



Reporter: Nguyen Thi Hue

The Present State of Water Environment in Vietnam



2nd WEPA forum, 2007



Content

General introduction

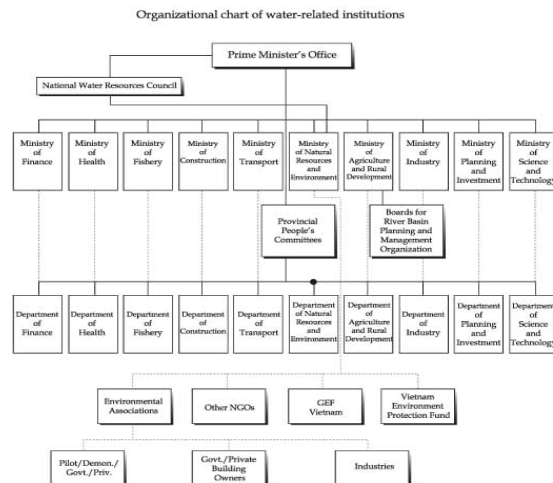
Part 1. Surface water and
groundwater quality

Part 2. Activities of Water
Environmental Protection in
Institute of Environmental
Technology (IET)

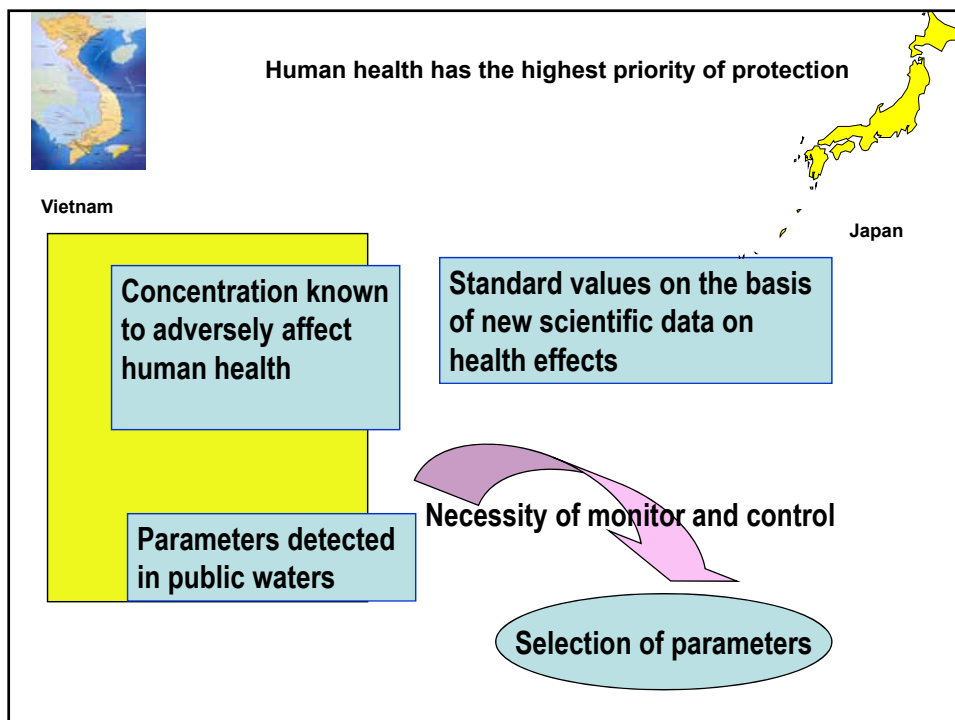


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Organization Chart: The water environment administrative structure in Viet Nam



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Water Classification and Standards

Vietnam has an extensive set of Water Quality Classifications and Standards:

- **Class A:** water resources which meet the value in the column A of Vietnamese standards can be used for domestic water supply with appropriate treatment.
- **Class B:** water resources which meet the value in the column B of Vietnamese standards can be used for other purposes such as agriculture and aquaculture purposes.



Ambient standards. The standards prescribe three types of water quality standards. For a) Surface Water Quality, b) Coastal Water Quality, and c) Groundwater Quality.

The standards below are shown only for parameters used in this report.

TCVN 5942: 1995: Surface water quality Standard

Parameter	Unit	Class A	Class B
pH			
COD	mg/l	6-8.5	5.5-9
BOD5	mg/l	<10	<35
NO3	mg/l	<4	<25
NH4-N	mg/l	10	15
Dissolved Oxygen	mg/l	0.05	1.0
SS	mg/l	>6	>2
Coliform	MPN/100 ml	20	80
		5000	10,000

TCVN 5943: 1995: Coastal Water Quality Standard

Parameter	Unit	Beach	Aqua-culture	Other places
BOD	mg/l	<20	<10	<20
Oil	mg/l	Nil	Nil	0.3
Coliform	MPN/100 ml	1000	1000	1000

Standards suggested at National Conference on Coastal Environment Monitoring in 1998 within framework of a National Research Program.

Phosphate	10 µg/l
Nitrate	50 µg/l
COD	30 – 40 mg/l

TCVN 5944: 1995: Water Quality - Ground water quality standard.

Parameter	Unit	Limits
Arsenic	mg/l	0.05
Chloride	mg/l	200 – 600
Nitrate	mg/l	45
Fe	mg/l	1 – 5
Coliform	MPN/100 ml	3

Effluent Standards: Standards are prescribed for Industrial Wastewater and for Domestic Wastewater. The standards are adapted to consider the type and use of the receiving aquatic system.

TCVN 5945: 1995: Industrial Waste Water - Discharge Standards.

TCVN 6772: 2000: Water Quality - Domestic wastewater standards.

TCVN 6773: 2000: Water Quality - Water quality guidelines for irrigation.

TCVN 6774: 2000: Water Quality - Freshwater quality guidelines for protection of aquatic sites.

