A <u>methodology</u> to determine <u>riverine loads</u> and <u>coastal deposition processes</u> of <u>polluted sediments</u> in the Drammen Harbour, Southern Norway

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EC
WFD

Rivers
at risk

Need for
low cost
methodology
development

Financed
by
counties

Coastal
areas
at risk

Aim

- Combine interdisciplinary methods to estimate fluxes of pollutants to the harbour

- Make up a pollution budget for the Drammen Harbour

- Unmask unknown pollution sources

- Estimate future sediment quality in the harbour

NIVA

Input from River Drammen

Input from River Lier

Input from urban areas (Drammen)

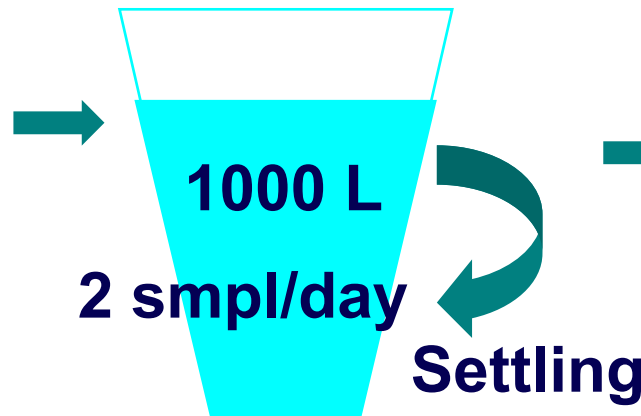Deposition of polluted sediments in Drammen Harbour
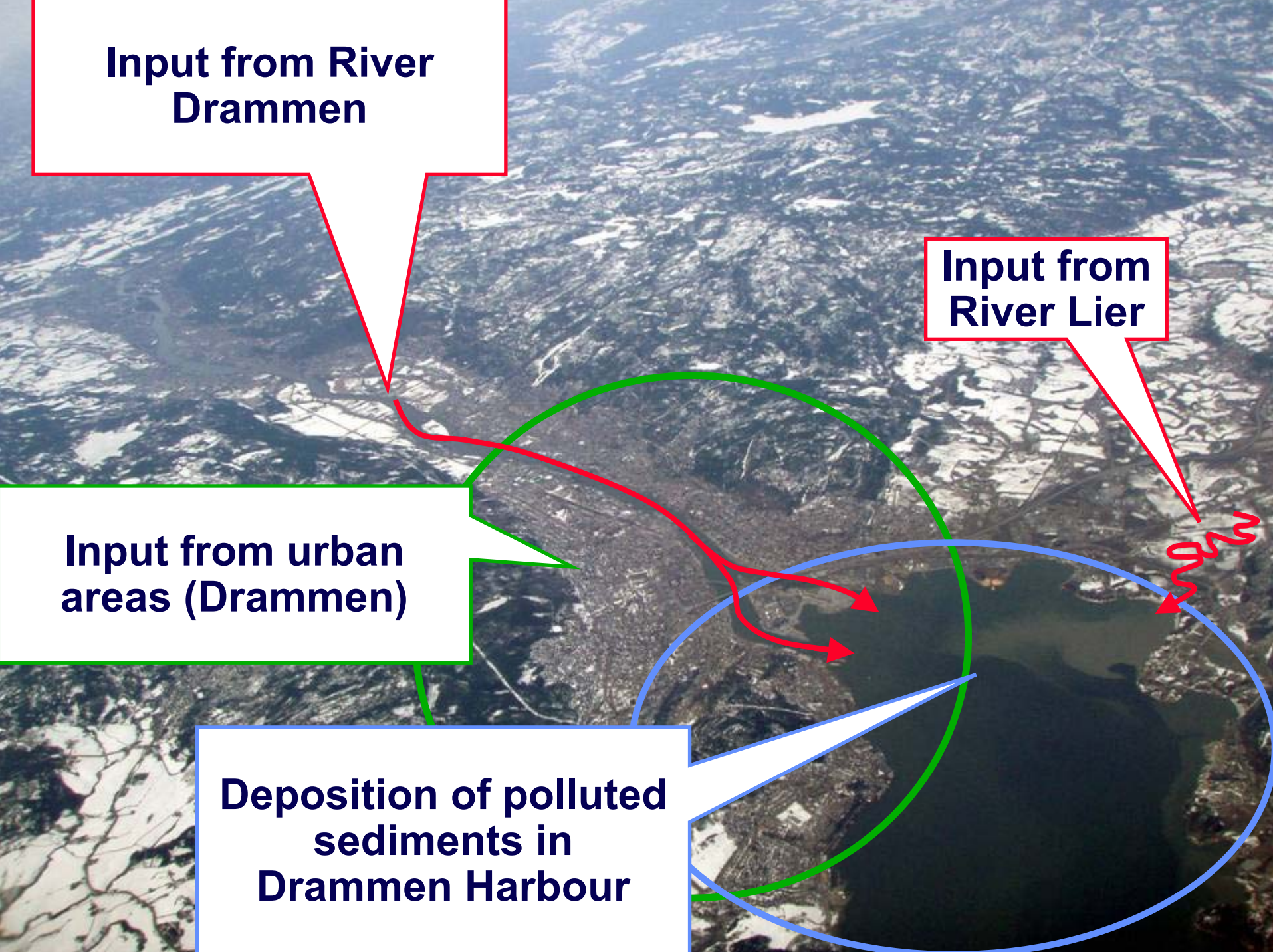
Sampling methodology rivers

