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Author(s)	Kato, Daisuke; Sawaki, Masanori; Kanazawa, Shigemori et al.
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The development and the use of lakes and marshes in Hanoi, Vietnam

--Focusing on three major areas--

Daisuke KATO*, Masanori SAWAKI**, Shigemori KANAZAWA*** and Tran Anh Tuan ****

** Doctoral course student of Osaka University, Department of Environmental Engineering*

*** Associate Prof. Dr., Osaka University, Department of Environmental Engineering*

**** Prof. Dr., Osaka Industrial University, Department of Urban Environment*

***** Doctor Course Student of Kansai University, Department of Geography*

ABSTRACT

VIETNAM'S DOI MOI PROGRAM exerted a strong influence on the environment in Vietnam, especially on water environment. Hanoi, also, cannot get around the situation. Due to repeated and unplanned land-fill works, an overflow and contamination of existing rivers', lakes', and marshes' water were brought about in an urban area, particularly a central urban area. Moreover, the small-scale lake is increasing rapidly on a central urban area and the outskirts of it. In this research, we typified the lakes and marshes in Hanoi, and collected the features in hard/soft side of each type. With the use of information we got from there, we proposed the future tasks for living together with lakes and marshes of many sizes.

KEYWORDS

Hanoi City, landfill of water surface, use of water surface,
DOI MOI PROGRAM, central urban area

INTRODUCTION / Background and Destination of the study

In Hanoi, Vietnam's capital, there are many water surfaces, for instance, rivers, lakes, and marshes. Recently large or small development has been carried out by land-filling land from lakes and marshes, while the central urban areas are expanding haphazardly. It caused an overflow of water and contamination of existing rivers', lakes', and marshes' water. The cause is as follow: The government adopted DOI MOI PROGRAM in 1986 and was trying to introduce market economy to Hanoi, which was in green planned economy. It brought much Illegal business on land use and triggered the overflow and the contamination.

In this research, first we mentioned the water surfaces in Hanoi, especially, the change, the development, and the use of lakes and marshes. And then we typified them according to their features. Next, we referred to the use and the evaluation of the major one which represents respective types. They are based on the information from those who use their lakes and marshes everyday. Finally, we would like to propose a better plan for the future of Hanoi, mainly about a better development and use.

MATERIALS AND METHODS

- I. FIELD INVESTIGATION (Sep 21th-30th, 2002): an inspection, a questionnaire, an interview, and collecting data in Hanoi.
- II. Making of the land-use maps of Hanoi in 1983 and 1996: We made the land-use maps from the topographical maps 1:10,000 of each near year. (near but not equal exactly) Hanoi, now, has 12 districts. (7 districts are in an urban area, the rest 5 are on the outskirts. the total area: 927.5km²) I chose 7 districts out of 12, whose land uses often change remarkably. The 7 districts are TAY HO DISTRICT, GUA GIAY DISTRICT, BA DINH DISTRICT, HOAN KIEM DISTRICT, HAI BA TRUNG DISTRICT, DONG DA DISTRICT, THANH XUAN DISTRICT in an urban area, and TU LIEM DISTRICT (partly), THANH TRI DISTRICT (partly) on the outskirts. (the 7 districts' area: 191.15km²) These land-use maps were made with the cooperation of a geography laboratory, Hanoi campus at Vietnam National University. We made these maps within Hanoi city because taking the topographical maps out of the country is banned.
- III. Comparison between 1983 and 1996: We arranged the features on changes of the two water surfaces.
- IV. Typifying of the lakes and marshes: We did on-the-spot visits and interviews with the general public living in the vicinity. And then, We arranged the features in detail and classified them into 3 types.
- V. The outline of typical examples of the 3 types
- VI. Analysis of the questionnaire: First we did cross tabulation of the items about the relationship between people there and lakes and marshes, and their evaluation of the lakes and marshes. And next, we typified the respondent using quantification of the 3 types and cluster analysis, following each item of their evaluation of lakes and marshes. And then, we set "the interested type to lakes and marshes ". And finally, we did cross tabulation of "the interested type to the lakes" and "their evaluation of the lakes and marshes " and considered the results.
- VII. Conclusion and Proposal: We put together my thought on the present conditions of lakes in Hanoi, and we proposed the information, which would help this city live together with lakes.

