



# Remediation and Re-Use of Contaminated Sediments in Finland

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# Ekokem-Service's Treatment Centres for Contaminated Soil & Sediments

## Treatment Centres for contaminated soil

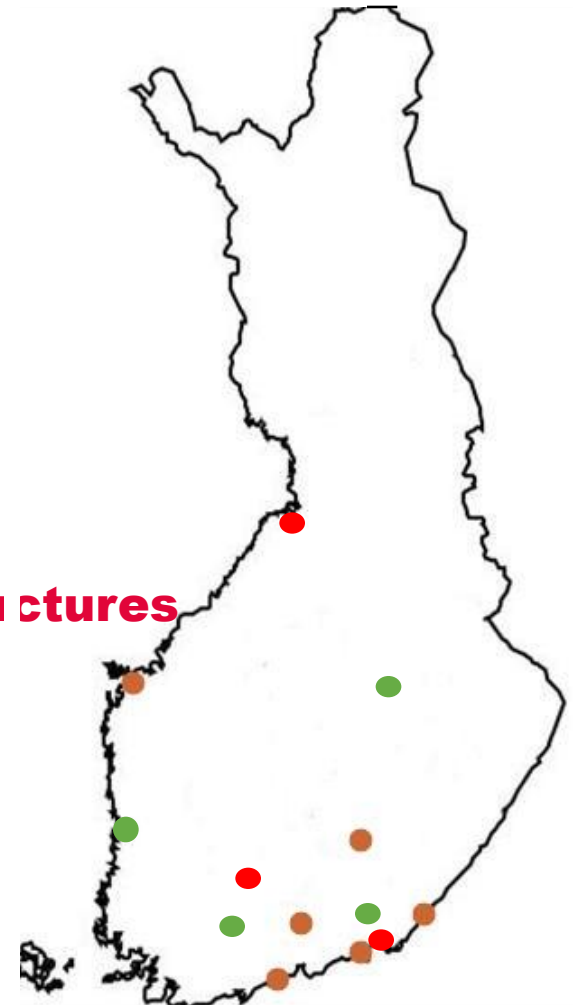
- Hausjärvi (Kuuloja)
- Pori (Peräkorpi, Mäntyluoto)
- Anjalankoski (Keltakangas)
- Kuopio (Sorsasalo),

## Remediated Contaminated Sediments

- Vaasa, Mäntyharju, Kotka, Lahti, Imatra, Helsinki

## Re-use of Contaminated Soils in Landfill structures

- Siikajoki (Huumola)
- Anjalankoski (Keltakangas)
- Karhula
- Valkeakoski



# Quality criteria for soil and sediment

	SOIL			SEDIMENT	
	Lower mg/kg	Upper mg/kg	Hazardous mg/kg	Level 1 mg/kg	Level 2 mg/kg
<b>C10-C40</b>	-	-	10 000	50	1 500
<b>Anthracene</b>	5	15	1 000	0,01	0,1
<b>Hg</b>	2	5	1 000	0,1	1,0
<b>Cd</b>	10	20	100	0,5	2,5
<b>Cr <sup>3+</sup></b>	200	300	-	65	270
<b>Pb</b>	200	750	2 500	40	200
<b>Ni</b>	100	150	1 000	45	60
<b>As</b>	50	100	1 000	15	60
<b>TBT <sup>1)</sup></b>	1	2	2 500	3	200
<b>PCDD/F <sup>2)</sup></b>	100	1 500	15 000	20	500