Seasonal sampling for ca. 6 weeks:
*during spring (snow melt season).
*summer rain
* autumn rain

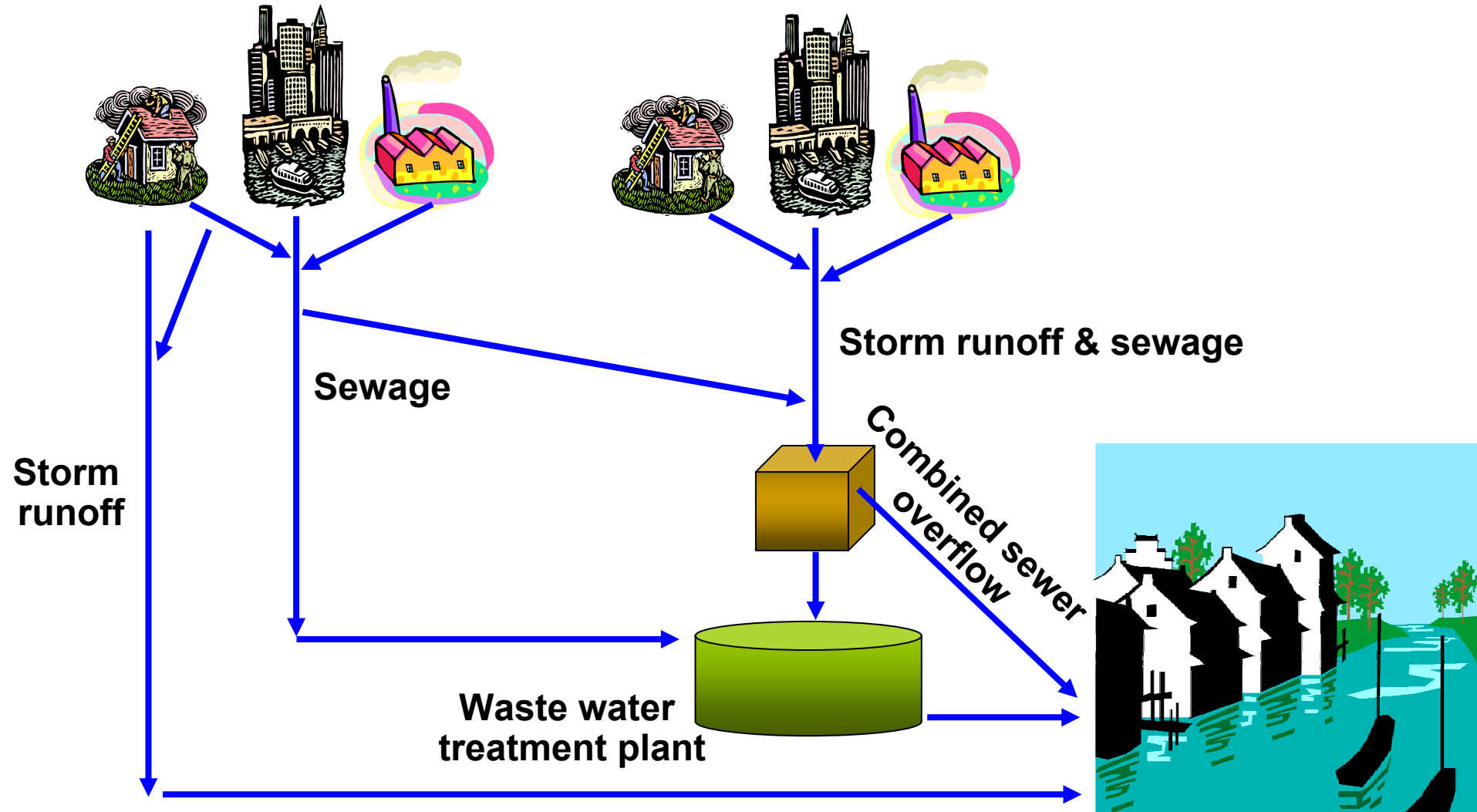**Spot sampling (1/day) for suspended sediment load estimates, sediment rating curves**