RESULTS AND DISCUSSION

1) Present Conditions of water surfaces in Hanoi

By comparing between the two land-use maps, 1983(before the adoption of DOI MOI PROGRAM) and 1996(10 years after the adoption), we arranged the change of water surface in Hanoi before and after the practice of DOI MOI PROGRAM. The small-scale lake is increasing rapidly on a central urban area and the outskirts of it for that period. We think there are 3 reasons. (We arranged this date in detail in our another paper.)

They are as follow:

- I. The lake and marshes which existed originally expands. (in whole area)
- II. The lake and marshes which existed originally is partially filled in, and is divided into a few pieces, and then, each part expands. (in whole area)
- III. A new lake appears. (often, on central urban area and the outskirts of it)

This is because the water closed underground, which resulted from repeated and unplanned land-fill works, spouts out from the soft part of the ground. That's why the number of small lakes and marshes is increasing rapidly, especially on a central urban area and the outskirts of it, where

many works have done. You can understand easily that searching for the way to live together with lakes and marshes of many sizes is an urgent subject. Exceptionally, there is a case that the water surface increases due to the use of agriculture and fishery in the village site of south.

There are two types of urban development by reclaiming. They are as follow:

- I. Private individuals acquire the right to use the lands, and prepare a housing site. As a result, urbanization becomes more and more active. In this case, it means that an urban area is supposed to be made in soft ground, which brings about a problem on living environment, for instance, inundation and a flood.
- II. The corporation acquires the right, and does it, according to the plan and on a large scale. This case is mainly seen in the outskirts.

2) The features of the lakes and marshes in Hanoi

table-1 the features of typical 7 lakes and marshes

lakes and marshes	scale	use of water surface	around the lake	The lake-wall is well-maintained	The lake has the function as the park.	The water quality	other
Ba Mau	large	water	office, residence, apartment house	yes	yes	good	
Hao Nam	small	vegetable culture	house, temple, road	no	no	not good	land-fill works have already done.
Van Chuong	small	vegetable culture, water	house, shop	no	no	bad	
Linh Quang	small	vegetable culture, water	house	no	no	bad	
Giang Vo	large	water	house, paved road	yes	yes	good	
Kim Lien	middle	water	house	no	no	so bad	sewage influx
Ngoc Khanh	large	water	office, residence, paved road, temple, tea room	yes	yes	good	

We did on-the-spot visits and interviews in the lakes and marshes which dot the central urban area. And I could get to know the things as follows, and we showed the features of typical 7 lakes and marshes out of them, in table-1.

- I. Small & Middle: People there grows vegetables in small-scale lakes and marshes. The lake-wall is not well-maintained, and there is much garbage dumped. KIM LIEN LAKE plays a major role in saving raw sewage pumped up, the water quality is very bad, and there are some places producing foul odors around there.
- II. Large: The lake-wall is well-maintained, and a lot of parks are built around there. The water visibility is relatively good, and there are many people who culture fish there.

3) The type of the lakes in Hanoi

According to above-mentioned, the lakes and marshes in Hanoi can be put in one of the following 3 types.

- I. sewage influx - type: The water quality is remarkably bad. This type is usually in a middle-size lake. In some cases, People grow vegetables there. A representative example is KIM LIEN LAKE.
- II. small & application of water surface - type: This type of lake and marsh is small, and the lake-wall and around there are not maintained. Many land-fill works have already done. In most cases, People grow vegetables there. A representative example is HAO NAM LAKE.
- III. large & well-maintained – type: This type is large, and the lake-wall and around there are well-maintained. Therefore, It is like a park. Water surface is not used, but it works as a fish farm. A representative example is NGOC KHANH LAKE.