TCVN 6980: 2001: Water Quality - Standards for industrial effluents discharged into rivers used for domestic water supply.

TCVN 6981: 2001: Water Quality - Standards for industrial effluents discharged into lakes used for domestic water supply.

TCVN 6982: 2001: Water Quality - Standards for industrial effluents discharged into rivers used for water sports and recreation.

TCVN 6983: 2001: Water Quality Standards for industrial effluents discharged into lakes used for water sports and recreation.

TCVN 6984: 2001: Water Quality - Standards for industrial effluents discharged into rivers used for protection of aquatic life.

TCVN 6985: 2001: Water Quality - Standards for industrial effluents discharged into lakes used for protection of aquatic life.

TCVN 6986: 2001: Water Quality - Standards for industrial effluents discharged into coastal waters used for protection of aquatic life.

TCVN 6987: 2001: Water Quality Standards for industrial effluents discharged into coastal waters used for water sports and entertainments.

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General introduction

Vietnam has a dense river network-2360 rivers with a length of more than 10 km. All the rivers traversing Vietnam provide an abundant supply of water (255 bill. cubic meter annually).

Inadequate physical infrastructure and financial capacity results in a low utilization of only 53 bill. m³ per year.

In addition, the uneven distribution across Vietnam of the average annual rainfall of 1,960 mm and the prolonged dry season result in serious shortages of water in many areas.



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General introduction

- Many rivers are choked with contamination and untreated waste from craft villages and industrial production zones.
- Most of the monitored rivers are found to be polluted with substances like N and P, from 4 to nearly 200 fold compared with water resource of type A in and from 2 to 20 times in comparison with water source of type B in VN Std limit.

- 20% of the old industrial enterprises have renovated and modernized their production technologies.
- 90% of the old enterprises do not have any wastewater treatment system and most of the old industrial zones do not have a central wastewater treatment plant.
- Wastewater is directly discharged into lake/pond and river, causing serious pollution of surface water environment.



Rivers (Tolich, Kimnguu, Nhue) contain a high concentration of COD, NO₂⁻, NO₃⁻ and SS

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General introduction

- Law on water resources was enacted and came into force (1st Jan.1999)
- Law had not been implemented in direct contact with enterprises/companies, which the cause of pollution



- The polluted water resource not only affect the present generation but also future generations.



The situation continues, fish and other creatures will die and become extinct causing irreversible damage to Vietnam's ecological system.

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Vietnamese Academy of Science & Technology



Part 1

Surface water and groundwater quality



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**Parameter Limits and Maximum Allowable Concentration of Pollutants
in Surface Water (TCVN 5942-1995)**

N°	Parameter and Substance	Unit	Limitation Value		N°	Parameter and Substance	Unit	Limitation Value	
			A	B				A	B
1	pH value	--	6 - 8,5	5,5 - 9	17	Mercury	mg/l	0,001	0,002
2	BOD ₅ (20°C)	mg/l	<4	<25	18	Tin	mg/l	1	2
3	COD	mg/l	<10	<35	19	Ammonia (as N)	mg/l	0,05	1
4	Dissolved oxygen	mg/l	≥ 6	≥ 2	20	Fluoride	mg/l	1	1,5
5	Suspended solids	mg/l	20	80	21	Nitrate (as N)	mg/l	10	15
6	Arsen	mg/l	0,05	0,1	22	Nitrite (as N)	mg/l	0,01	0,05
7	Barium	mg/l	1	4	23	Cyanide	mg/l	0,01	0,05
8	Cadmium	mg/l	0,01	0,02	24	Phenol compounds	mg/l	0,001	0,02
9	Lead	mg/l	0,05	0,1	25	Oil and grease	mg/l	not detectable	0,3
10	Chromium, Hexavalent	mg/l	0,05	0,05	26	Detergent	mg/l	0,5	0,5
11	Chromium, Trivalent	mg/l	0,1	1	27	Coliform	MPN/100 ml	5000	10000
12	Copper	mg/l	0,1	1	28	Total pesticides (except DDT)	mg/l	0,15	0,15
13	Zinc	mg/l	1	2	29	DDT	mg/l	0,01	0,01
14	Manganese	mg/l	0,1	0,8	30	Gross alpha activity	Bq/l	0,1	0,1
15	Nickel	mg/l	0,1	1	31	Gross beta activity	Bq/l	1,0	1,0
16	Iron	mg/l	1	2					

**Parameter Limits and Maximum Allowable Concentration of Pollutants
in Surface Water (TCVN 5942-1995)**

Note

Values in the column A are applied to the surface water using for source of domestic water supply with appropriate treatments.

Values in the column B are applied to the surface water using for the purposes other than domestic water supply. Quality criteria of water for aquatic life are specified in a separate standard.



Parameter Limits and Maximum Allowable Concentration of Pollutants in domestic water supply (TCVN 5502: 2003) (34 parameters)

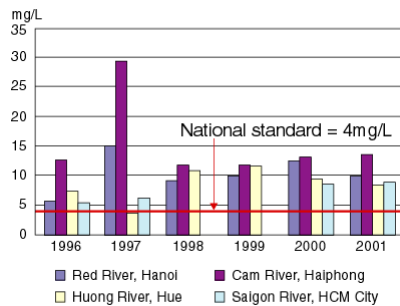
No	Parameter and substance	Unit	(TCVN 5502:2003)	No	Parameter and substance	Unit	(TCVN 5502:2003)
1	Color	mg/l Pt	15	18	Manganese	mg/l	0.5
2	Smelt	-	None	19	Al	mg/l	0.5
3	Turbidity	NTU	5	20	NO ₃ ⁻	mg/l	10.0
4	pH	-	6+8.5	21	NO ₂ ⁻	mg/l	1.0
5	Hardness (as CaCO ₃)	mg/l	300	22	Total Fe	mg/l	0.5
6	DO	mg/l	6	23	Mercury	mg/l	0.001
7	TDS	mg/l	1000	24	Cyanide	mg/l	0.07
8	Ammonia (as N)	mg/l	3	25	Detergent(LAS)	mg/l	0.5
9	Arsenic	mg/l	0.01	26	Benzen	mg/l	0.01
10	Sb	mg/l	0.005	27	Phenols	mg/l	0.01
11	Cl ⁻	mg/l	250	28	Mineral oil and fat	mg/l	0.1
12	Lead	mg/l	0.01	29	Organochloride Pesticide	mg/l	0.01
13	Chromium	mg/l	0.5	30	Photphorus Pesticide	mg/l	0.1
14	Copper	mg/l	1.0	31	Coliform	MPN/100ml	2
15	F ⁻	mg/l	0.7+1.5	32	Fecal Coliform	MPN/100ml	0
16	Zinc	mg/l	3.0	33	Gross alpha activity	pCi/l	3
17	H ₂ S	mg/l	0.05	34	Manganese	mg/l	0.5