1000 L

2 smpl/day

Settling

Composite sampling for estimates of hazardous substances

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Urban run-off

Separate sewer system

Combined sewer system

Storm runoff & sewage

Sewage

Storm runoff

Combined sewer overflow

Waste water treatment plant

Sediment traps

- 3 periods
- 7 areas
- Parallel samples
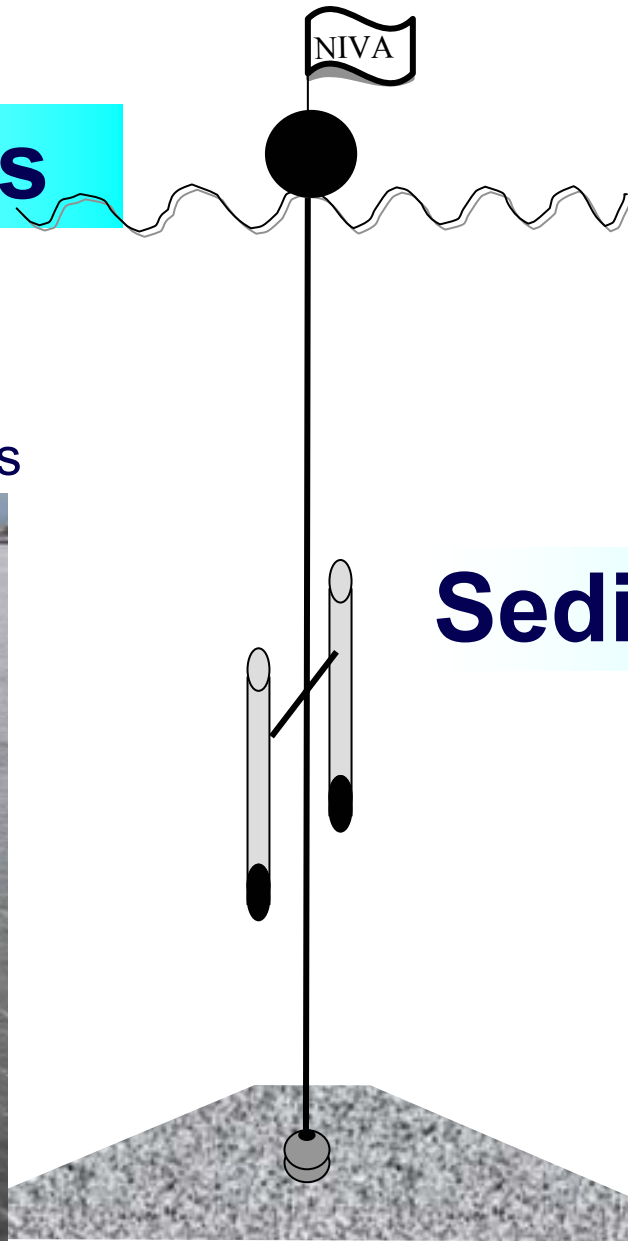
Sediment cores

