

EVALUATING THE ENVIRONMENTAL IMPACT OF THE HOANKIEM LAKE WITH FOCUS ON URBAN DEVELOPMENT PLANNING BY USING A DPSIR FRAMEWORK.

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Abstract: In recent year, the Government of Hanoi has built/promulgated many management policies on environment and urban development planning and increased investment for sustainable development. However, we are still facing/addressing the conflicts of environment associated with urban development planning such as the land-use change and its impact to people living in ancient streets around the HoanKiem lake. The obtained result, established by a DPSIR framework, can be used to evaluate the environmental impacts with focus on urban development planning, and as well as supported to policy makers for *'good urban governance'*. These indicators are divided into 5 groups such as Driving forces, Pressures, States, Impacts, and Responses. Major findings were formed by multiplying the weighed indexes, so the Governance of Hanoi should promulgate and execute legal documents of urban environmental prevention, and command/control waste water sewage by using economic instrument, and encourage the administrative/tourist buildings for applying the system of ISO 14000 in the attempt of saving energy and conserving cultural resources for sustainable urban development.

Keywords: Environment, Urban planning, Governance, DPSIR, the HoanKiem lake.

Tóm tắt: Trong những năm gần đây, Chính quyền Hà Nội đã xây dựng và ban hành nhiều chính sách quản lý về môi trường và qui hoạch phát triển đô thị và tăng cường đầu tư cho phát triển bền vững. Tuy nhiên, chúng ta vẫn đang phải đối mặt và giải quyết các xung đột môi trường liên quan đến qui hoạch phát triển đô thị như thay đổi sử dụng đất và tác động của nó đến người dân sinh sống ở những khu phố cổ quanh hồ Hoàn Kiếm. Kết quả thu được, thiết lập bởi khung Động lực-Áp lực-Hiện trạng-Tác động-Đáp ứng (DPSIR), có thể được sử dụng để đánh giá các tác động môi trường tập trung vào quy hoạch phát triển đô thị và cũng như hỗ trợ cho các nhà hoạch định chính sách cho *"Quản trị đô thị tốt"*. Các chỉ số này được chia thành 5 nhóm như Động lực, Áp lực, Hiện trạng, Tác động và Đáp ứng. Những phát hiện chính được xác định bằng cách nhân các trọng số. Do đó, Chính quyền Hà Nội cần ban hành và thực thi các văn bản pháp lý về ngăn ngừa môi trường đô thị, điều hành và kiểm soát nước thải thông qua sử dụng các công cụ kinh tế và khuyến khích các tòa nhà hành chính và du lịch áp dụng hệ thống ISO 14000 trong nỗ lực tiết kiệm năng lượng và bảo tồn tài nguyên văn hóa để phát triển đô thị bền vững.

Từ khóa: Môi trường, qui hoạch đô thị, quản trị, DPSIR, Hồ Hoàn Kiếm.

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1. INTRODUCTION

In Vietnam, there are various plans such as construction planning, urban development planning, etc. which take the evaluating of environmental impacts into account. However, these plans are still limited, and spatial criteria are not in line and do not go in hand with sustainable development in the special area like the HoanKiem lake and its adjacency [1],[2],[3],[4].

Meanwhile, the Environmental Protection Planning focuses on the solutions of state management to deal with environmental risks but this is not strongly related to urban development planning and land-use changes [5],[7].

The HoanKiem lake, meaning “Lake of the Returned Sword”, also known as Hồ Gươm (Sword Lake), is a fresh lake in the historical center of Hanoi, the capital city of Vietnam. Its area is about 12 ha. In the legendary story, in 1428, Le Loi King was boating on the lake when a Golden Turtle God surfaced and asked for his magic sword that he used it for the battle against Ming China. From then on, the lake became the HoanKiem lake.

After Hanoi’s massive expansion in 2008, the HoanKiem lake plays as one of the most important centers of Hanoi capital. The city is envisioned to become a large-scale capital as well as a political-administrative, cultural, scientific, educational, economical and trading hub until 2050 [8],[9].