Parameter Limits and Maximum Allowable Concentrations of Pollutants in Ground Water(TCVN 5944-1995) (22 parameters)

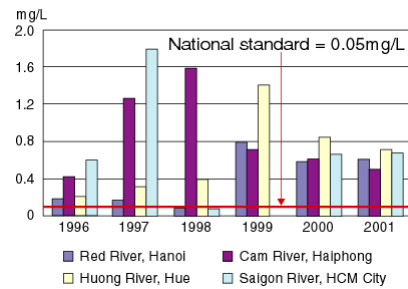
N°	Parameter and Pollutant	Unit	Limitation Value	No	Parameter and Pollutant	Unit	Limitation Value
1	pH value		6,5 - 8,5	12	Fluoride	mg/l	1,0
2	Colour	Pt - Co	5 - 50	13	Zink	mg/l	5,0
3	Hardness (as CaCO ₃)	mg/l	300 - 500	14	Manganese	mg/l	0,1 - 0,5
4	Total solids	mg/l	750 - 1500	15	Nitrate	mg/l	45
5	Arsenic	mg/l	0,05	16	Phenol compound	mg/l	0,001
6	Cadmium	mg/l	0,01	17	Iron	mg/l	1 - 5
7	Chloride	mg/l	200 - 600	18	Sulphate	mg/l	200 , 400
8	Lead	mg/l	0,05	19	Mercury	mg/l	0,001
9	Chromium (VI)	mg/l	0,05	20	Selenium	mg/l	0,01
10	Cyanide	mg/l	0,01	21	Fecal coli	MPN/100 ml	Not detectable
11	Copper	mg/l	1,0	22	Coliform	MPN/100 ml	3

Surface water quality (River)

The monitored data for 4 rivers running the main urban of Vietnam: **Red river** (Hanoi), **Cam River** (Haiphong), **Huong River** (Hue) and **Saigon River** (HCM City)



BOD₅ concentration in 4 rivers



NH₄ concentration in 4 rivers

Source: NEA, SOE reports 1997-2002

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Surface water quality (River)

Northern Vietnam :
The Cau, Nhue and Day rivers are seriously polluted.
Water in the Cau river contains many dangerous pollutants including industrial lubricants.
Waste products dumped in rivers affect natural levels of bacteria and nutrients and biochemical reactions occur
Tolich, Kimnguu, Nhue are also containing very high concentration of COD, NO₂⁻, NO₃⁻ and SS.



BOD, COD, P, N: 2-3 times higher than VNese Std limits

Southern Vietnam :
Sai Gon, Vam Co Dong rivers :
4,000 enterprises discharging wastewater, of which 439 enterprises are the most serious, and are required reallocated.
Dong Nai, Thi Vai and Saigon Rivers each day are accepted 137,000 m³ of wastewater from factories (93 tons of waste).
By 2010, waste in the Dong Nai river will increase by 1.7 times compared with 2007

Source: MONRE, 2007

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Surface water quality (lake and reservoir)

Vietnam :

3600 reservoirs of various sizes (15 % is large / medium, capacity: 1 mill. m³ with a height of more than 10 m)(West Lake, Babe).



Hoankiem Lake, Hanoi



West lake sampling

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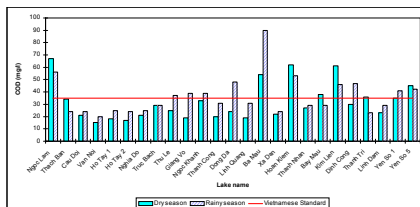
Surface water quality (lake and reservoir)

Hanoi Lakes :

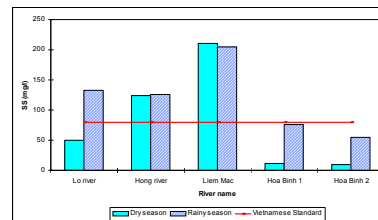
Most of the lakes in Hanoi are seriously polluted with high BOD levels.
25 lakes and 5 rivers were surveyed for two seasons (March, August, 2005).



COD's values, which are approximately 24% in dry season and 44% in rainy season, are over VNese Std for the 25 lakes



The value of COD in dry and rainy season



The value of SS in dry and rainy season

Source: IET,ALMEC corp., 2005

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Surface water quality (lake and reservoir)

Water Quality in Urban Rivers, Lakes, and Canals

River/Lake /Canal	SS (mg/l)	BOD (mg/l)	COD (mg/l)	DO (mg/l)
Kim Nguu (Hanoi)	150-220	50-140		0.5-1.0
Set (Hanoi)	150-200	110-180		0.2-0.5
Lu (Hanoi)	150-300	60-120		0.5-1.5
To Lich (Hanoi)	60-350	14-120		0.5-7.9
Lakes Hanoi	100-150	15-45		0.5-2.0
Lakes Hai Phong	47-205	15-67	15-105	0.5-7.0
Sluice gates Hai Phong		60-390	80-500	<1.0
TCVN 5942 (Class B)	80	<25	<35	>2



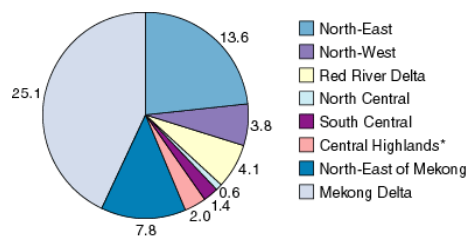
Source: MOSTE

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Ground water quality

VN groundwater resources are abundant with the total potential exploitable reserves of the country's aquifers estimated at nearly 60 billion m³ per year.

