The Environmental Characteristics of Sediments in Western Nakdong River

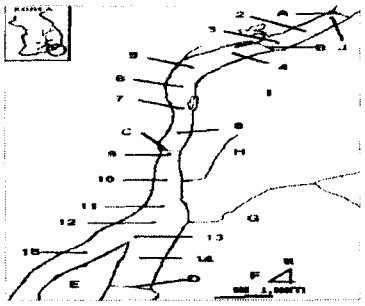
School of Environmental Science and Engineering
Heung-Jai Park

Purpose :

The relationship between riverbed structure and sediment pollution

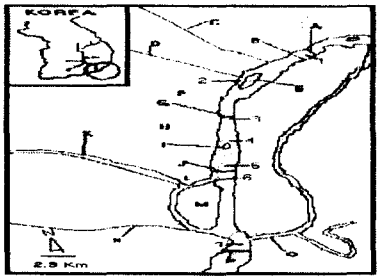
< Sampling site >

Nakdong River



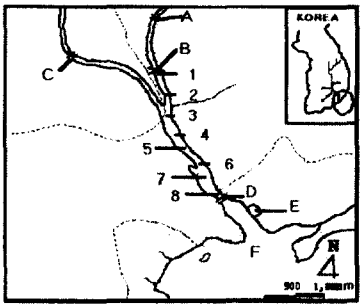
< Sampling site >

Western Nakdong River



< Sampling site >

Suyoung Stream



<Period>

- For three stream form February 20th, 1997 to June 15th, 1997
- In case of Western Nakdong River continually to January 31th, 2001

<Analysis>

- Sediment

a) heavy mental
Inductively coupled Plasma
(SPS 1200A Plasma Spectrophotometer, SII Seiko Instrument)

b) pesticides
GC/NPD (HP 5890 Series II Plus)

2. Water quality

a) COD, BOD, TN, anions(F^-,Cl^-, NO^{3-}, SO_4^{2-})

RESULT

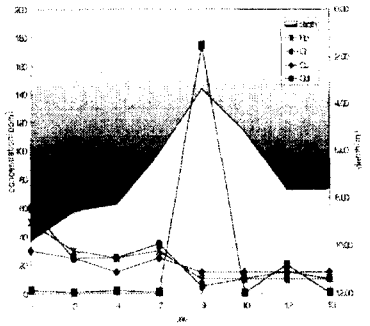
A. Relationship between River bed structure and heavy metal concentration of Sediments