Concentrations of metals and organic micro pollutants

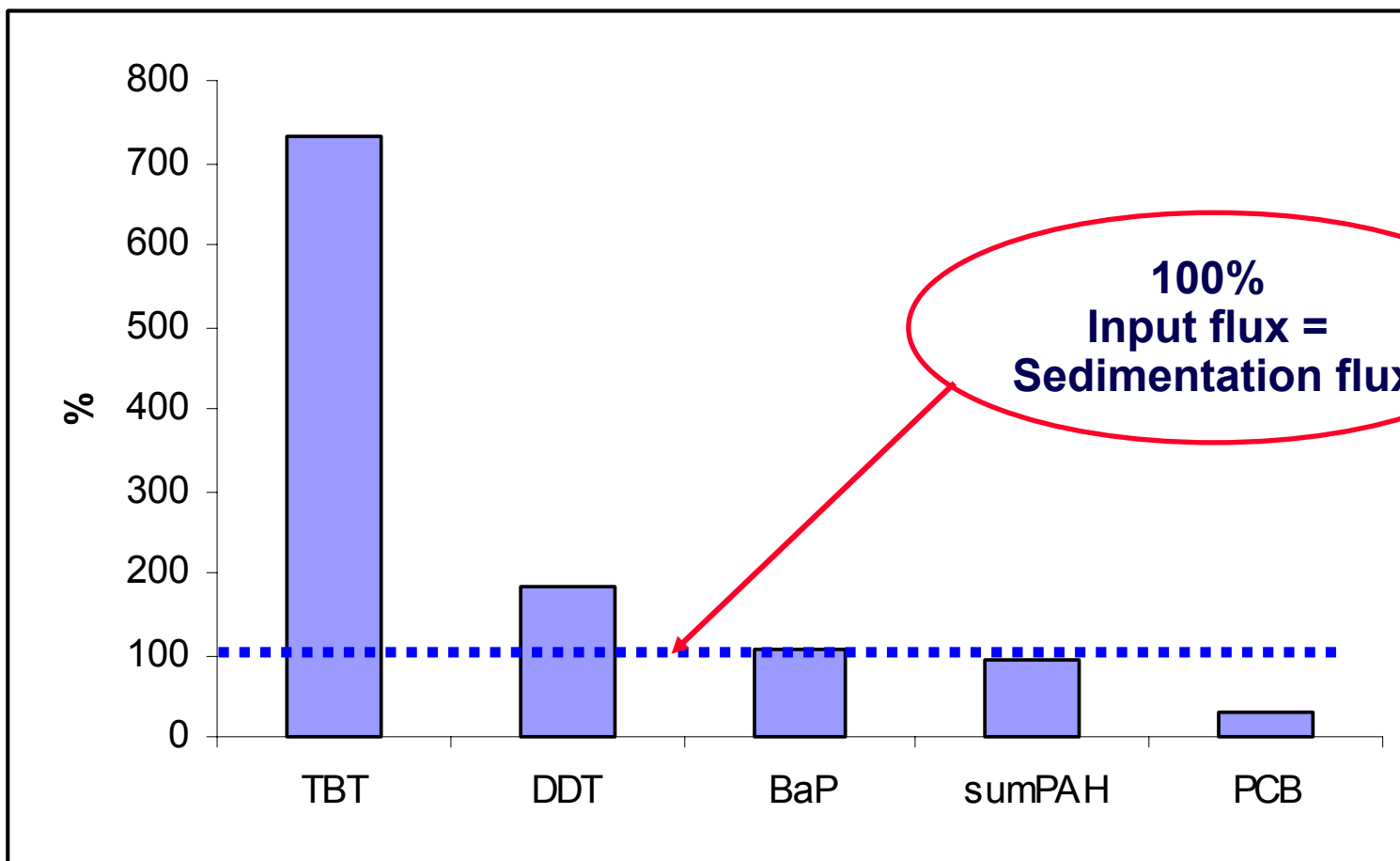| Sample	μg/kg					mg/kg						
	TBT	PAH 16	BaP	PCB7	DDT	Cd	Cr	Cu	Hg	Ni	Pb	Zn
Sediment	1006	49000	306	198	1,1	0,3	30	63	0,2	32	34	134
Traps	790	2662	168	9,9	5,0	0,3	34	89	0,2	29	44	230
River Lier	22	57	5	1,4	2,7	0,7	36	62	0,1	38	21	273
River Drammen	26	311	25	9,6	1,6	1,0	49	133	0,1	34	74	381
Urban run-off	21	777	29	38	2,4	0,5	34	67	0,2	27	39	184