However, despite the abundance of groundwater reserves, less than 5% of the total reserves are exploited for the country as a whole.



Exploitable Groundwater Bill. m³/year

Source: MONRE report 2006

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Ground water quality

The results showed that:

Hanoi:

A broad survey of arsenic pollution in the 12 provinces of the Red River Delta, Mekong Delta and Central area was carried out from Nov. 2003 to Apr. 2004 by IET and UNICEF.

Total: 12,439 water samples were tested with arsenic in 419 communes of 33 districts in the 12 provinces



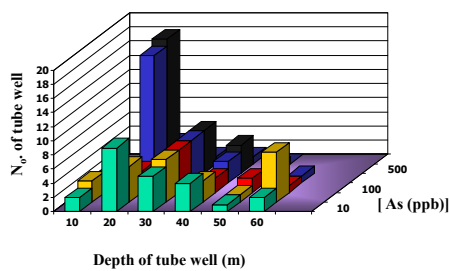
34.92% and 21.07 % of tube wells found with arsenic higher than 0.01 mg/l and 0.05 mg/l

Especially some communes in Ha Nam province, the tube wells water was a high arsenic level like Vinh Tru, Binh Luc, Duy Tien, Kim Bang communes (there are 52.46 % and 35.16 % of tube wells found with arsenic higher than 0.01 mg/l and 0.05 mg/l, respectively).

3 provinces in Mekong, in spite of that the number of field test was still limited, a remarkable number of water samples was found with high arsenic in Dong Thap province (39.15% tube wells found with arsenic higher than 0.05 mg/l).

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Ground water quality

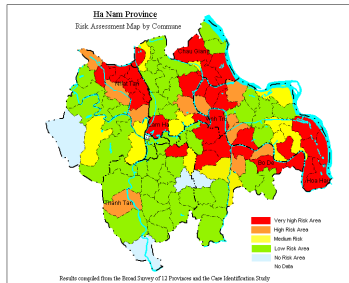


Arsenic concentration and the depth of tube wells

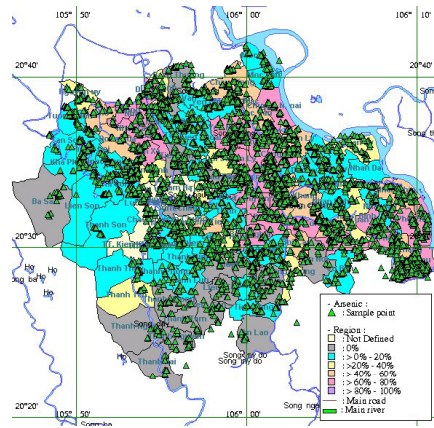
Depth of tube well (m)	10	20	30	40	50	60
As concentration (ppb)						
≤10	2	9	5	4	1	2
11-50	3	5	6	3	1	7
51-100	2	3	6	2	2	1
101-200	1	18	6	3		
201-500		19	6	4		
>500		3	1	1		
Total	8	57	30	17	4	11

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Ground water quality



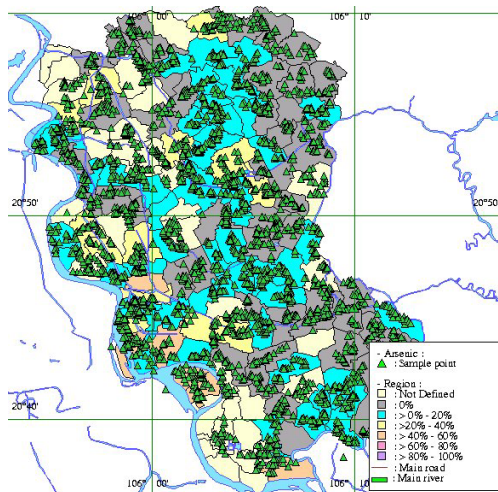
As Risk Map of Ha Nam



The delineation map of arsenic contamination risk prediction in Ha Nam province

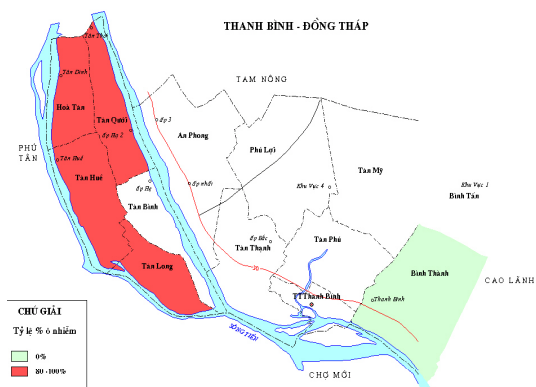
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Ground water quality



The delineation map of arsenic contamination risk prediction in Hung Yen province

Ground water quality



The delineation map of arsenic contamination risk prediction in Dong Thap Province