a) Nakdong River

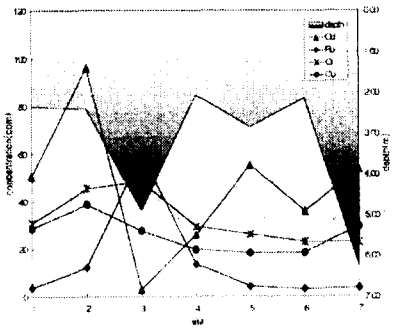
b) Western Nakdong River

c) Suyoung Stream

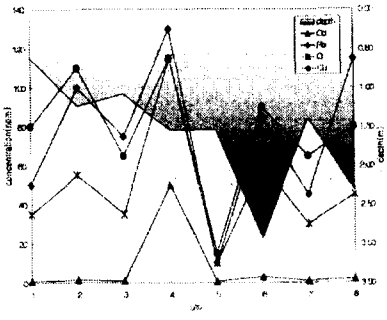
Nakdong River



Western Nakdong River



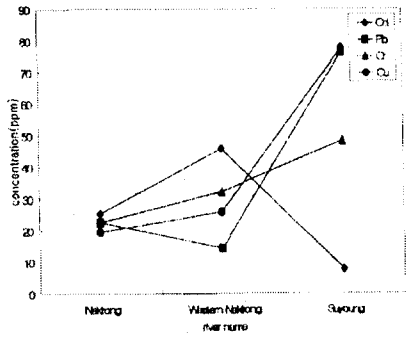
Suyoung Stream



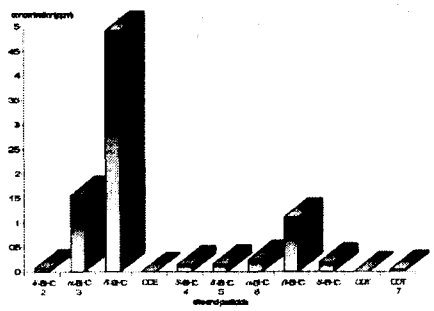
B. Pollution characteristics between streams

- Concentration of heavy metal in sediment
- Concentration of pesticides in sediment
- Water quality(COD, BOD, TN) in water(Fig. 10~Fig. 13)
- Characteristics of Anions(F^-,Cl^-, NO^{3-} SO_4^{2-}) in water (Fig. 14~Fig. 17)

