ISE 2018

International Symposium on Ecohydraulics

12th International Symposium on Ecohydraulics

Aug19~Aug24,2018,
Tokyo,JAPAN

Contents

Welcome message

Welcome to the 12th International Symposium on Ecohydraulics (ISE 2018), which will be held during August 19-24, 2018 in Tokyo, Japan. The symposium is jointly convened by the International Association for Hydro-Environment Engineering and Research (IAHR), and the International Society for River Science (ISRS). ISE 2018 brings together multi-disciplinary communities of researchers and professionals, as well as old and new friends from all over the world, in a relaxed atmosphere.

The objectives of ISE 2018 are to combine outstanding science and management of aquatic biota, e-flows, lake and river restoration, to produce innovation for environmental issues of our surrounding water in a rapidly changing world, and to share the knowledge and views of water related disaster protection.

The symposium will be held at a very convenient location in the Tokyo city center. The ISE 2018 participants will experience the joy of roaming around one of the most renovated cities in the world, just two years prior to the Olympic Games. The venue is Nihon University, located at a 15-minute walk from the Imperial Palace. All traditional sightseeing spots of Tokyo are easily accessible by frequent local trains from the symposium venue.

We are confident that you will enjoy several days of excitement and discovery, make new friends and business partners, and experience a magnificent feel of friendliness and traditional spirit of Japan.

Prof. Takashi Asaeda
Institute for Environmental Science,
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Special Session 32	**Title:** River Restoration Methodology contributing to the Formation of Ecological Network **Organizer(s):** Kenji Kanao (Chairperson of Asian River Restoration Network (ARRN), President of Japan Riverfront Research Center, Japan), Junjiro Negishi (International Exchange Committee, Ecology and Civil Engineering Society; Hokkaido University, Sapporo, Japan), Nobuyuki Tsuchiya (Japan River Restoration Network, Japan RiverFront research Center, Tokyo, Japan) **Keywords:** River restoration, ecological network, organisms'growing and breeding habitats, flood plain, regional collaboration, consensus building
Special Session 33	**Title:** Sustainable river basin management looking from institutional and cultural perspectives **Organizer(s):** Guangwei Huang (Professor, Graduate School of Global Environmental Studies, Sophia University, Japan) **Keywords:** Sustainability, water allocation, public participation, water culture, environmental justice
Special Session 34	**Title:** Wastewater treatment techniques by utilizing site-specific and low-cost materials in developing countries **Organizer(s):** Prof. Ken Kawamoto (Saitama University, Japan), Dr. Tran Thi Viet Nga (National University of Civil Engineering), Dr. Nguyen Hoang Giang (National University of Civil Engineering, Vietnam) **Keywords:** Wastewater treatment, Pollution control techniques, Site-specific materials, Solid waste landfills, Cost effectiveness, development countries
Special Session 35	**Title:** Physical, chemical, and biological processes of sediment and suspended particles in rivers, lakes, and oceans **Organizer(s):** Ryuichiro Shinohara (National Institute for Environmental Studies, Japan), Tetsunori Inoue (Port and Airport Research Institute (PARI), Japan), Eiichi Furusato (Graduate School of Science and Engineering, Saitama University, Japan) **Keywords:** sediment, suspended particles, field observation, laboratory experiment, numerical simulation
Special Session 37	**Title:** Management strategies of cyanobacterial blooms and secondary metabolites in lakes and reservoirs **Organizer(s):** Dr. H. Damitha Lakmali Abeynayaka (Saitama University, Japan) **Keywords:** Cyanobacteria, Odor formation, Toxin, lake management, environmental parameters, controlling, prediction

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Session Name		SS35: Physical, chemical, and biological processes of sediment and suspended particles	
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CONCENTRATION OF SOME HEAVY METAL IN WATER AND IN *EHYDRA FLUCTUANS* COLLECTED FROM CAU RIVER AT RIVER SECTION FROM SON CAM TO CAU TRA VUON