4) The use of lakes and marshes in Hanoi, 3 representative examples

table2 age groups of respondents

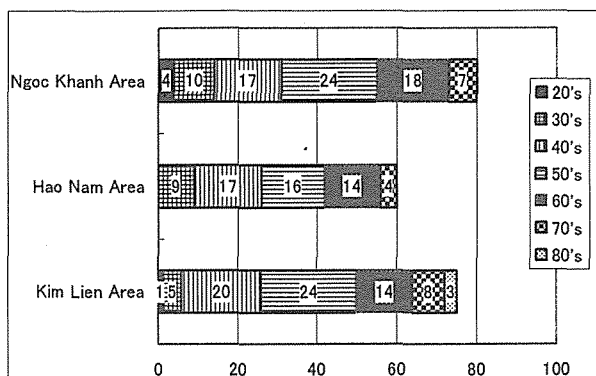


table3 the frequency of each lake-use

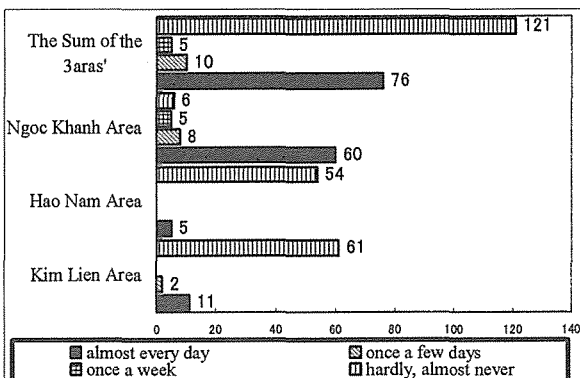
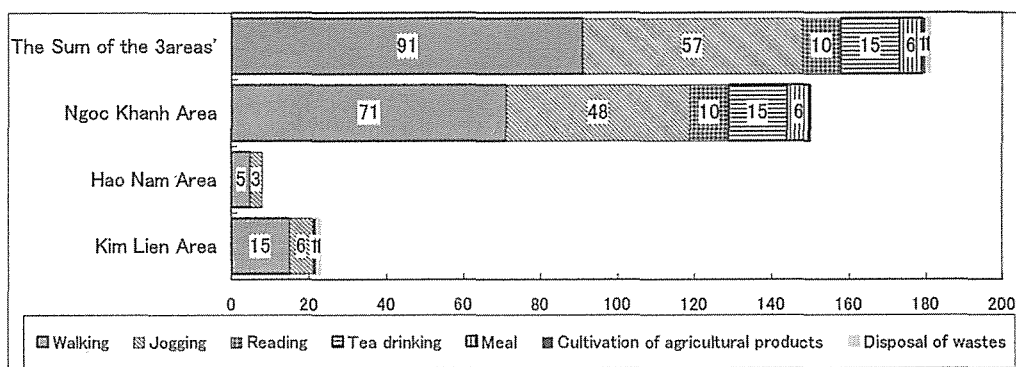


table4 the use of each lake



In this chapter, we mentioned the use of lakes and marshes in Hanoi, 3 representative examples, KIM LIEN, HAO NAM, NGOC KHANH, according to the results of the questionnaire survey. This survey was conducted from the end of Sep to the beginning of Oct, 2002, in above-described 3 districts, with the cooperation of a geography laboratory, Hanoi campus at Vietnam National University. Random respondents chose their answers from the prepared items. We conducted this survey in interview-style, from door to door.

First, we show age groups of respondents in table-2. The total number of 40's, 50's, and 60's accounted for three quarters of all respondents in any areas. The sex ratios of them are as follows: (M : F =) (39.2 : 60.8) at KIM LIEN, (43.3 : 56.7) at HAO NAM, (45.0 : 55.0) at NGOC KHANH, (42.5 : 57.5) in total of 3 areas. The frequency of each lake-use in table-3 and the use of it in table-4 are shown respectively.

- I. The frequency: 80% or more in KIM LIEN (sewage influx - type), and HAO NAM (small & application of water surface - type) answered that they didn't use the lakes and marshes, while 80% or more in NGOC KHANH (large & well-maintained - type) answered that they used once a day or once every three days.
- II. The use: 90% or more in KIM LIEN and HAO NAM answered that they walked and jogged around there, while those in NGOC KHANH answered that they, in addition, used as a place of recreation and relaxation.