- Concentration of heavy metal in sediment

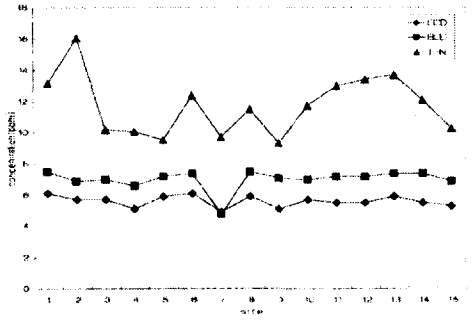


b) Concentration of pesticides in sediment

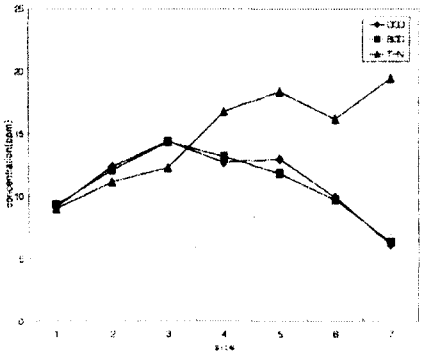


<Western Nakdong River>

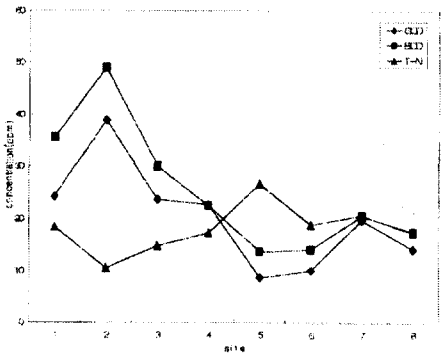
c) Water quality(COD, BOD, TN) in water



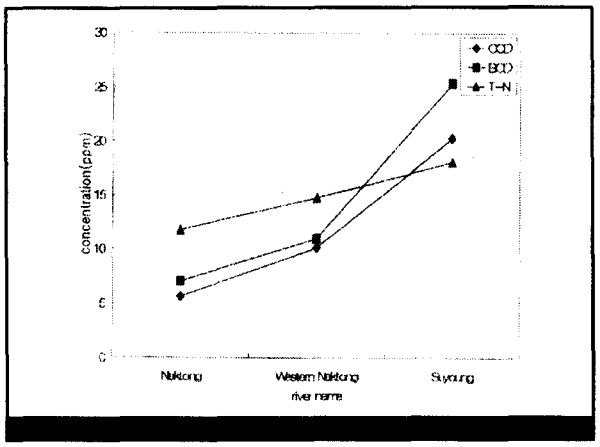
<Nakdong River>



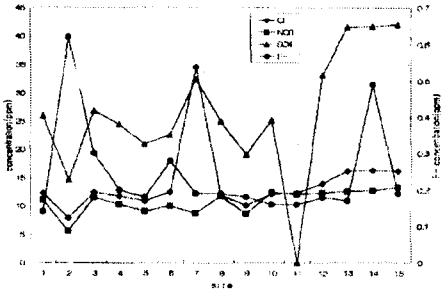
<Western Nakdong River>



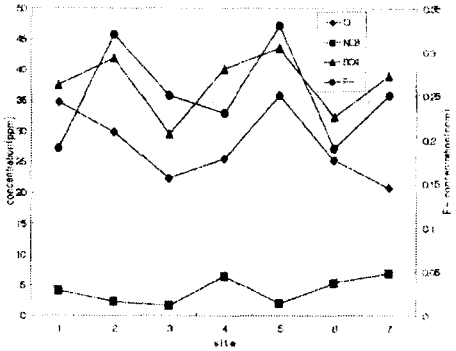
<Suyoung Stream>



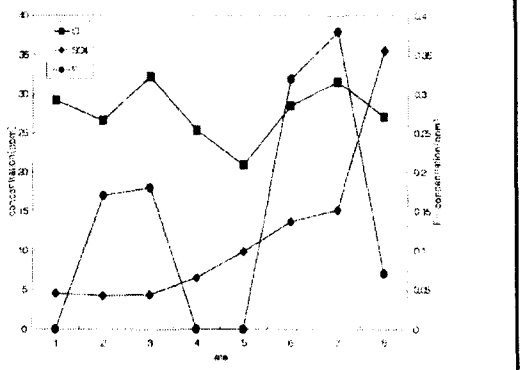
d) Characteristics of Anions(F^-,Cl^-, NO^{3-}, SO_4^{2-}) in water



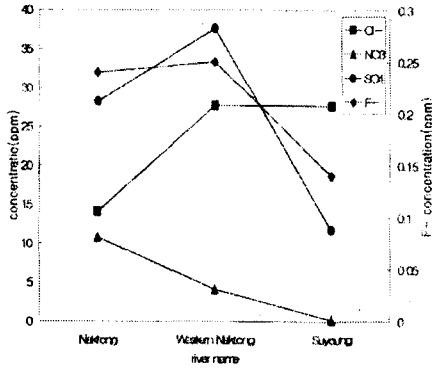
<Nakdong River>



<Western Nakdong River>



<Suyoung Stream>



1st Conclusion

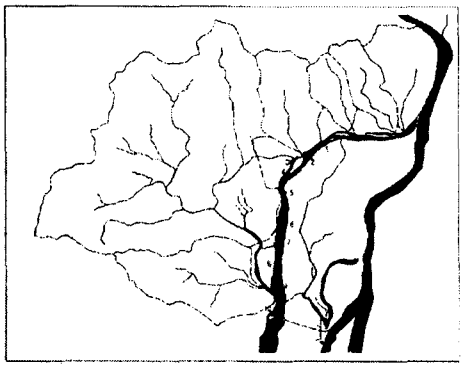
Because of two water gate, western Nakdong River is similar to lake.

So, it is very serious polluted.

and depth tendency of western Nakdong River is similar to degree of pollution.

So, We continuously studied for Western Nakdong River.

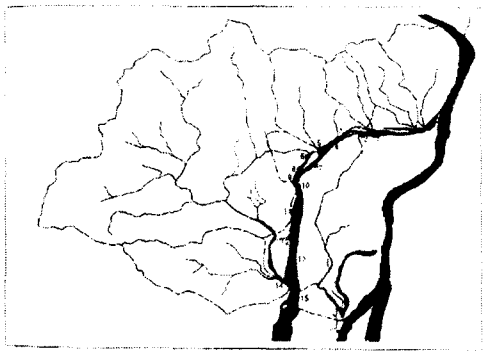
Western Nakdong River(1998 ~ 2001)



<Sampling Site 1998>

(Unit : ppm)