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Abstract:Water samples and Ehydra fluctuans samples were collected at 4 sites along Cau river from Son Cam to Cau Tra Vuon in dry seasons of 2016. 3 heavy metal concentration inside these samples conclude Fe, Pb, Zn was analyzed. Total metal concentration is determined by the method of atomic absorption spectroscopy (AAS). Heavy metal concentration in water has detected with high levels of Fe, Pb, Zn at 3 sites (Hoang Van Thu; Cau Gia Bay; Cau Tra Vuon) and the overall concentration of heavy metals showed the trend: Fe > Zn >Pb. Analyzing result prove Cau river water quality in this section not satisfy standard for aquaculture by both Vietnamese goverment standard also EPA standard. This result also prove Cau River basin - in Thai Nguyen province has received large amounts of iron, lead and zinc from waste water from the mining areas (specially Pb-Zn ore mining), Thai Nguyen Iron and Steel Industrial Park, Lu Xa metallurgical area,... These sources of waste directly pollute Cau River, partially change the Cau river water quality.

Analyzed results also indicate the correlation between iron, lead and zinc content in water and in plant tissues. The content of iron, lead and zinc in plant tissues is proportional to the iron and lead content in the river water environment. Analytical results also demonstrated that the high ability to absorb and accumulate iron and lead in roots, stems, leaves, especially in the roots of Ehydra fluctuans. This demonstrates the serious effects of heavy metal concentrations in the Cau River water for living organisms in using of Cau river water.

Keyword: Cau River, heavy metal, Ehydra fluctuans, bio-accumulation coefficient, plant tisue.

1. INTRODUCTION

Cau River originates from the southern tip of Phia Booc (1,578 m high) of Van On mountain in Phuong Vien Commune, Cho Don District, Bac Kan Town. The last of this river is in Pha Lai, Chi Linh, Hai Duong. Total length of Cau River is 288 km. Cau River basin is facing serious environmental challenges in Vietnam process of industrialization. Day by day, the more industrial plants and factories in the basin increase, the more industrial wastewater with higher pollutants are received by the Cau River. In many kinds of pollutants in these industrial wastewater, heavy metals interested more concern by scientists for its high toxicity to environment because of their typical accumulation potential, which can be enriched in the muscle through the food chain and in combination with organic substances in the process of conversion into more toxic substances. In recent decades, there have been a large number of studies evaluating the accumulation of heavy metals in river sediments in efforts to protect aquatic ecosystems and bottom animals [5], [15].

Ehydra fluctuans is cultivated free floating in river, lakes and ponds, or rooted in wet or moist soils at conditions similar to paddy rice [11]. *Ehydra fluctuans* are fed to livestock in many country such as Vietnam, Thailand, Philippine,…

This article presents assessment results of some heavy metal elements (Fe, Pb and Zn) in water and in *Ehydra fluctuans* collected from Cau river at study sites. These assessments help managers, scientists and the community have general information on the extent and risk of heavy metal contamination in water and plant to have the right solutions in environmental protection and management in the study area.

2. MATERIALS AND METHODS

Sampling sites were selected on the basis of field surveys and information on pollution sources. Use Mapinfo 15.0 and Coreldraw 10 software to represent the sampling map based on the actual sampling location coordinates. Water samples, surface sediments are taken at 4 points on Cau river from Son Cam site to Cau Tra Vuon (21 km length). Figure 1 shows the map of sampling location at Cau river. Table 1. presents water sampling sites and sampling purposes.