Consolidated Data

Preliminary Results of the 12 Province Random Survey									
#	Province	Number of Communes	Number of Tests	Arsenic Concentration (mg/l)					
				0 - 0.01	>0.01- 0.05	> 0.05 - 0.1	> 0.1- 0.2	> 0.2- 0.5	> 0.5
1	Thai Nguyen	10	240	233	5	2	0	0	0
2	Quang Ninh	10	240	235	5	0	0	0	0
3	Ha Tay	57	1,368	728	307	230	60	41	2
4	Hai Duong	20	480	446	31	3	0	0	0
5	Hung Yen	141	3,384	2,684	390	156	76	58	20
6	Nam Dinh	20	480	341	45	31	27	35	1
7	Ha Nam	111	5,080	2415	879	795	463	504	24
8	Hue	10	240	234	5	1	0	0	0
9	HCM	10	240	240	0	0	0	0	0
10	Long an	10	235	235	0	0	0	0	0
11	Dong Thap	10	212	124	5	6	27	41	9
12	An Giang	10	240	179	51	8	1	1	0
Total		419	12,439	8,094	1,723	1,232	654	680	56
In %			100	65.08	13.85	9.9	5.25	5.47	0.45

Part 2: Activities of Water Environmental Protection in IET

**Institute of Environmental
Technology (IET)**

Web: www.iet.ac.vn

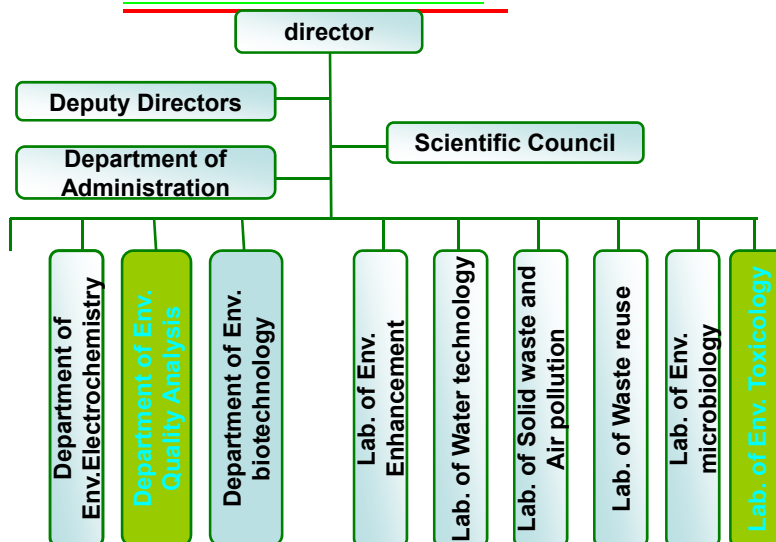


**Vietnamese Academy of Science
and Technology (VAST)**



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Organization Chart: Institute of Environmental Technology

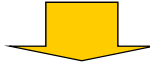


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Part 2: Activities of Water Environmental Protection in IET