According to the Hanoi Master Plan, the core center is expected to have a population of 3.7 million and 4.6 million in 2020 and 2030, respectively. It will serve as an administrative, economic and cultural hub for the capital and nation as well. Under the master plan, public and military offices, headquarters of the Party, National Assembly, and Government will continue to locate in Ba Đình District. Meanwhile, administrative offices of local government/authorities are positioned around Hoan Kiem Lake and its adjacency.

The central Government and the Government of Hanoi have recently issued the regulation on management of development planning and detailed planning of the HoanKiem lake and its adjacency. From 1996 to 2016, the Decisions are issued by: Ministry of Construction as No.448 BXD/KTQH on Approving the detailed planning of the HoanKiem lake and its adjacency, the Hanoi’s People Committee as No.6389/QD-UBND on Promulgation of architectural management of ancient streets in Hanoi, and the new one as the Decision No.11/2016/QD-UBND signed 4th April, 2016 on Stipulation of management regulation of high-buildings in historical inner-city of Hanoi. The most important documents of planning focus on the relationship between urban spatial architectures and functional zoning updated in the Law of Urban Planning [6]. The monthly reports of the HoanKiem’s People Committee demonstrate the association between business-friendly economic governance activities and business responses to those activities. Nevertheless, business-friendly economic governance activities have much to do with the pilot model of urban governance and its institutional reform endorsed by the Government of Hanoi.

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The DPSIR framework uses as a mixed analysis in the attempt for evaluating the environmental impacts in this paper. Firstly, the paper explains the general legal of Hanoi's urban development planning and the impact of environment nexus in the classification of land-use in the area of the HoanKiem lake and its adjacency. Secondly, the author uses the DPSIR's indicators for addressing a number of environmental conflicts with focus on urban development planning. The relationship between urban governance and sustainable development including a cooperation network of the stakeholders like non-State sector and NGOs. Thirdly, the general recommendations suggest the local authorities take a number of action points in the term governance that it understood with its full meaning of strategic management with acknowledgement of stakeholders like in other countries. Last, but not least, indicators and scoring system are under scrutiny in order to improve in the policy-making process for sustainable urban development.¹

2. MATERIALS AND METHODS

Materials:

The integration of Urban Development Planning and Environmental Protection Planning in the HoanKiem lake and its adjacency is recognized along with functional zoning. Functional zoning is considered to be the first planning of a planning cycle and is a commonly used tool in spatial planning and as well as a management instrument for zoning.

The Ministry of Construction considers the Strategic Environmental Assessment (SEA) not only as a technical tool but also as a management tool for environmental protection. Circular No.01/2011/TT-BXD, guiding the SEA in any construction planning and urban planning project, defines the SEA as the process of analyzing and forecasting the environmental impacts of the construction project prior to approval in order to provide an optimal plan for the construction planning and urban development planning oriented towards sustainable development[3].

The SEA is propose to the integration assessment of environmental impacts in the planning process and thus to provide the suitable objectives of sustainable development in the decision-making process. By using the DPSIR framework, the indicators are formed by multiplying the weighed indexes, so the Governance of Hanoi should promulgate and execute legal documents of urban environmental prevention, and command/control waste water sewage by using economic instrument, and encourage the administrative/tourist buildings for applying the system of ISO 14000 in the attempt of saving energy and conserving cultural resources for sustainable urban development.

Methods:

The paper uses a mixed method approach. An UNDP's reference book analyses on good governance including its public administrative, public financial and PARs implications and lesson learned from practice was conducted². Empirical work included a review on urban planning and its institutional reform in Hanoi including the land-use changes of the HoanKiem lake and its adjacency.

In the HoanKiem lake, the author evaluated statistical data regarding socio-economic performance, population development and the environmental impacts including soil, air, water pollution, and ecosystem. Urban development planning documents and reports were included

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as well as the classification of land-use in the area of HoanKiem lake and its adjacency. Moreover, about 2 workshops funded by DAAD with German's alumni from different society fields were conducted at Hanoi. Lastly, the DPSIR's indicators, extended by the Pressures-State-Response model conducted as a research of environmental risk management in Industrial zone in Hoa Binh province and Bac Giang province[11],[12],[13], was measured as the effectiveness of public sector of the HoanKiem lake and its adjacency.