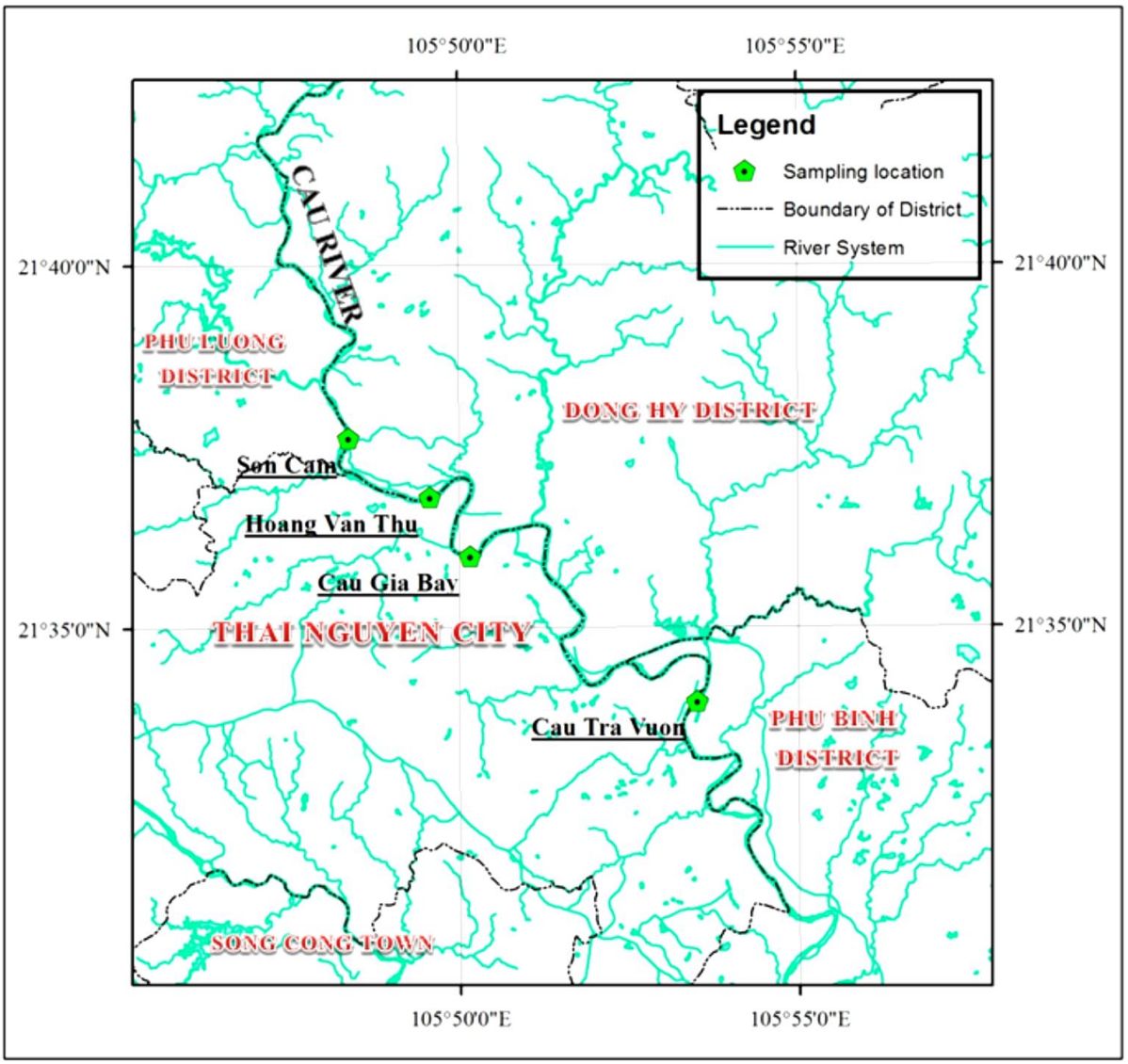

Fig 1. Sampling map at Cau river

Table 1. Water and plant sampling sites and sampling purposes

No	Study sites	Coordinates		Sampling purposes
		Latitude	Longitude	
1	Son Cam	21° 37' 37"	105° 48' 20"	Assessment of water quality of Cau river before flowing into Thai Nguyen city.
2	Hoang Van Thu	21° 36' 38"	105° 49' 37"	Assessment of water quality of Cau river after receiving wastewater from coal companies.
3	Cau Gia Bay	21° 35' 51"	105° 50' 14"	Assessment of water quality of Cau river after receiving wastewater from iron mines.
4.	Cau Tra Vuon	21° 33' 52"	105° 53' 38"	Assessment of water quality of Cau river after receiving wastewater from steel processing companies