1-11-2003



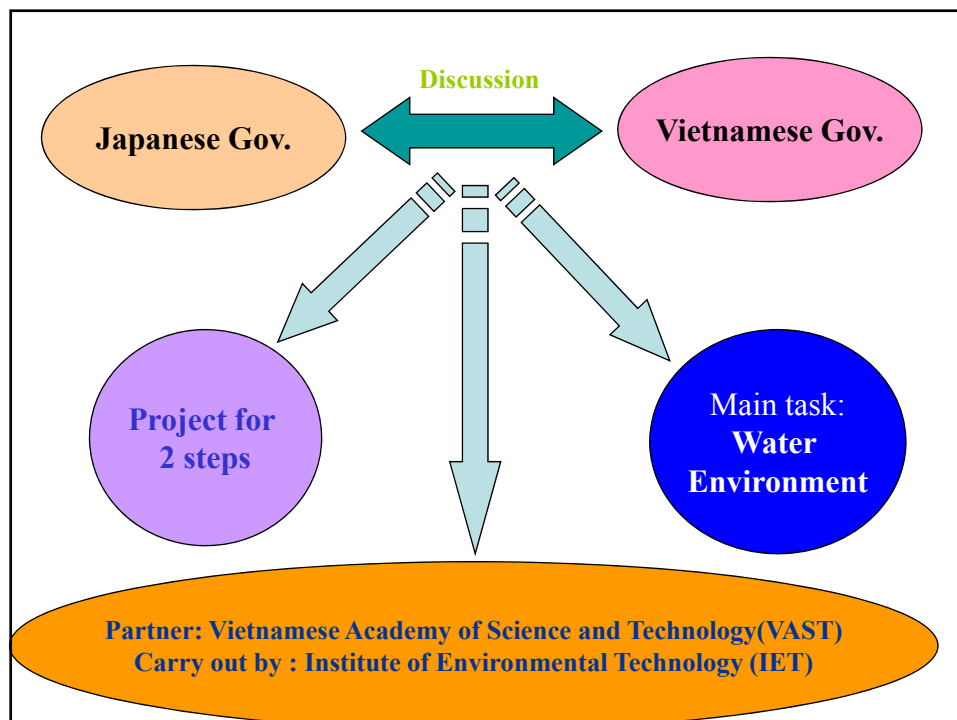
31-10-2006

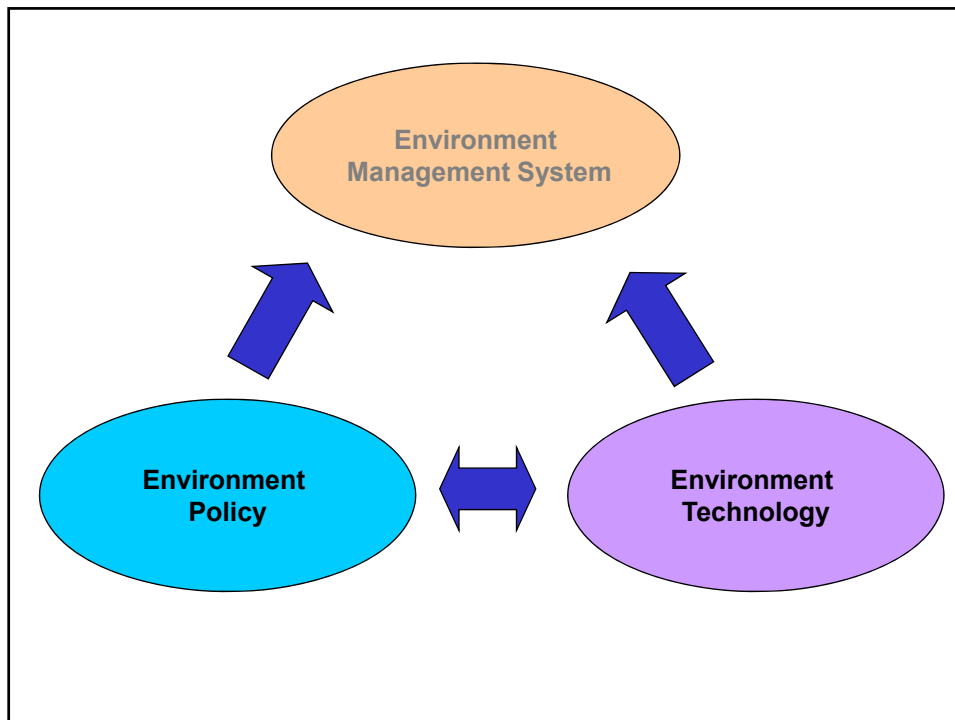


31-12-2010

JICA - VAST project

Enhancing capacity of VAST in water environmental protection



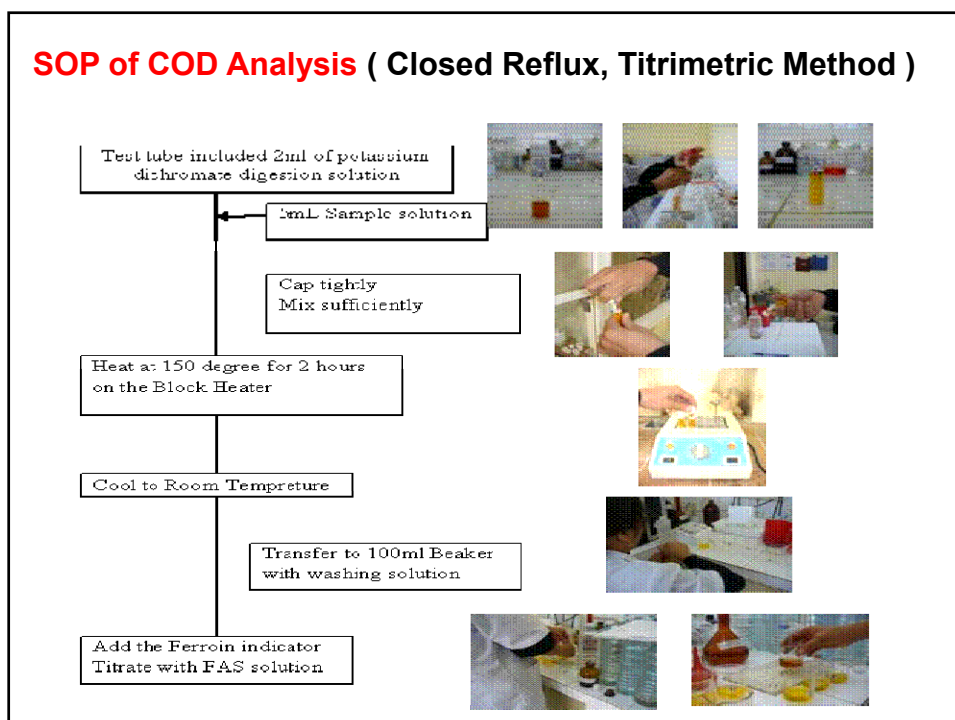
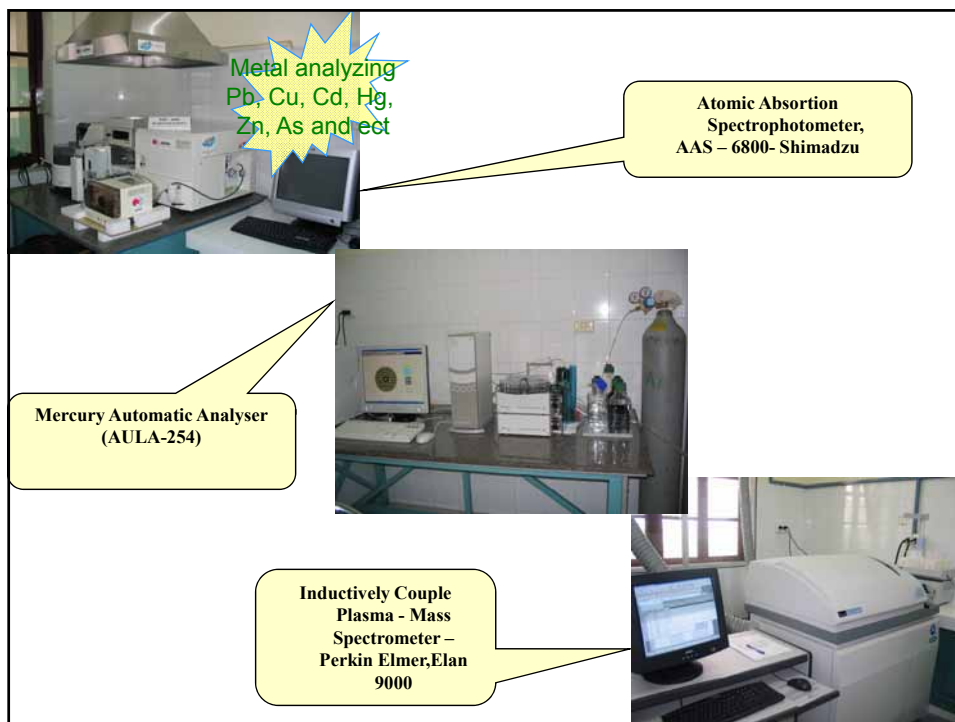