5) Evaluations of 3 representative examples by the local people

table5 the evaluations of each lake according to the answers of respondents

Investigation area		The lake helps the local image improve		The lake purifies air		The lake works as a place of recreation and relaxation		The lake is suitable for fishing and water playground		The lake is suitable for children's playground		The lake is suitable for vegetable culture		The lake is suitable for fish culture		It can't be helped, if the lake is used for dumping ground		The water quality is good		The lake is useful for the flood control measures		The lake is an important place in this area	
		YES	NO	YES	NO	YES	NO	YES	NO	YES	NO	YES	NO	YES	NO	YES	NO	YES	NO	YES	NO	YES	NO
Kim Lien Arc	frequency	8	67	23	47	25	47	8	65	1	65	10	62	15	56	72	1	0	71	39	34	41	29
	%	10.7%	89.3%	35.6%	64.4%	34.7%	65.3%	11.0%	89.0%	1.5%	98.5%	13.9%	86.1%	21.1%	78.9%	98.6%	1.4%	0.0%	100.0%	53.4%	46.6%	58.6%	41.4%
Hao Nam Arc	frequency	34	25	52	8	15	44	3	56	3	56	21	38	20	38	59	0	0	46	55	2	42	16
	%	57.6%	42.4%	86.7%	13.3%	25.4%	74.6%	5.1%	94.9%	5.1%	94.9%	35.6%	64.4%	34.5%	65.5%	100.0%	0.0%	0.0%	100.0%	96.6%	3.4%	72.4%	27.6%
Ngoc Khanh Area	frequency	80	0	80	0	78	2	7	73	47	31	0	79	64	16	80	0	32	39	66	10	75	0
	%	100.0%	0.0%	100.0%	0.0%	97.5%	2.5%	8.8%	91.3%	60.3%	39.7%	0.0%	100.0%	80.0%	20.0%	100.0%	0.0%	45.1%	54.9%	86.8%	13.2%	100.0%	0.0%
Sum of 3 areas	frequency	122	92	153	55	118	93	18	194	51	152	31	179	99	110	211	1	32	153	161	46	158	45
	%	57.0%	43.0%	74.2%	25.8%	55.9%	44.1%	8.5%	91.5%	25.1%	74.9%	14.8%	85.2%	47.4%	52.6%	99.5%	0.5%	17.0%	83.0%	77.8%	22.2%	77.8%	22.2%

table6 the result of cross tabulation of “the interested type to the lake” and “the evaluation of the lake in KIM LIEN LAKE

Cluster		Evaluation to a lake											
		Sum	The lake helps the local image improve.	The lake purifies air.	The lake works as a place of recreation and relaxation.	The lake is suitable for fishing and water playground.	The lake is suitable for children's playground.	The lake is suitable for vegetable culture.	The lake is suitable for fish culture.	It can't be helped, if the lake is used for dumping ground.	The water quality is good.	The lake is useful for the flood control measures.	The lake is an important place in this area.
Sum	frequency	74	9	26	25	8	1	10	15	72	0	39	41
	%	100.0%	12.2%	35.1%	33.8%	10.8%	1.4%	13.5%	20.3%	97.3%	0.0%	52.7%	55.4%
recreation-type	frequency	7	0	1	6	7	0	0	0	6	0	0	1
	%	100.0%	0.0%	14.3%	85.7%	100.0%	0.0%	0.0%	0.0%	85.7%	0.0%	0.0%	14.3%
flood control measures-type	frequency	33	2	15	15	0	0	5	7	32	0	30	25
	%	100.0%	6.1%	45.5%	45.5%	0.0%	0.0%	15.2%	21.2%	97.0%	0.0%	90.9%	75.8%
garbage dumps-type	frequency	24	1	2	0	0	0	3	5	24	0	4	6
	%	100.0%	4.2%	8.3%	0.0%	0.0%	0.0%	12.5%	20.8%	100.0%	0.0%	4.2%	25.0%
freshness-type	frequency	8	5	7	3	1	0	2	2	8	0	7	8
	%	100.0%	62.5%	87.5%	37.5%	12.5%	0.0%	25.0%	25.0%	100.0%	0.0%	87.5%	100.0%
children's playground-type	frequency	1	0	1	1	0	1	0	0	1	0	0	0
	%	100.0%	0.0%	100.0%	100.0%	0.0%	100.0%	0.0%	0.0%	100.0%	0.0%	0.0%	0.0%
fish culture-type	frequency	1	1	0	0	0	0	0	1	0	0	1	1
	%	100.0%	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%	100.0%	0.0%	0.0%	100.0%	100.0%