The samples were taken in 11th November in 2016. After taken water samples were transported immediately to the laboratory, stored at 4^0C. Plant samples were cutting separately to different parts such as roots, stems, leaves, then dried for 48 h at 70 °C to get a constant weight. Dried samples were ground in a grinder to a fine powder. Samples were analyzed in the laboratory of Vietnam Academy of Science and Technology. Water temperature, pH, conductivity are measured on the spot using the WQC-24 / TOA water quality meter. Heavy metals Fe, Pb, Zn in water and plant samples were analyzed in the laboratory by flame atomic absorption spectrometry using Perkin Elme and follow the procedure of APHA, AWWA, and WEF [4].

3. RESULTS AND DISCUSSION

3.1. Heavy metal concentration in water

pH value of Cau river water in section river from Son Cam to Tra Vuon was at range of 7,5 ÷ 8,18; EC ranges from 0,182 ÷ 0,237 mS/cm. Total salt concentration of Cau River water at sampling sites was around 0,01%.

Heavy metals is a collective term which applies to the group of metals and metalloids with a atomic density greater than 4 g/cm^3 or 5 g/cm3 [9]. Heavy metal Fe, Pb, Zn in Cau River water is presented in Table 2. The overall results reveals that the Cau River is moderately polluted by some heavy metal.

Table 2. Heavy metal concentration in Cau River Water

No	Study sites	Water class	Heavy metals (μg.L^{-1})		
			Fe	Pb	Zn
1	Son Cam		890	8,0	79
2	Hoang Van Thu		2054	92	690
3	Cau Gia Bay		2700	56	1250
4	Cau Tra Vuon		2280	60	1080
EPA standards for surface water		2 class	1000	8,5	86
		4 class	1000	50	1000
		5 class	1000	50	1000
Vietnamese standards (for daily water supply)			1000	20	1000

Analyzed results show that the concentration of heavy metals in Cau river water at study sites varied markedly in other studied sites, tended to increase along the river section and the overall concentration of heavy metals in water showed the trend: Fe > Zn >Pb. At Son Cam site, heavy metal concentration meets class 2 of EPA standard and Vietnamese surface standard using for daily supply [12], 13]. While in other locations, the higher concentration of lead, iron, zinc was detected. Especially, analytical results revealed highest iron concentration (2700 μg/L^{-1}), highest zinc concentration (1250 μg/L^{-1}) at Cau Gia Bay site, with highest lead concentration 92 μg/L^{-1} at Hoang Van Thu sites. These high heavy metal concentration in water downgrade water quality of these sites to 5 class of EPA; Heavy metal contamination is not a modern problem arising out of industrialization - it began when humans started processing ores [8]. Since then the use of metals and their impacts on the environment have accelerated, with a major increase during the 19th and 20th centuries [3]. Generally, most of the heavy metals enter the river from different sources, it can be either natural by erosion and weathering and or anthropogenic. In view of the intense human activity, natural sources of heavy metals from leaching and weathering of rocks in the environment are usually of little importance. The most important anthropogenic sources of heavy metal are various industries and domestic sewage. The practice of discharging waste from industries and untreated domestic sewage into the aquatic ecosystem is continually going on that leads to the increase in concentration of heavy metals in river water [2]. Cau river water quality is not an exception. The reason for the degradation of water quality of Cau River water is due to wastewater of serious of lead slag factories from river basin, from the mining areas (specially Pb-Zn ore mining), Thai Nguyen Iron and

Steel Industrial Park, Lu Xa metallurgical area,... discharge directly into Cau river. These sources of waste directly pollute Cau River, partially change the quality of Cau river water quality.