The study, as established a DPSIR (Drivers, Pressures, State, Impact, Response) framework, can be used to evaluate the environmental impacts in the HoanKiem lake with focus on urban development planning and as well as supported to policy makers for '*good urban governance*'. In Vietnam, the term governance is not yet used officially as management. Urban governance is not yet understood with its full meaning of strategic management with acknowledgement of stakeholders like in other countries. However, urban management in Vietnam is transforming towards urban governance with the participation of non-State actors, with more strategic approach. The term governance, therefore, is used as a synonym with urban management when referring to the Government's activities.

3. RESULTS AND DISCUSSION

The HoanKiem lake, located in the center of the HoanKiem district, is considered as one of the most suitable to develop socio-economic. Its' geographical coordinates are 21⁰⁰1' North and 105⁰⁵1' East. The HoanKiem lake and its adjacency has a borderline in the North with the streets named: Hang Gai, Cau Go and Hang Thung; in the South with Hai Ba Trung street; in the West with the streets named: Quang Trung, Nha Chung, Nha Tho and Hang Trong; in the East with the streets named: Nguyen Huu Huan, Ly Thai To, National Bank, The August Square and Phan Chu Trinh (seen as Figure 1).

According to its detailed planning of the HoanKiem lake, the priority shall be given to the construction of city offices (TSC or CTS); banking facilities, trade centers, services, tourist hotels, guest houses (SKC), housing (ODT) and public amenities (DVH, DGD, DDT). In addition, for existing houses, in accordance with the planning to be retained, they will be renovated, adjusted and upgraded according to the approved planning (seen as Figure 2).

Recently, the HoanKiem district's budget was reach at 2495.76 billion VND in the 1st quarter 2018. The growth rate of tourist sector increased 19.61% in compare to last year (the HoanKiem people's committee, the 1st quarter, 2018). The growth rate of business, trade sand tourist sectors in July, 2018 increased 18.05% in comparision. Together with socio-economic development, land-use has also changed largely towards the increase of land value and utilization (the HoanKiem People's Committee, 2017). On the other hand, the high density of population and administration/tourism leads to the conflict of environment which puts the high risk on public health and biodiversity loss. Around the Hoan Kiem lake, there are some changes on urban development planning such as spatial walking-the ancient streets in weekend or folk festivals for traditional culture.