Site	Pb			Cr			Cu		
	6th	8th	9th	6th	8th	9th	6th	8th	9th
1	6.33	12.57	9.91	3.71	6.01	4.73	2.73	5.52	3.8
2	29.76	39.84	38.86	26.52	80.66	45.78	19.32	40.66	31.9
3	29.24	17.66	21.14	45.36	11.89	15.39	22.4	9.43	11.21
4	3.69	24.46	7.20	4.42	18.22	4.79	1.33	10.82	2.21
5	26.82	22.60	34.90	7.99	17.18	16.34	7.16	13.65	12.77
6	26.88	25.82	10.13	15.71	8.27	5.67	11.06	5.26	3.95
7	10.94	22.78	16.57	7.99	9.48	7.67	4.54	7.55	5.90
8	31.50	24.72	9.74	15.22	11.63	4.74	12.07	9.73	3.07
9	3.51	3.75	7.50	2.46	1.93	2.98	1.65	0.99	2.47
10	22.64	23.98	29.3	8.15	9.31	15.13	12.43	8.26	12.64
MEAN	19.13	21.90	18.51	13.75	17.44	12.32	9.49	11.21	8.99

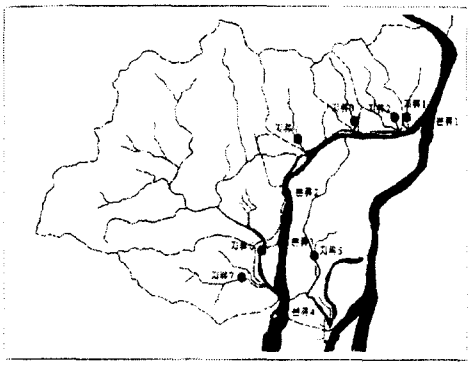


<Sampling Site 1999-2000>

(Unit : ppm)

Site \ Sort	Pb	Cd	Cr
1	12.776	0.098	13.092
2	25.693	2.677	33.215
3	9.265	1.365	7.278
4	19.928	1.976	20.841
5	11.888	14.09	6.547
6	14.792	0.656	12.890
7	24.168	2.220	19.539
8	19.127	1.413	18.402
9	31.647	2.069	40.517
10	19.808	1.293	17.415
11	9.635	ND	13.521
12	8.885	0.306	7.295
13	15.810	0.797	14.273
14	16.947	0.303	11.200
15	29.367	1.644	20.137

ND : not determined



item / point	COD (mg/ℓ)	pH	ignition loss(%)	Cd (㎍/g)	Cr (㎍/g)	Hg (㎍/g)	Pb (㎍/g)	T-N (mg/ℓ)	T-P (mg/ℓ)
Daeje water gate	6.47	7.89	2.01	0.58	6.99	0.78	13.27	0.04	1.19
Daegamseo am	8.78	7.32	5.84	1.87	15.87	0.52	39.25	0.15	3.29
Yean steam	14.74	7.24	7.54	1.21	9.78	0.36	24.38	0.05	11.98
Jujung steam	7.09	7.17	4.64	0.21	0.10	ND	20.01	ND	1.47
Shingo steam	18.01	7.24	0.86	0.43	1.79	0.65	10.87	0.40	17.25
Kangdang bridge	12.78	7.49	6.54	2.68	40.06	1.72	79.14	4.21	2.58
Pyung steam	16.20	7.53	7.98	2.98	28.98	8.10	55.12	0.17	2.29
Dunchu	27.28	7.69	6.55	1.54	16.25	3.25	45.24	4.68	2.46
Joman river	15.31	7.19	4.54	1.78	5.48	1.31	28.78	0.51	2.98
Jisa steam	12.54	7.54	3.53	1.21	6.14	1.15	35.68	0.04	6.47
Nosan water gate	8.23	8.21	0.69	0.45	2.98	5.59	7.98	1.61	2.51