table7 the result of cross tabulation of “the interested type to the lake” and “the evaluation of the lake in HAO NAM LAKE

cluster		Evaluation to a lake											
		Sum	The lake helps the local image improve.	The lake purifies air.	The lake works as a place of recreation and relaxation.	The lake is suitable for fishing and water playground.	The lake is suitable for children's playground.	The lake is suitable for vegetable culture.	The lake is suitable for fish culture.	It can't be helped, if the lake is used for dumping ground.	The water quality is good.	The lake is useful for the flood control measures.	The lake is an important place in this area.
Sum	frequency	60	35	51	15	3	3	21	20	59	0	56	42
	%	100.0%	58.3%	85.0%	25.0%	5.0%	5.0%	35.0%	33.3%	98.3%	0.0%	93.3%	70.0%
amenity&vegetable culture-type	frequency	8	6	5	8	1	0	5	0	8	0	8	4
	%	100.0%	75.0%	62.5%	100.0%	12.5%	0.0%	62.5%	0.0%	100.0%	0.0%	100.0%	50.0%
amenity& fish culture-type	frequency	5	5	3	5	2	0	1	5	4	0	5	4
	%	100.0%	100.0%	60.0%	100.0%	40.0%	0.0%	20.0%	100.0%	80.0%	0.0%	100.0%	80.0%
flood control measures-type	frequency	30	14	27	0	0	0	9	0	30	0	28	20
	%	100.0%	46.7%	90.0%	0.0%	0.0%	0.0%	30.0%	0.0%	100.0%	0.0%	93.3%	66.7%
freshness&fish culture-type	frequency	13	8	13	0	0	0	6	13	13	0	12	11
	%	100.0%	61.5%	100.0%	0.0%	0.0%	0.0%	46.2%	100.0%	100.0%	0.0%	92.3%	84.6%
fish culture-type	frequency	1	0	0	0	0	0	0	1	1	0	0	0
	%	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	100.0%	100.0%	0.0%	0.0%	0.0%
children's playground-type	frequency	3	2	3	2	0	3	0	1	3	0	3	3
	%	100.0%	66.7%	100.0%	66.7%	0.0%	100.0%	0.0%	33.3%	100.0%	0.0%	100.0%	100.0%

table8 the result of cross tabulation of “the interested type to the lake” and “the evaluation of the lake in NGOC KHANH LAKE

NGOC KHANH LAKE		Evaluation to a lake											
		Sum	The lake helps the local image improve.	The lake purifies air.	The lake works as a place of recreation and relaxation.	The lake is suitable for fishing and water playground.	The lake is suitable for children's playground.	The lake is suitable for vegetable culture.	The lake is suitable for fish culture.	It can't be helped, if the lake is used for dumping ground.	The water quality is good.	The lake is useful for the flood control measures.	The lake is an important place in this area.
Sum	frequency	80	80	80	78	7	47	0	64	80	32	66	75
	%	100.0%	100.0%	100.0%	97.5%	8.8%	58.8%	0.0%	80.0%	100.0%	40.0%	82.5%	93.8%
children's playground&water quality-type	frequency	12	12	12	12	0	12	0	9	12	12	7	10
	%	100.0%	100.0%	100.0%	100.0%	0.0%	100.0%	0.0%	75.0%	100.0%	100.0%	58.3%	83.3%
fish culture&water quality-type	frequency	14	14	14	14	0	0	0	13	14	11	13	13
	%	100.0%	100.0%	100.0%	100.0%	0.0%	0.0%	0.0%	92.8%	100.0%	78.6%	92.8%	92.9%
children's playground-type	frequency	26	26	26	25	0	26	0	20	26	0	26	26
	%	100.0%	100.0%	100.0%	96.2%	0.0%	100.0%	0.0%	76.9%	100.0%	0.0%	100.0%	100.0%
fish culture-type	frequency	7	7	7	7	0	7	0	7	7	0	0	5
	%	100.0%	100.0%	100.0%	100.0%	0.0%	100.0%	0.0%	100.0%	100.0%	0.0%	0.0%	71.4%
flood control measures-type	frequency	14	14	14	13	0	0	0	9	14	14	13	14
	%	100.0%	100.0%	100.0%	92.9%	0.0%	0.0%	0.0%	64.3%	100.0%	100.0%	92.9%	100.0%
fishing-type	frequency	7	7	7	7	7	2	0	6	7	6	7	7
	%	100.0%	100.0%	100.0%	100.0%	100.0%	28.6%	0.0%	85.7%	100.0%	85.7%	100.0%	100.0%