Part 2: Activities of Water Environmental Protection in IET

1. Transfer technologies on water quality monitoring and analysis

- Develop the manual for water quality monitoring
- Develop Standard Operation Procedure (S.O.P) on water quality analysis relevant to water quality standards
- Recommend appropriate monitoring procedure to relevant government organizations through the process of collecting and assessing data from some pilot state water monitoring stations





SOP of Hg analysis using AULA-254 Analyzer

Preparation of Reagents

Rinsing Solution

Oxidant (KMnO_4)

Reductant (NH_3OHCl)

Reductant (SnCl_2)

Hg calibration standard solutions

Carrier gas (Argon 99.998%)

Drain tank solution (Na_2CO_3)



Starting the AULA-254 System

Switch on the PC

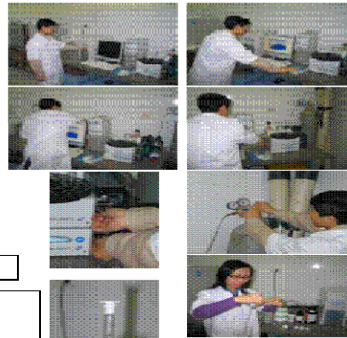
Turn on individual power switches of Photometer, of the autosampler, and ASD unit.

Turn on the power switch of the socket board

Apply the Carrier gas

Set the samples on the turntable of ASD

1. Water Blank
- 2 - 7. Calibration Hg Standards
8. Water



Part 2: Activities of Water Environmental Protection in IET

2. Transfer technologies on wastewater treatment

- Improve wastewater treatment system in VAST by its researchers.
- Advise concerned Vietnamese authorities on suitable technologies for wastewater treatment
- Collect information of advanced or suitable technologies on wastewater treatment





Flotation tester



A₂₀ process device



Aerobic fluidized bed reactor



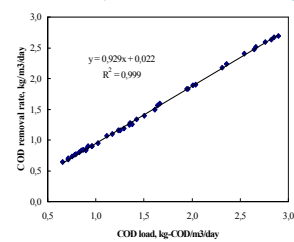
Ozonation reactor



Simultaneous removal of organic matters and nitrogen



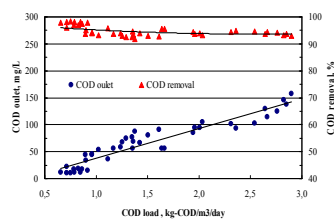
Removal of organic pollutants from textile wastewater by contact oxidation process



Relation between COD load and COD removal rate



Treatment of beery wastewater by activated sludge process



Relation between COD load and COD removal



Treatment of beery wastewater by UASB process

Part 2: Activities of Water Environmental Protection in IET

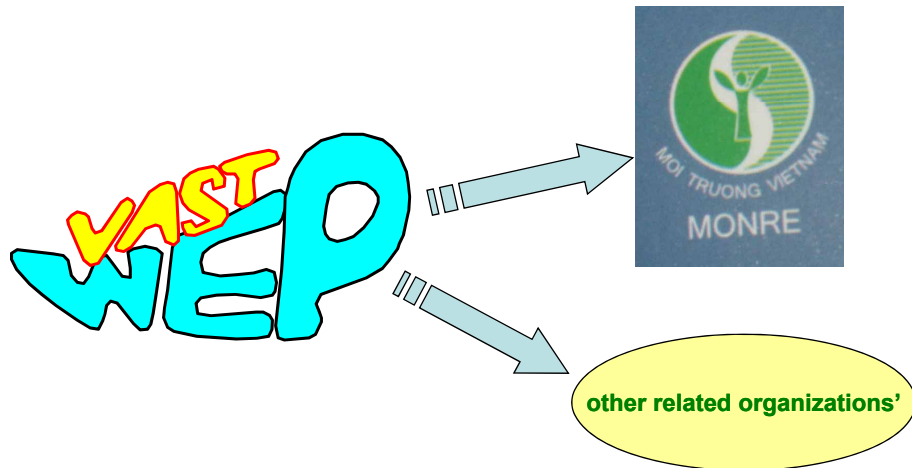


3. Train VAST (IET) staff members in conducting training courses on water environment protection

Conduct training courses for central and local organizations on water environment management, water quality monitoring and analysis, and wastewater treatment technologies

Conduct seminars on water environment protection in Vietnam

4. Contribute to MONRE's and other related organizations' activities of water environment protection



Managements, local officials, universities, institutes, ect

4. Contribute to MONRE's and other related organizations' activities of water environment protection:

1. **Thach Son project**
2. **VN standard**
3. **Monitoring on:**

Thang Long Park Industrial (TLIP): Monitoring industrial environment in TLIP (wastewater, surface water, ground water, tap water, ...) from 2003 to now.

Nui Phao Mineral Processing and Exploiting Joint Stock Company: Analyzing of water quality in mines in Thai Nguyen province.

Institute of Mineral and Geology Research: Analyzing of ground water in Cao Bang, Bac Kan, Ha Giang, ... provinces.

Informatics Develop Company: Analyzing of waste, ground, surface and drinking water in coal mines in Quang Ninh province.

5. Other outputs based on WEP

UNICEF project on Random survey on Arsenic contamination in ground water in 12 provinces in Vietnam.(Cooperation with MONRE and MARD)

With Hanoi Donre, MONRE: AEI (Ass. Envir, Impact of Joint Compañnies TL park, Goshi, Toyota etc..)

Cooperation with Ministries MOI, MOH, MARK...

MONRE project on As and NH_4^+ contamination in domestic potable water.