ND : not determined

Using the polluted Sediment

⇒ tile

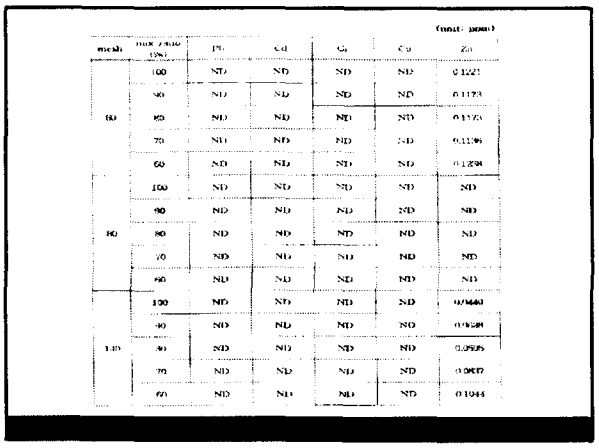
mesh	Containing material	Containing ratio(%)
60	SiO_2	60.5099
	Al_2O_3	21.3897
	Fe_2O_3	6.7480
	K_2O	2.6466
	MgO	2.5033
	P_2O_5	1.7054
	CaO	1.2983
	Na_2O	1.1045
	SO_3	0.9026
	TiO_2	0.7674
	MnO	0.2003
	ZnO	0.0318
	SrO	0.0272
	ZrO_2	0.0252
	Cr_2O_3	0.0173
	Rb_2O	0.0165
	CuO	0.0089
	NiO	0.0072

mesh	Containing material	Containing ratio (%)
80	SiO_2	59.8589
	Al_2O_3	21.3118
	Fe_2O_3	7.9845
	K_2O	2.6235
	Na_2O	2.5797
	P_2O_5	1.9471
	CaO	1.3100
	SO_3	0.9447
	Na_2O	0.8972
	TiO_2	0.7796
	MnO	0.2221
	BaO	0.0700
	ZnO	0.0360
	ZrO_2	0.0357
	SrO	0.0256
	Rb_2O	0.0157
	Cr_2O_3	0.0151
	NiO	0.0091
	CuO	0.0085

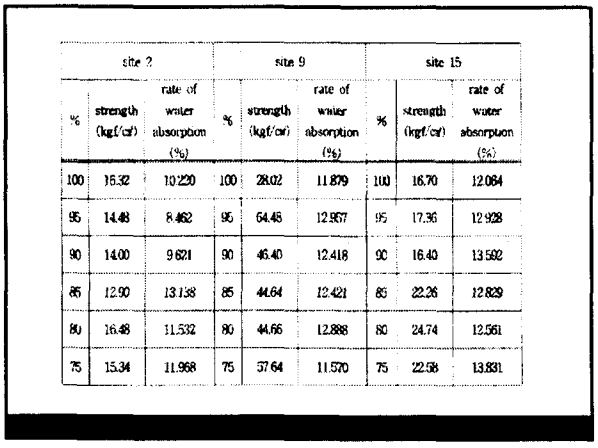
mesh	Containing material	Containing ratio (%)
140	SiO_2	59.0971
	Al_2O_3	21.5020
	Fe_2O_3	8.2318
	K_2O	2.6233
	MgO	2.5038
	P_2O_5	1.8706
	CaO	1.1561
	SO_3	0.9684
	Na_2O	0.8869
	TiO_2	0.7911
	MnO	0.2350
	BaO	0.0742
	ZnO	0.0392
	ZrO_2	0.0300
	SrO	0.0195
	Rb_2O	0.0164
	Cr_2O_3	0.0137
	CuO	0.0111
	NiO	0.0107

(unit: ppm)