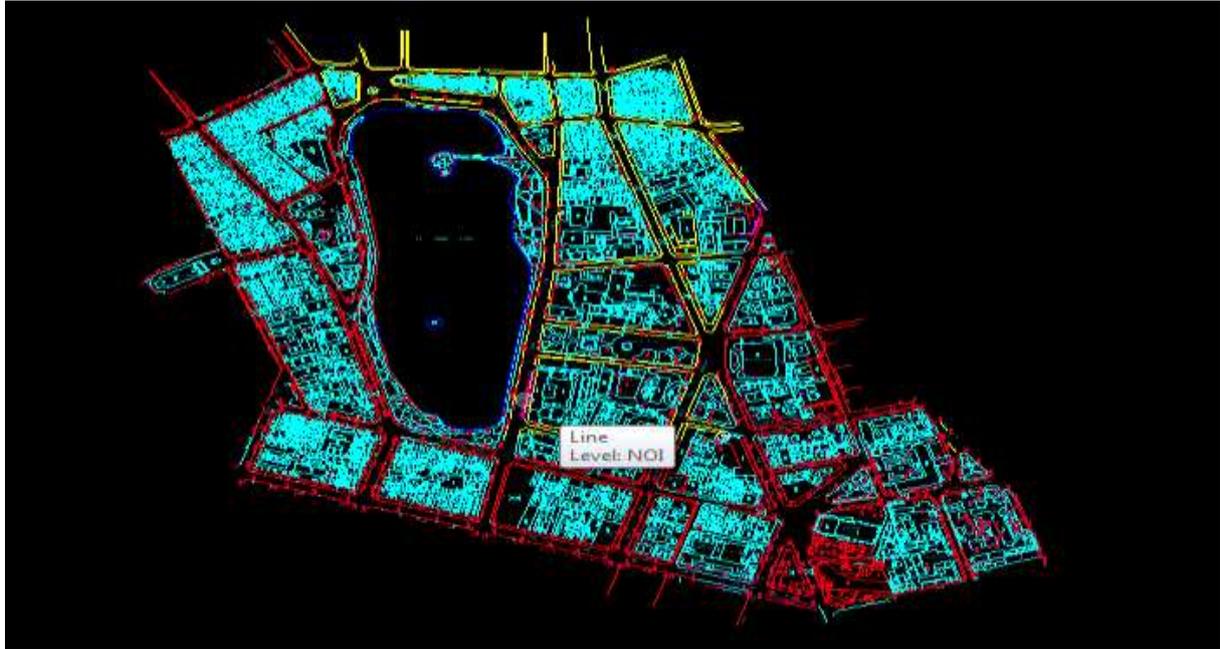


Figure 1. The administrative borderline of the HoanKiem lake and its adjacency



Figure 2. Land-use changes in the HoanKiem lake and its adjacency
 Note: Present map in 2018 (on the left) and Future map in 2020 (on the right)

3.1 Land-use changes – the urban development planning & the impact of environment nexus

The Vietnam Prime Minister has recently approved the Hanoi’s master plan until 2030 with a vision toward 2050 to convert the city into a sustainable development capital with synchronous and modern infrastructure system, harmonious cultural values, economic growth, and environmental protection (Decision No.1878/QD-TTg signed 22th December, 2008).

The Hanoi's capital in 2030 will have an administrative borderline of around 334,400 ha with its administrative center – The ancient streets – positioned around the HoanKiem lake and its adjacency. The Hanoi Capital Construction Master Plan paves the way for the resettlement of households and buildings for low income people in satellite cities.

Urban development and management are regulated by several formal laws of the National Parliament (Quoc hoi), as well as Decisions, Decrees, Circulars of the Central Government (Chinh phu) and the Local Government (Chinh quyen). The most important legal source is the Law of Environmental Protection 2014, providing specific regulations for evaluating environmental impacts in the special areas like the HoanKiem lake and its adjacency. The law requires that state management of urban planning shall be in accordance with the objectives of sustainable environmental development, biodiversity, security strategies, and saving natural resources coping with climate change. Further regulations detailing the provision systems of the Urban Planning Act 2009 (Amended 2016), Law of Construction 2014, Law of Land 2014 and other implementation guidelines for different types of planning (urban construction planning) include: General planning, zoning planning and detailed planning. Specific regulations for urban planning are stipulated in Decree No. 37/2010/ND-CP on the formulation, appraisal, approval and management of urban planning, Decree No.38/2010/ND-CP on management of spatial architecture and urban landscape, Decree No.39/2010/ND-CP on management of underground works, Decree No.11/2013/ND-CP on management of urban development investment, and Circular No.10/2010/TT-BXD dated 11th August 2010 on the regulation of dossiers of each type of urban planning, focuses to spatial management in the process of urbanization during 2020-2030.

Summarizing this, the HoanKiem lake and its adjacency, a total area of 63.717 ha seen as Table 1, has to be managed by an unbelievable high number of legal documents that were promulgated from 1996 to 2016. And, one of the most priority is the growth on economic by any way and we are still facing the unsustainable development on society and environment. Consequently, the most visible important of environment is the change of water color in the HoanKiem lake as well as its quality for living species named *Rafetus swinhoei* or *Cu Rua*. Currently, there are 3 classifications of land-use in the area of Hoan Kiem lake and adjacency shown in Table 1.

Table 1. Classification of land-use in the area of the HoanKiem lake and its adjacency

Kind of land	Area (hectar)	Area (%)
Land for construction	27.30	43
Land for trees	17.745	27
Land for traffic	18.672	29.3
Total	63.717	100

(Source: Decision No 448 BXD/KTQH, 1996)

Over 20 years, we can observe a large gap between the high level of regulation and the reality. There are substantial deficits in the urban planning and environmental performance of the local government/authorities. This arguably suggests that the administrative institutional factors are more significant than political factors (voice and accountability), which become more significant in high-income countries.³

Therefore, the question is then how to measure effectiveness of public sector and suitable model of performance applied to the issue of environment in the HoanKiem lake and its adjacency?