Budget

100%
Input flux =
Sedimentation flux
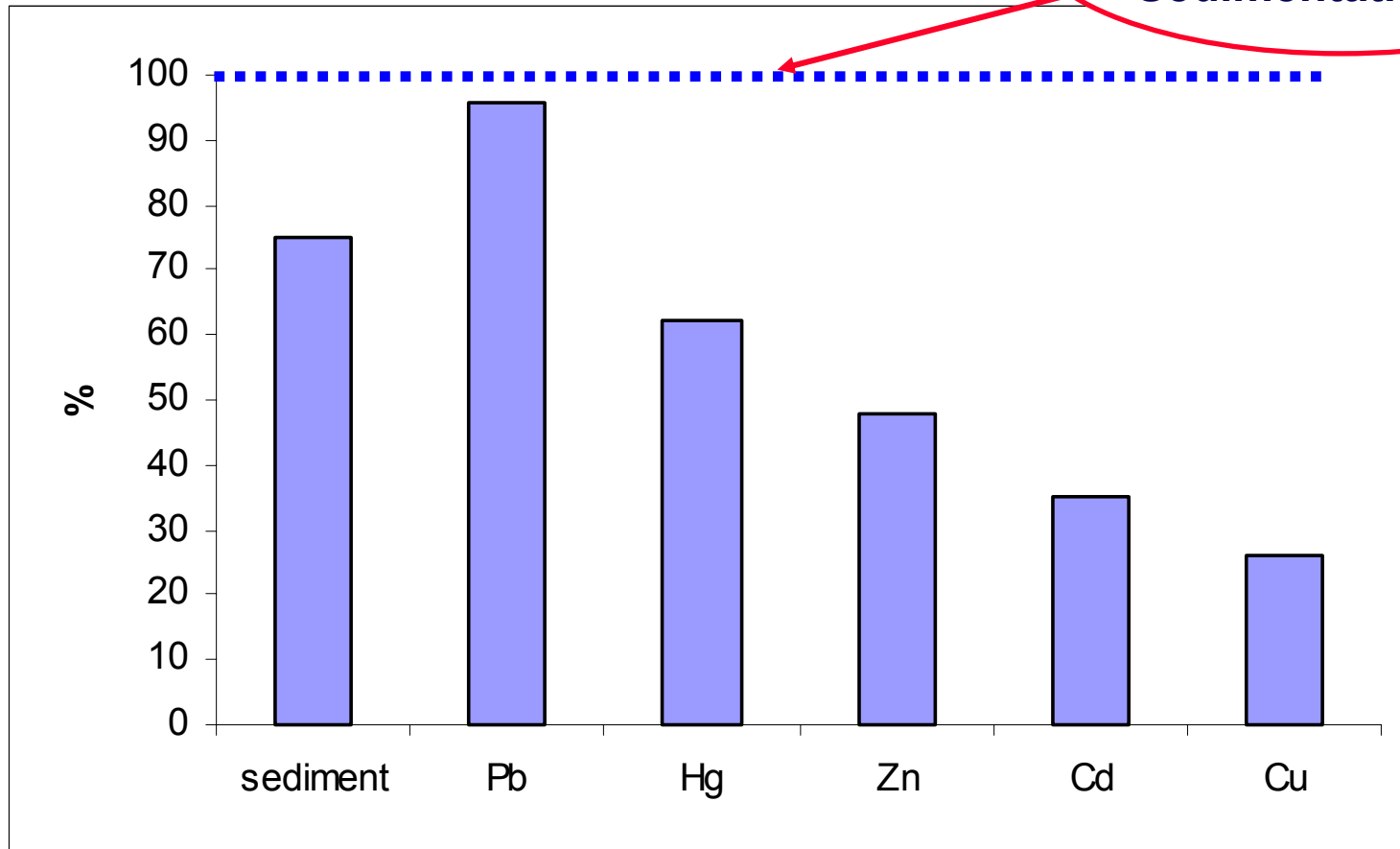
Budget

Conclusions

- if the rivers and urban run-off alone deliver particulate matter to the harbour, the pollution conditions would in about 15 years become "good ecological status" (WFD)

- there must be a major source of TBT that we were not aware of

- these conclusions resulted in a closer follow-up of a shipyard in the harbour and

- were also a contributing factor for capping of some sediment areas in the harbour

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+ and -

- Low cost method
- Simple way to achieve detectable concentrations of organic contaminants in river water
- Rough estimates good enough for detecting unknown sources (at least of some magnitude)
- The results need to be validated through more measurements during the entire year and for variations between years
- Need more frequent sampling in the very first beginning of rain periods, both in rivers and in storm run-off pipes

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