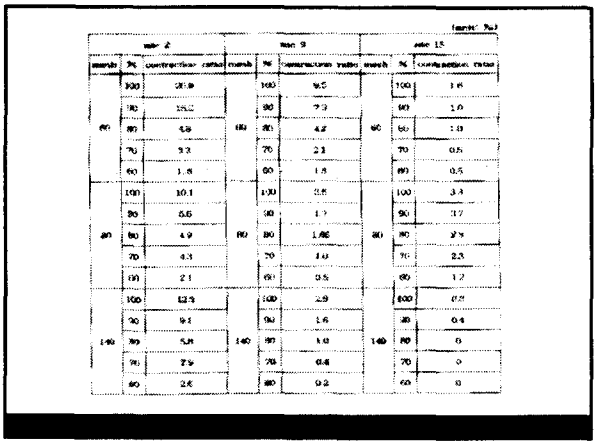
site	mesh	Cd	Cr	Cu	Pb	Zn
2	60	ND	72.00	502.300	2.525	236.500
	80	ND	138.30	54.050	44.235	225.540
	140	ND	72.15	121.870	48.385	238.300
9	60	ND	55.05	30.340	ND	139.445
	80	ND	38.60	35.415	ND	152.010
	140	ND	28.80	52.595	ND	187.805
15	60	ND	16.35	26.630	ND	145.560
	80	ND	25.90	35.400	3.435	151.025
	140	ND	44.56	45.160	3.625	171.270

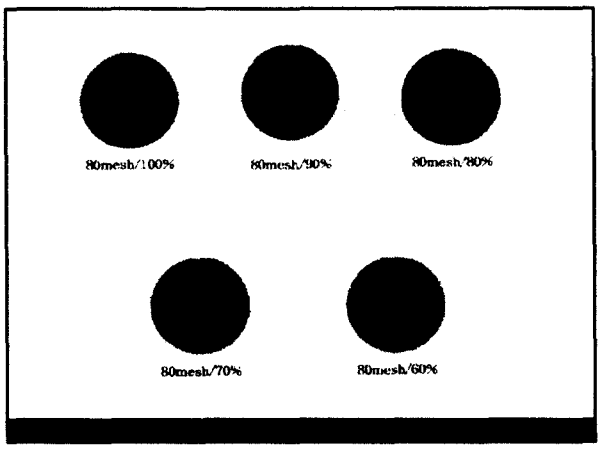


mesh	폐기물 함량 (%)	Pb	Cd	Cr	Cu	Zn
80	100	ND	ND	ND	ND	0.1021
	90	ND	ND	ND	ND	0.1173
	80	ND	ND	ND	ND	0.1173
	70	ND	ND	ND	ND	0.1196
	60	ND	ND	ND	ND	0.1258
90	100	ND	ND	ND	ND	ND
	90	ND	ND	ND	ND	ND
	80	ND	ND	ND	ND	ND
	70	ND	ND	ND	ND	ND
	60	ND	ND	ND	ND	ND
140	100	ND	ND	ND	ND	0.0460
	90	ND	ND	ND	ND	0.0638
	80	ND	ND	ND	ND	0.0935
	70	ND	ND	ND	ND	0.0937
	60	ND	ND	ND	ND	0.1044



site 2			site 9			site 15		
%	strength (kgf/cm²)	rate of water absorption (%)	%	strength (kgf/cm²)	rate of water absorption (%)	%	strength (kgf/cm²)	rate of water absorption (%)
100	16.32	10.220	100	28.02	11.879	100	16.70	12.064
95	14.48	8.462	95	64.46	12.957	95	17.96	12.928
90	14.00	9.621	90	46.40	12.418	90	16.40	13.592
85	12.90	13.158	85	44.64	12.421	85	22.26	12.829
80	16.48	11.532	80	44.66	12.888	80	24.74	12.561
75	15.34	11.968	75	57.64	11.570	75	22.58	13.831





2st Conclusion

Because of both water gates, deeperplace of water depth for structure of riverbed are generally more polluted.
So, it is necessary to dredge for clean stream.
But, there are some problem for treatment of dredged Sediment.
We proposed one method of stable treatment for polluted sediment. That is, Tiling, Blocking, ... etc(construction materials), of polluted sediment.