In order to target measurement efforts, the core elements of urban environmental prevention approach such as: principle of synthesis, principle of elimination and minimization of environmental damage at source, principle from cradle to grave, and principle of responding to climate change. And the DPISR' framework in which and thought which we can think about management, policy and performance are of the most logical indicators to measure effectiveness of public sector.

Evaluating the environmental impacts inconjunction with spatial-oriented planning for urban development project is the planning, organization and arrangement of environmental protection measures aimed at eliminating and minimizing pollution at source in order to contribute to the sustainable development of the HoanKiem lake and its adjacency. The management of environment is a multi-actor task such as central government, local government, people and local communities, and NGOs.

According to the Government Performance Project (GPP), the underlying model of the assessment identified four management subsystems that contribute to management capacity-defined as the potential for performance, financial management, human resources management, capital management and information technology management.⁴

Against this background, the actor constellation of the HoanKiem lake and its adjacency was investigated. The most important actors of public sector are: the Vietnam central government with a number of ministries having different legislative responsibilities such as Ministry of Natural Resources and Environment (MONRE), Ministry of Construction (MOC), Ministry of Planning and Investment (MPI), Ministry of Finance (MOF), Ministry of Health (MOH), Ministry of Labour, Invalids and Social Affairs (MOLISA). And, the Hanoi government is responsible for land use, transportation, works, tourism, etc. and contributing to administrative reform in the provision of public services (building permits, housing and residential certificates, and real estate). Also here, several departments are involved: Department of Natural Resources and Environment (DONRE), Department of Construction (DOC), Department of Planning and Investment (DPI), Department of Finance (DOF), Department of Communication and Transport (DOCT), Department of Culture, Sport, and Tourism (DOCST), etc. And, the People's Committees at the HoaKiem district and commune level within its adjacency.

The idea is that non-State sectors work together to implement an action plan in which and thought which we can think about cooperation network of Business-Policy-Society Interface – mean as the Governance of Hanoi. And, the Governance of Hanoi should promulgate and execute legal documents of urban environmental prevention by using the DPSIR framework of 18 indicators divided into 5 groups such as Driving forces, Pressure, States, Impacts, and Responses. The most important ones are the recommendation of primary and secondary responsibilities for local authorities of the HoanKiem lake and its adjacency.

3.2 Using a DPSIR framework – The Urban Governance and sustainable development

The DPSIR, an extension of the Pressure-State-Response model developed by OECD in 2003, is a causal framework for describing the interactions between society and the environment: Human impact on the environment and vice versa because of the interdependence of the components. It is divided into 5 groups such as Driving forces: e.g. public administration, tourism, economic growth; Pressure: e.g. pollution, land-use change, population growth; States: e.g. water quality, soil quality, air quality, habitat, vegetation; Impacts : e.g. public

health, habitat fragmentation, economic crisis, environmental damage, biodiversity loss; and Responses : e.g. taxes, environmental laws (seen as Table 2).

The evaluation of environmental impacts aims to systematically assess the negative or potential effects of pollutants on the plants, animals or the entire ecosystem. The purpose of evaluating environmental impacts of the HoanKiem lake is to identify public health or degradation of environment (soil, water, air). This allows the urban governer to determine the direction of managing environmental impacts for the study area.

There are 5 levels of environmental risk in the HoanKiem lake, from non-risk level to high risk level (seen as Table 3).

Urban environmental prevention requires a change in the awarance/attitudes of stakeholders, the responsibility of environmental management with a focus on “green, clean, attractive and dynamic” options.

The core elements of urban environmental prevention approach are as follows:

- Continuous application, prevention and unification of urban environmental prevention strategies (principle of synthesis);
- Conservation of materials and energy, removal of toxic raw materials and reduction of the volume and toxicity of all hazardous waste and gases at source (principle of elimination and minimization of environmental damage at source);
- Reduce negative impact throughout the trends of consuming, from design to disposal (principle from cradle to grave);
- Green growth, low carbon emissions in the design and delivery of society services (the principle of responding to climate change).