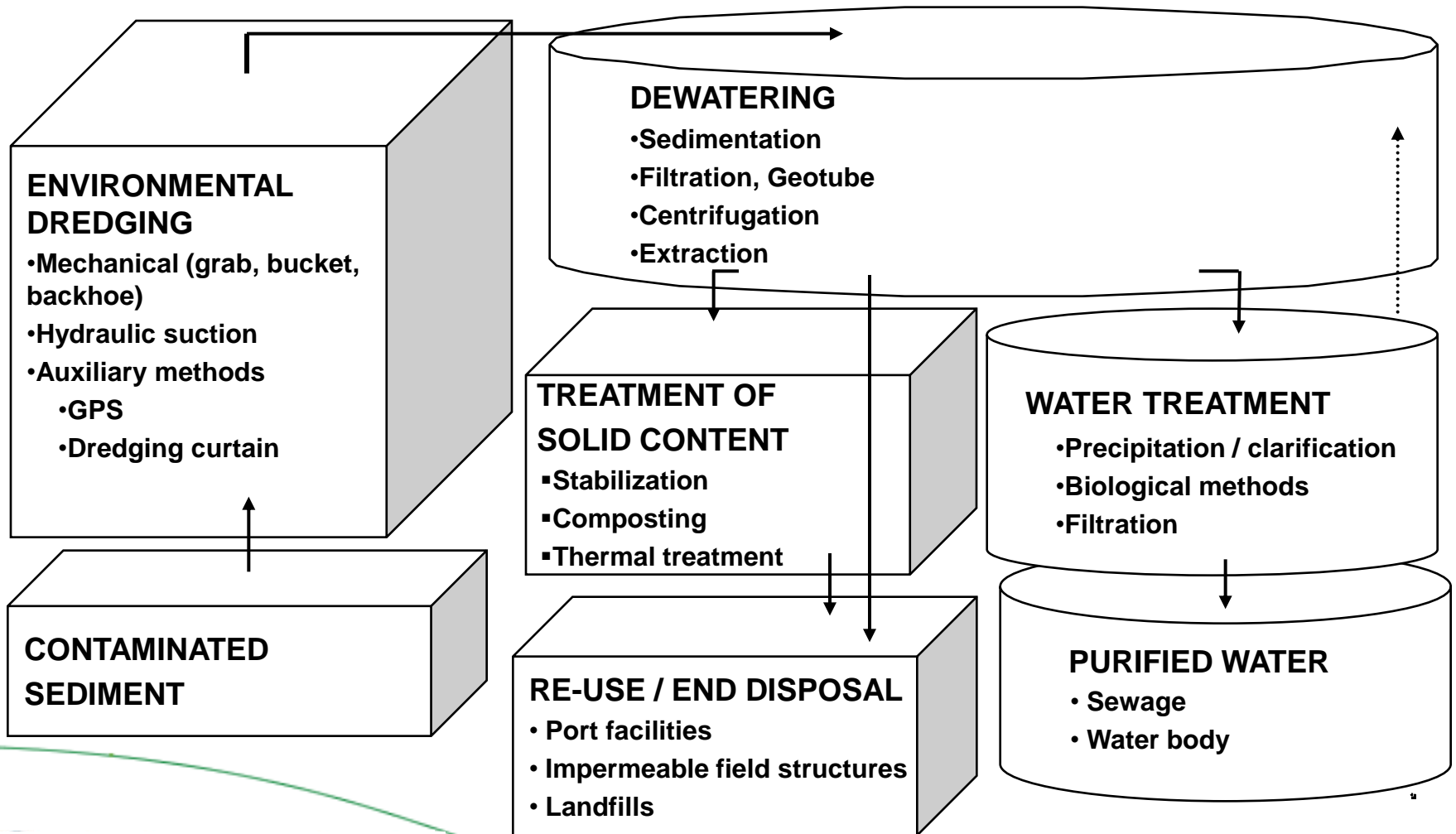
1) ug/kg

2) ng-TEQ/kg

# Remediation and re-use of contaminated sediments

- Capital, maintenance, mineral and environmental dredging
- Ca. 1 500 000 t/a sediments dredged, ca. 50 % deposited ashore
- Ca. 500 000 t/a contaminated soil excavated
- Different threshold limits for sediment and soil
- Same rules for remediation of all contaminated earth materials
- Re-use of waste permitted, but strictly regulated
- All re-used waste is exempted from Waste Disposal Tax

# Remediation and re-use of contaminated sediments

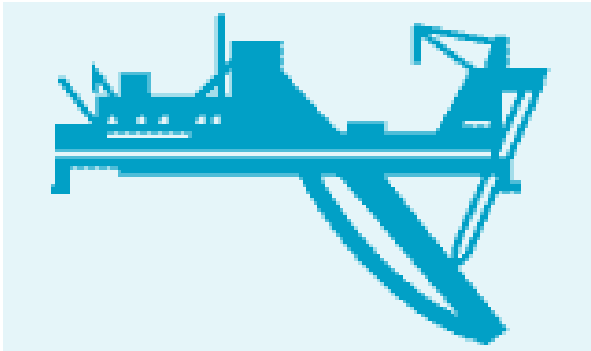


# Factors in environmental dredging

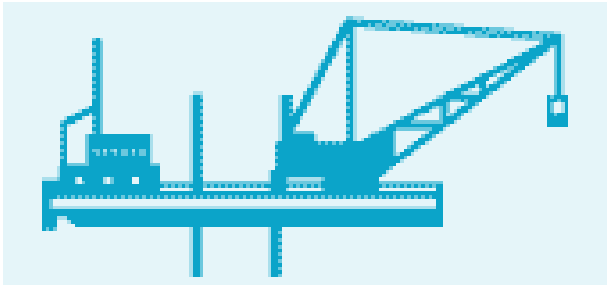
- Soil type (sand, clay, organic)
- Rocks and other big objects
- Leachability of contaminants
- Distance to shore
- Depth
- Final destination