In this chapter, we arranged the evaluations of each lake and marsh, according to the answers of respondents. (Table-5) There is three features. They are as follows.

- I. 80% or more of the respondents answered that the lake was not suitable as a place to fish, or a playground. They answered that it became a garbage dump or a dirt dump.
- II. All respondents in NGOC KHANH answered like this: "A lake helps the local image improve." "The lake purifies air." "A lake is an important place in this area." On the contrary, 88% of the respondents in KIM LIEN, which is put in sewage influx – type, answered that a lake doesn't help the local image improve. 65% answered that The lake doesn't purify air. And 41% answered that a lake is not an important place in this district.
- III. We can point out the fact that "water quality" has to do with the answer to the question, "Is it suitable for a children's playground?" We typified the respondent using quantification of the 3 types and cluster analysis, following each item of their evaluation of lakes. And then, we set "the interested type to lakes". And finally, we did cross tabulation of "the interested type to the lakes". The results are shown in Table-6, Table-7, and Table-8. In any 3 areas, People have a strong feeling that the lake is a garbage dump. That's why I basically ruled out this item from the keyword for classifying, and considered the results. Now I mention them.

The main features of each three area

I. KIM KIEN AREA:

- A percentage of "Flood control measures" is the largest (44.6% of all respondents).
- A percentage of "Garbage dumps" is following this (32.4% of all respondents).
- A value on "Amenity" is low.

II. HAO NAM AREA:

- A percentage of "Flood control measures" is the largest (50.0% of all respondents).
- A percentage of "Commercial Use" is following this (Vegetable Culture = 31.7%, Fish Culture = 13.3%, The total = 45.0%).

III. NGOC KHANH AREA:

- 90.0% or more of all respondents has a positive image, for instance, "The lake is the place of recreation and relaxation", "The lake helps the local image improve.", and "The lake purifies air."
- A percentage of "Children's playground" is 50.0% of all respondents.

CONCLUSIONS

VIETNAM'S DOI MOI PROGRAM exerted a strong influence on the environment in Vietnam, especially on water environment. Hanoi, also, cannot get around the situation. Due to repeated and unplanned land-fill works, an overflow and contamination of existing rivers', lakes', and marshes' water were brought about in an urban area, particularly a central urban area. Moreover, the small-scale lake is increasing rapidly on a central city area and the outskirts of it. We summarize the feature about "the development and the use of lakes and marshes in Hanoi" acquired from this research below. In it we would like to make a few issues in the future clear, in order that we can live together with many types of lakes and marshes in an urban area, Hanoi.

- I. sewage influx - type: The water quality is remarkably bad. This type is usually in a middle-size lake. This type is almost no use of the water surface and its circumference. Because this type is recognized as "the function of the flood control measures" and "the garbage dump". A serious

deterioration of water quality results from influx of sewage. It is necessary to work on constructing sewerage system from the area which requires urgently.

- II. small & application of water surface - type: This type of lake and marsh is small, and the lake-wall and around there are not maintained. As a result many land-fill works have already done. This type has “the function of measures against flood” “high value of the commercial use”. If the system which controls the right to use old and new lakes is managed properly, we think it’s possible to produce big industry.
- III. large & well-maintained – type: This type is large, and the lake-wall and around there are well-maintained. Therefore, It is like a park. Water surface is not used, but it works as a fish farm. This type has high value of the amenity use as “children’s playground” and “the place of recreation and relaxation”. We think the use of lakes and marshes as a park helps citizens put their minds to WATER CITY, HANOI. And we think it can stop unplanned reclamation works, if this is extended to a middle-scale lake.

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