Table 2. The DPSIR indicators for evaluating environmental impacts

Group	Notation	Name of indicator	Explanation	Scoring
(1)	(2)	(3)	(4)	(5)
Driving forces	D1	Administration	Urban Governance, PARs, Effective public service for SDG implementation	1. High HDI ⁵ (6-10); 2. Moderate HDI (3-6); 3. Low HDI (0-3)
	D2	Tourism	Folk, traditional culture, and festivals in spatial walking in the old Hanoi.	1. High quality (6-10); 2. Moderate quality (3-6); 3. Low quality (0-3).
	D3	Economic growth	Average income, standard of living and society security	1. High income (>3000 \$/year) 2. Moderate income (2500-3000 \$/year). 3. Low income (<2500 \$/year)
Pressure	P1	Pollution	Environmental control and management, effective application of environmental tools.	1. Exellent (9-10); 2. Very good (7-9); 3. Good (5-6) 4. Poor (<5)
	P2	Land-use changes	Long-term use, stable and right function of zoning area.	1. Exellent (9-10); 2. Very good (7-9); 3. Good (5-6) 4. Poor (<5).
	P3	Population growth	The growth rate of the mechanical population	1. High rate > 3% (6-10). 2. Moderate rate from 2 to

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			(reflecting the distribution of labor)	3% (3-6). 3. Low rate <2% (0-3).
State	S1	Soil quality	According to VN Soil quality (QCVN)	1. High pollution (6-10); 2. Moderate pollution (3-6). 3. Low pollution (0-3).
	S2	Water quality	According to VN Water quality (QCVN)	1. High pollution (6-10); 2. Moderate pollution (3-6). 3. Low pollution (0-3).
	S3	Air quality	According to VN Air quality (QCVN)	1. High pollution (6-10); 2. Moderate pollution (3-6). 3. Low pollution (0-3).
	S4	Habitat	The demands for transport, infrastructure, social services, housing, environmental controls, data management and public amenities.	1. Excellent (9-10); 2. Very good (7-9); 3. Good (5-6) 4. Poor (<5)
	S5	Vegetation	Improving life quality, creating landscape for tourism and ecological environment.	1. Excellent (9-10); 2. Very good (7-9); 3. Good (5-6) 4. Poor (<5)
Impact	I1	Public health	A system of medical interventions, reducing risk factor and increasing health promotion and prevention	1. Excellent (9-10); 2. Very good (7-9); 3. Good (5-6) 4. Poor (<5)
	I2	Habitat fragmentation	Caused by human when Cu Rua is died for human activities such as clean-up water in the lake	1. Excellent (9-10); 2. Very good (7-9); 3. Good (5-6) 4. Poor (<5)
	I3	Economic crisis	The rate of inflation, jobless, and bankrupt of SME	1. High rate > 2% (6-10). 2. Moderate rate from 1 to 2% (3-6). 3. Low rate <1% (0-3).
	I4	Environmental damage	damage caused by exceptional natural events, such as flooding which causes pollution in the area	1. High pollution (6-10); 2. Moderate pollution (3-6). 3. Low pollution (0-3).
	I5	Biodiversity loss	The extinction of species named <i>Rafetus swinhoei</i> ⁶ , and only three individuals.	1. Excellent (9-10); 2. Very good (7-9); 3. Good (5-6) 4. Poor (<5).
Resposes	R1	Taxes	Personal income tax, VAT	1. High tax (>25 %) 2. Moderate tax (10%-25 %). 3. Low tax (<10%)
	R2	Law of Environmental	According to the national standard of enviromental	1. Excellent (9-10); 2. Very good (7-9);

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Protection management, ISO 14000, 3. Good (5-6)
 CDM and community-based 4. Poor (<5)
 participants

(Source: Author, 2018).

