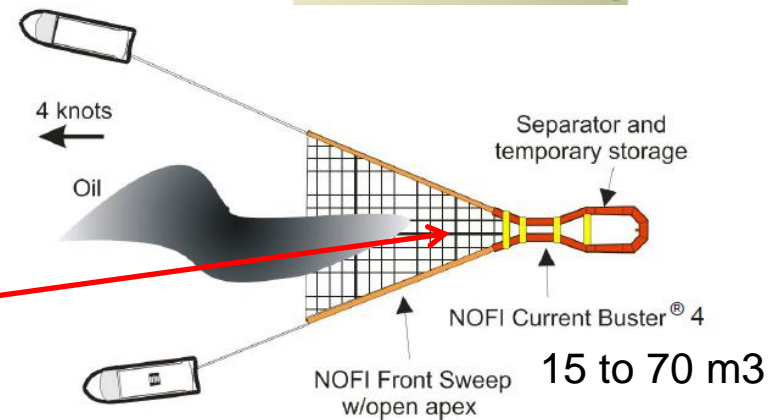
Conventional booms are efficient for currents up to 0,35m/s (**0,7 knots**) in perpendicular configuration



Specific equipments are developed for high currents :

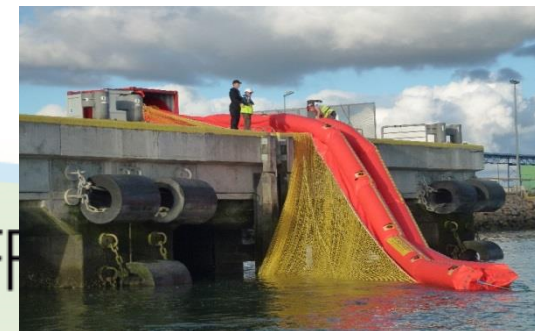
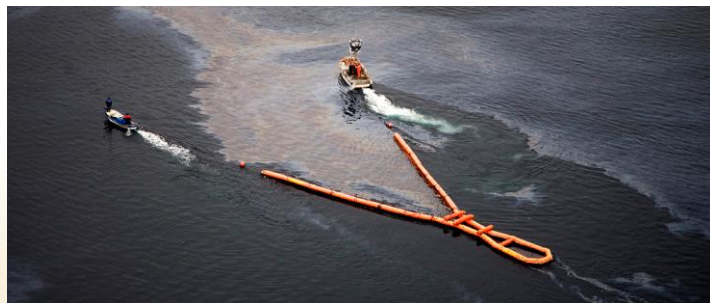
- **example of NOFI « Current buster »** efficient up to **4 knots** used for dynamic/static recovery

An open worknet to slow down the current



Towed by 2 vessels

Towed by 1 vessel and a paravane (deflectore)





# Second example : Flood in the Parisian Basin - june 2016

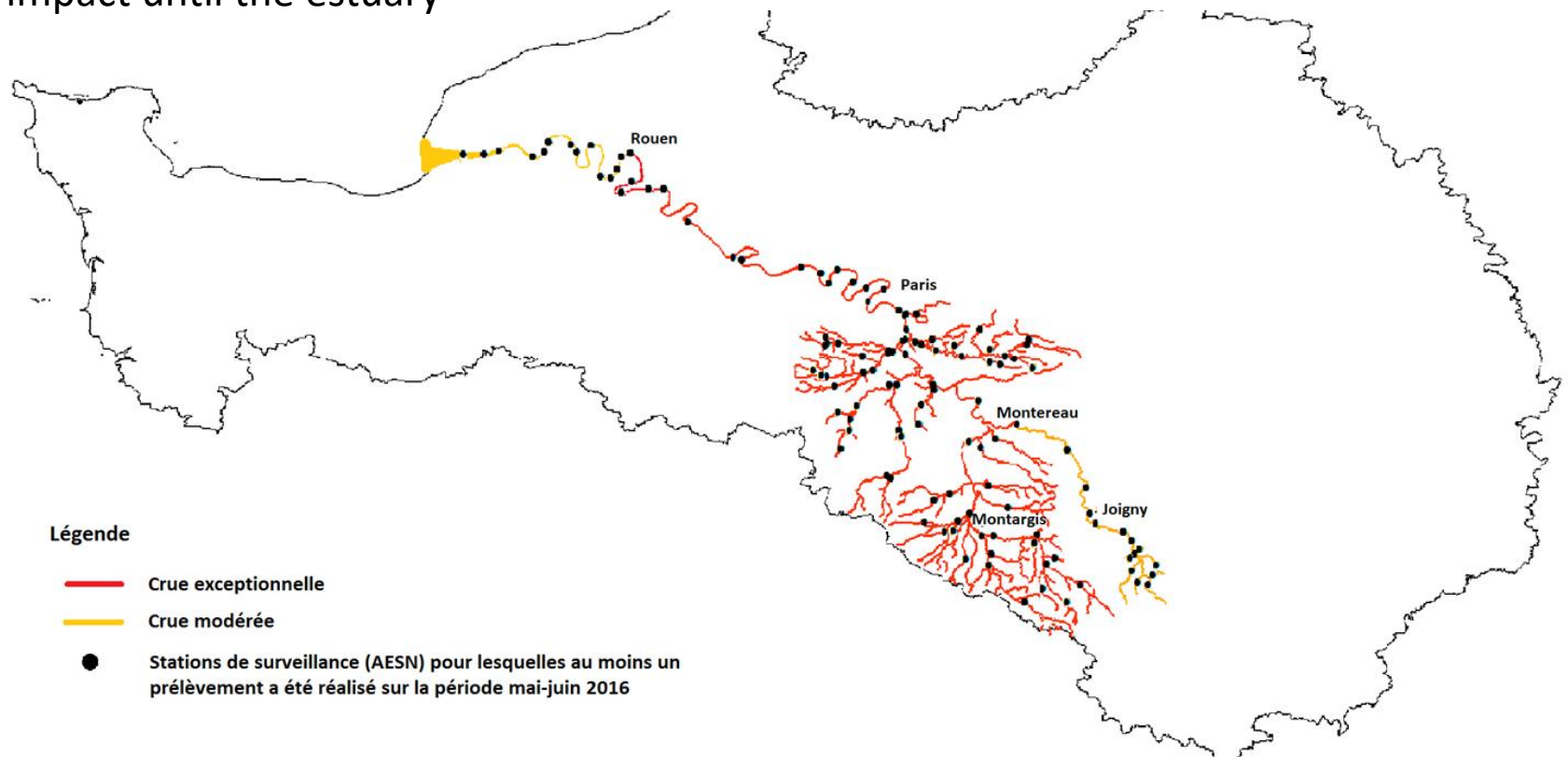
Exceptionnall flood, out of «historical » floods period as it occurs in june