3.2. Heavy metal in plant tissues

Analyzed results show that the content of heavy metals in *Ehydra fluctuans* samples of Cau river also tended overall content of heavy metals in water showed the trend: Fe >Pb> Zn. Samples of *Ehydra fluctuans* contained remarkable iron, lead and zinc content. However, while samples collected at Son Cam contained a very small of these heavy metal, samples collected at Hoang Van Thu, Cau Tra Vuon, Cau Gia Bay contained higher many times of heavy metal. Iron content in *Ehydra fluctuans* tissue were in a range of 17 ÷79 $\mu g.g^{-1}$ DW at leaves, got highest value 79 $\mu g.g^{-1}$ DW at Cau Gia Bay site, lowest value at Son cam site; Iron content in stem and root tissue were also higher many times at Hoang van Thu, Cau Gia Bay, Cau Tra Vuon compare to this heavy content at samples collected from Son cam. Lead content in leaf, stem, and root of *Ehydra fluctuans* were found in range of 0,4 ÷ 9 $\mu g.g^{-1}$ DW, 10 ÷ 39 $\mu g.g^{-1}$ DW, 7,6÷9,2$\mu g.g^{-1}$ DW, 22,3 ÷ 68,5 $\mu g.g^{-1}$ DW respectively. This indicates the correlation between iron, lead and zinc content in water and in plant tissues. This prove plants may accumulate both essential and non-essential elements at concentrations which are not phytotoxic but constitute a health risk for consumers [2]. The analyzed results also reveal that the heavy metal content in plant tissue is largely directly proportional to the heavy metal concentration in the river medium. When the lead in the medium was higher, the lead accumulated in plant tissue also almost exactly higher, especially the lead accumulated in root tissue. However, no such double-increasing pattern of heavy metal content is observed in the cases of stem and leaf. Thus, heavy metal content in the roots is more closely related to heavy metal in medium than in stems and leaves. The important factors determining heavy metal distribution in different plant tissues may lie in heavy metal translocation process in plant.

Table 2. Heavy metal content in *Ehydra fluctuans* tissues collected from Cau River

Study site	Iron content in *Ehydra fluctuans* ($\mu g.g^{-1}$)			Lead content in *Ehydra fluctuans* ($\mu g.g^{-1}$)			Zinc content in *Ehydra fluctuans* ($\mu g.g^{-1}$)		
	Leaf	Stem	Root	Leaf	Stem	Root	Leaf	Stem	Root
Son Cam	17	56	89	0,4	10	50	3,2	7,6	22,3
Hoang Van Thu	68	700	688	9	25	160	7,4	9,2	54,1
Cau Gia Bay	79	942	951	7	29	140	6,7	8,9	68,5
Cau Tra Vuon	73	986	1023	8	39	98	7,0	8,6	66,9

P. E. Holm et al (2003) also stated that the production of foods in aquatic systems using wastewater or other types of low quality water represents several risks to human health [10]. Pb has no known biological function, but is toxic elements [2]. Iron and zinc are essential elements for organisms but at low levels. At high levels, these heavy metals also harm living organisms causing health problems [7]. Heavy metals are not readily degradable in nature and accumulate in the organisms to a very high toxic amount leading to undesirable effects beyond a certain limit [3]. High concentration of lead concentration will be a threat to the lives of individuals living in Cau River as well as bring about potential risks to the use of Cau River water for daily supply water, to irrigate the fields and agriculture and aquaculture basins in the future because economic development will increase the volume of wastewater and the concentration of these metals without more stringent control.

CONCLUSIONS

Analyzed result prove Cau river water quality in river section from Hoang Van Thu to Cau Tra Vuon not satisfy standard for aquaculture by both Vietnamese goverment standard also EPA standard due to receiving large amounts of iron, lead, zinc from waste water from the mining areas, Thai Nguyen Iron and Steel Industrial Park, Lu Xa metallurgical area,... These sources of waste directly pollute Cau River, partially change Cau river water quality.

Analyzed results also indicate the correlation between iron, lead and zinc content in water and in plant tissues. The content of iron, lead and zinc in plant tissues is proportional to the iron and lead content in the river

water environment. Analytical results also demonstrated that the high ability to absorb and accumulate iron, lead and zinc in roots, stems, leaves, especially in the roots of *Ehydra fluctuans*. This demonstrates the serious effects of heavy metal concentrations in the Cau River water for living organisms in using of Cau river water.