Minh Khai textile company wastewater treatment

Huong Sen Beer company wastewater treatment

Son La hospital waste water treatment etc...

5.1. Improving wastewater treatment system in VAST

Construction of wastewater treatment facility (300 m³/day) (March, 2006)



Development of lab. waste liquid management system



5.2. Training and seminar

Seminar:

- Treatment of laboratory wastewater containing toxic chemicals: March 12th, 2005.
- Several seminars on water quality monitoring and analysis, and wastewater treatment technology for IET researchers

Working and studying on JICA Projects Equipments

for Master , graduated students from
- Hanoi Univ. of Sciences
- Hanoi Univ. of Technology
- Phuong Dong Univ.

2004-2005: 12 Master students
8 graduated students
20056-2006 (studying) : 6 masters students
8 grad. Students



**Training course on water quality
monitoring and analysis**
Hanoi, December, 5 - 9 (26 participants)

Seminars:

**March 4th, 2004 (30
participants)**



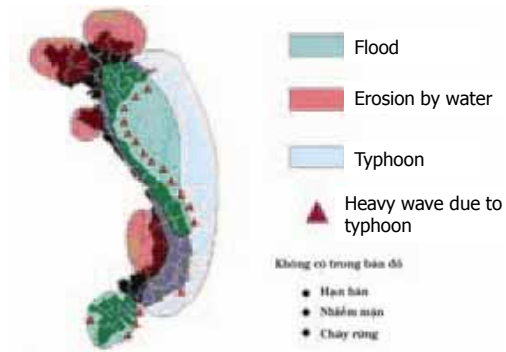
**December 4th, 2004 - Water
Environment Toxicology
seminar (60 participants)**



Current Policies and laws on Environment of Vietnam

<p>National Law on Environmental Protection (December 27, 1993 and Decree No 175/CP of the Government dated October 18, 1994 on guidance implementation Law on Environmental Protection. Law of Land (July 14, 1993; amended 2001).</p> <p>Law on Water Resources (May 20, 1998) and Decree 179/1999/ ND-CP of July 10, 1999 on implementing the Law on Water Resources.</p> <p>Law on Fishery resources (expected to be approved at the coming National Assembly Session in October 2003).</p> <p>Ordinance on Development and Protection Aquatic resources (1989).</p> <p>Ordinance on prevention, combat against floods and typhoons (1993) and Ordinance on Supplement and amendment ordinance on prevention, combat against floods and typhoons (2000).</p> <p>Decree No 26/Cp of the Government dated April 26, 1996 on administrative fines for violation of environmental protection.</p> <p>Decree No 49/ND-CP/1998 dated July 13, 1998 on issuing Regulation of fishery activities of foreigners and foreign boats in Vietnam's areas.</p> <p>Decree No 91/2002 dated November 11, 2002 on the Mandate, Organization and Functions of MONRE.</p> <p>Decree No 43/ND-CP/2003 dated May 2, 2003 on Mandate, Organization and Functions of MOFish.</p> <p>Decree No 67/2003 dated June 13, 2003 on Fees for wastewater.</p> <p>Decree No 70 -CP of the Government dated June 17, 2003 on administrative fines for violation in the fishery sector.</p> <p>Directive No 200/TTg of Prime Minister dated April 29, 1994 on guarantee clean water and rural environmental sanitation.</p> <p>Directive No 487/ TTg of the Prime Minister dated July 30, 1996 on Enhancement of State management on Water Resources.</p> <p>Decision 327 CT of September 15, 1992 on Policies for the use of bare land, denuded hills, forests, alluvial flats and water bodies.</p> <p>Decision No 860-TTg of Prime Minister dated December 30, 1995 on functions, responsibilities, powers and organization's machinery of Vietnam Mekong Committee.</p>	<p>Decision No 299/TTg of Prime Minister dated May 13, 1996 of Prime Minister on establishment the Central Guidance Board of prevention, combat against floods and typhoons.</p> <p>Decision 63/1998/QD-TTg of Prime Minister dated March 18, 1998 on National Orientation on water supply development in urban areas by 2020.</p> <p>Decision No 35/1999/QD-TTg dated March 5, 1999 on National Orientation on drainage development in urban areas by 2020.</p> <p>Decision No 155/1999/QD-TTg of Prime Minister dated July 16, 1999 on issuing Regulation of hazardous waste management (including hazardous wastewater).</p> <p>Decision No 67/2000/QD-TTg of Prime Minister dated June 15, 2000 on establishment National Water Resources Council.</p> <p>Decision No 104/2000/QD-TTg dated August 25, 2000 on National Strategy on Clean water and environmental Sanitation in rural areas.</p> <p>Decision No 99/2001/QD-TTg of Prime Minister on issuing Regulation on organization and operation of National Water resources Council.</p> <p>Decision 82/2002/QD-TTg dated June 26, 2002 on Establishment, Mandate and Operations of the Vietnam Environment Protection Fund.</p> <p>Decision No 45/QD-TTg dated on April 2, 2003 on establishment of provincial Department of Natural Resources and Environment.</p> <p>Decision No 357 of MARD dated March 13, 1997 on issuing Temporary Regulation of implementation of regimes of license and permit for searching, exploring, exploiting and drilling ground water and registration of ground water exploitation works.</p> <p>Decision No 395/1998/QD-BKHCNMT of MOSTE dated April 10, 1998 on issuing Regulation of environmental protection in searching, exploring, developing, exploiting, storing, transporting and processing oil, gas and other related services.</p> <p>Decision No 37, 38, 39/2001/QD/BNN-TCCB of MARD dated April 09, 2001 on establishment Boards for River basin planning and management of Mekong, Dong Nai, Thai Binh and Red Rivers.</p>
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Natural Disaster Map in Vietnam



Source: UNDP, website: <http://www.undp.org.vn/dmu>



Flood in the Central region of Vietnam