Elevated pluviometry and saturated soils before the event due to rain

Many important Seine afluentes

(In Paris a peak with elevation level of 6,10 m in 1 night) (a 20 years return period flood and more for upstream afluentes)

Flood impact until the estuary



# Flood in the Parisian Basin - 2016

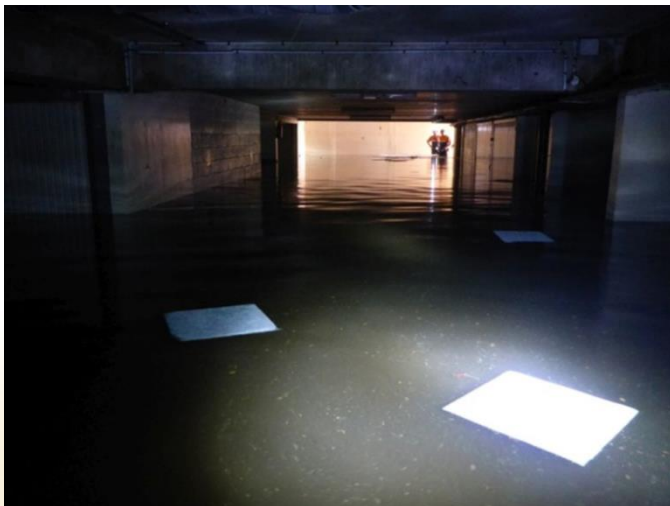
## Visible Contamination :

- Domestic fuel oil
- Oils from filling stations
- Used oils from garages
- Wastes, debris



## Invisible contamination :

- Phytosanitary, pesticides...
- Chemicals from professional activities (painting, plumbing ect..)
- Organic (sanitation systems, liquid manure tanks...)





# Response on oils



- Containment
- Pumping
- Use of sorbents



- Cutting of the oiled vegetation
- Excavation of oiled soil
- Low / high pressure
- Stonewall/ building : specialized societies



# Makeshift solutions : filtration of contaminated waters in river bed or pumped in houses and basements

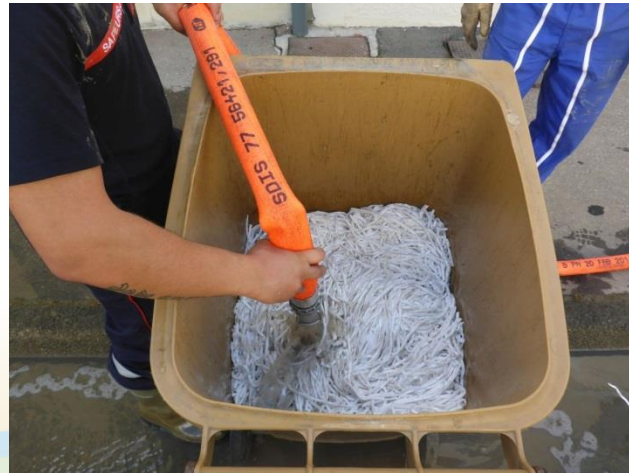


Makeshift filtration barrier (wire-mesh and loose sorbent)

Drilling holes at the bottom of a bin filled with loose-sorbent



27/05/2020



# Water and sediment monitoring

**A monitoring group was set up** ( 25 stakeholders : public services, providers of water, water management committies, sanitation companies)  
to share their data and organise :

- water monitoring
- Contamination of the fine sediment deposits of receding waters

## Contamination results :

- some localized increase of contamination with relation with spills for :
  - HAP, mineral contamination
- Organic contaminants: level under past floods contamination (decrease due to regulations of the past 10 years)
- Due to season a peak of nitrate and pesticides during few days

**In conclusion the group proposed:**

- **to set up a platform to facilitate and speed data exchanges**
- **to work on data formats**