It is therefore recommended that the National Environmental Protection Agency and other relevant government agencies should ensure monitoring regularly the river and put in place measures to regulate for dumping of domestic waste and discharging untreated industrial effluents into the river.

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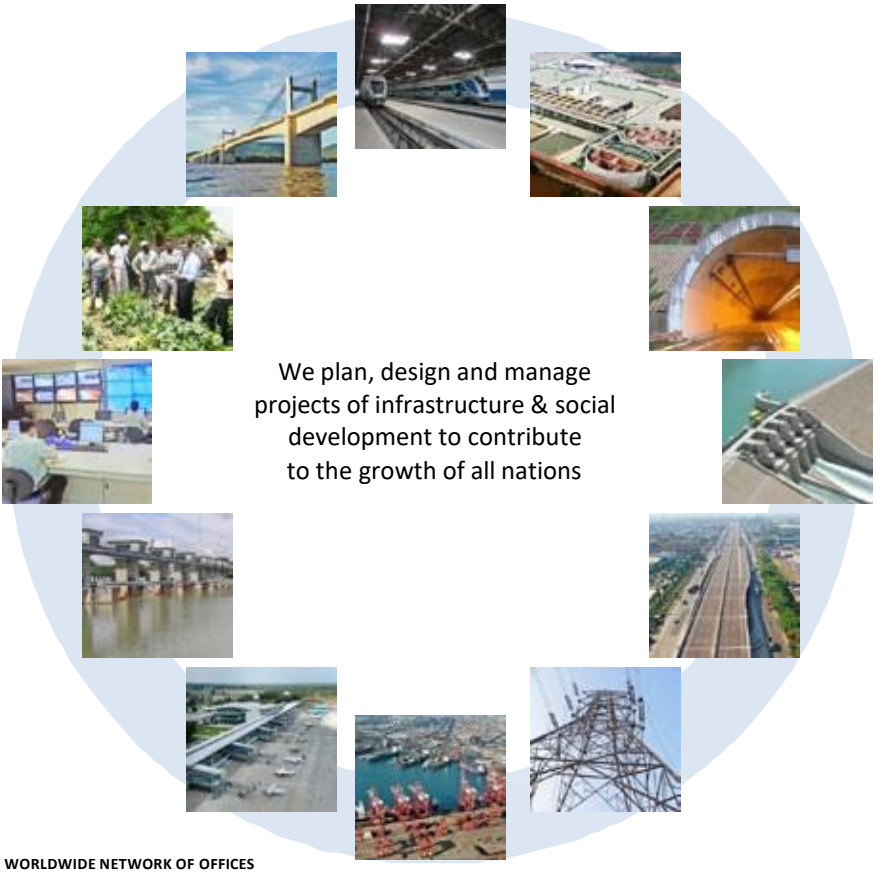

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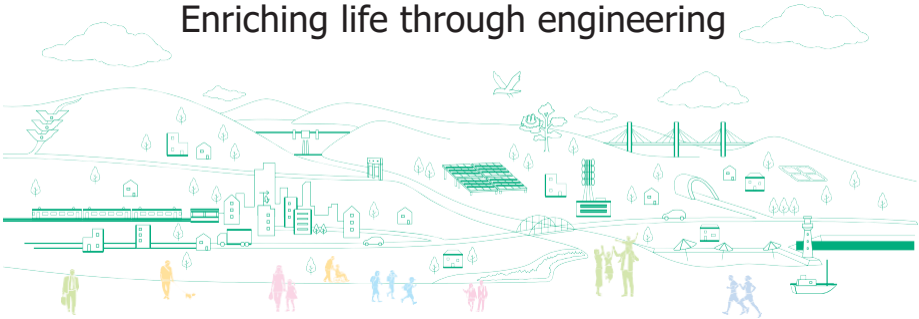

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