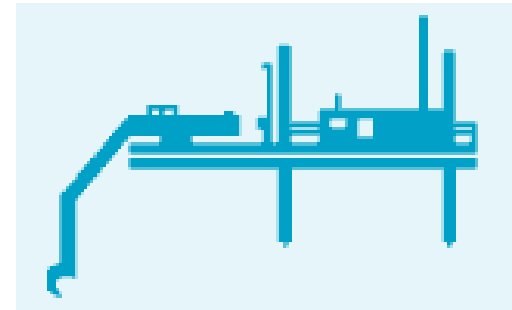
# Mechanical dredgers



Bucket dredger



Grab dredger



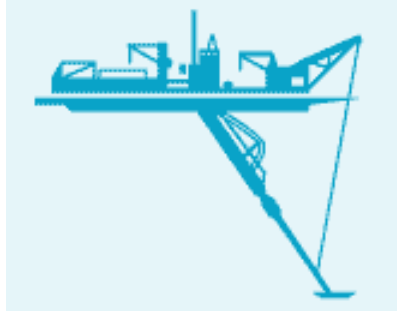
Backhoe dredger

# Dredging of contaminated sediments

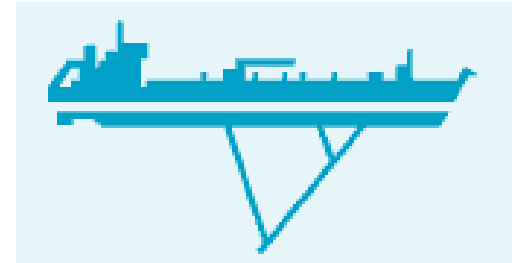


**Water Master –dredger with grab bucket**

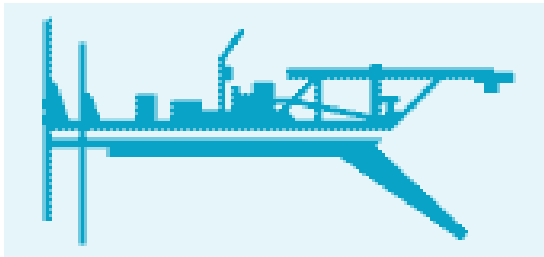
# Hydraulic dredgers



Suction dredger



Hopper



Cutter suction dredger

# Dredging of contaminated sediments



Hydraulic dredging with sludge pump



# Dredging of contaminated sediments



## Auxiliary devices

- Accurate positioning systems by i.e GPS
- Silt screen/shield

# Dewatering of contaminated sediments



# Dredging of oil spill sediments in Kurkilahti

Ongoing project in september 2008

Oil spill in 2007

1,5 km of protection enclosure

120.000 m<sup>3</sup> of water is pumped into  
a sedimentation basin

20.000 m<sup>3</sup> of sediment landfilled

Total cost 600.000 €



# Treatment of contaminated sediments

- Stabilization / solidification
- Composting
- Thermal methods
- Landfilling

Rare but possible:

- Soil washing
- Electro-kinetics
- Chemical oxid. / red.



# Re-use of sediments

- Typical properties of sediments complicating remediation and re-use
  - High water content
  - Fine grain size
  - High organic content
- Typical forms of re-use
  - Expansion of port facilities (solidified sediments)
  - Sealing layer of old landfills
  - Impermeable field structures
- Sediment properties optimized by blending of industrial by-products



# Expansion of Kotka Hietanen Port Area

Expansion of a car parking lot 37 ha over contaminated sludge pool

Car park has a low load that enables exceptionally light-weight structure

A large part of the ash produced in South-East Finland during 6 months was used as well as a lot of tires and crushed tires



# Special cases in Finland

- Kymijoki, ca. 100 000 m<sup>3</sup> of river sediments contaminated by PCDD/F ( > 10 000 ng/kg)
- Industrial waste sludge lagoons
- Explosives from World War II