Table 3. The level of environmental risk in the HoanKiem lake

Total score (weighted index)	The level of environmental risk
0 – 200	Non risk
200 – 400	Low risk
400 – 600	Risk
600 – 800	Potential risk
800 – 1000	High risk

(Source: Author, 2018)

3.3 Indicators and Scoring process in the DPSIR's framework

The result applied that the DPSIR indicators could estimate/evaluate the environmental impacts in the HoanKiem lake and its adjacency with a total score of 711 (seen as Table 4) at the level of *potential risk* (seen as Table 3), respectively. There are 3 indicators in group 1 (named from D1 to D3); 3 indicators in group 2 (named from P1 to P3); 5 indicators in group 3 (named from S1 to S5); 5 indicators in group 4 (named from I1 to I5); and 2 indicators in group 5 (named from R1 to R2).

Table 4. The result of evaluating environmental impacts in the HoanKiem lake

Group	Notation	Name of indicator	Scoring ⁷	Weighted Index ⁸	Total Score ⁹
(1)	(2)	(3)	(4)	(5)	(6)=(4)x(5)
Driving forces	D1	Administration	6	6	36
	D2	Tourism	6	8	48
	D3	Economic growth	1	9	9
Pressure	P1	Pollution	3	5	15
	P2	Land-use changes	6	6	36
	P3	Population growth	8	8	64
State	S1	Soil quality	6	6	36
	S2	Water quality	6	8	48
	S3	Air quality	1	9	9
	S4	Habitat	3	5	15
	S5	Vegetation	7	6	42
Impact	I1	Public health	9	9	81
	I2	Habitat fragmentation	7	7	49
	I3	Economic crisis	6	10	60
	I4	Environmental damage	7	9	63
	I5	Biodiversity loss	4	7	28
Responses	R1	Taxes	8	6	42
	R2	Law of Environment	6	5	30
Total Score			100		711

(Source: Author, 2018).

The result of compiling a set of the DPSIR's indicators for evaluating environmental impacts consists of 18 indicators (seen as Table 4). Individual indicators, named as D2, P3, S2, I1, and R1, were scored the value of 48, 64, 48, 81 and 42, respectively. Its value evaluated that the environmental impacts much more concern on tourism in group 1: Driving force; population growth in group 2: Pressure; water quality in group 3: State; public health in group 4: Impact; and taxes in group 5: Responses. And in order to eliminate the negative impacts of environment in the HoanKiem lake, so the Governance of Hanoi should promulgate and execute legal documents of urban environmental prevention by using the friendly product, changing the trends of consuming, improving health care system and command/ control waste water sewage by using economic instrument (environmental taxes), and encourage the administrative/tourist buildings for applying the system of ISO 14000 in the attempt of saving energy (3R) and conserving (folk) cultural resources for sustainable urban development.

4. CONCLUSIONS AND RECOMMENDATIONS

Good Urban Governance, the HoanKiem lake where optioned as “*green, clean, attractive and dynamic*”, is performed in terms of an effectiveness or efficiency in working of a local administrative system. The DPSIR model using individual indicators could be evaluated the negative impacts of environment with focus on Urban Development Planning that integrates 5 groups in the attempt for socio-economic development.

Further to sustainable development, the HoanKiem lake is considered as one of the centers most increased both business, trading and tourist sectors. The HoanKiem lake is particularly at potential risk as it is faced the conflict of environment such as degradation of soil, water, air and ecosystem.

So, the following are four general recommendations, related to which a number of action points are also suggested, along with the local authorities who might take primary and secondary responsibility:

1. Evaluating environmental impacts to enhance the effectiveness and efficiency of urban governance for improving spatial planning responses of the HoanKiem lake and its adjacency.
2. Developing urban strategies to enhance living conditions and land-use options for increasing investment of scio-economic and environment.
3. Building institutional capacities to ensure security protection for walking streets around the HoanKiem lake.
4. Encouraging ISO 14000 to ensure sustainable development for saving natural resources and conserving cultural heritages in the context of climate change.

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¹ Vietnam’s reform efforts are also conducted through a continuous wave of measures. After the first PARs Master Plan for 2001-2010, Vietnam executes the second PARs Master Plan for 2011-2020 with the overall aim of reforming of institution reform and improving of the quality of administrative services and quality of public services. Unfortunately, the analytical work on Vietnam’s public administration reforms and growth continues to be limited mainly to national regression studies. Vietnam, the public administration system of ASEAN member states, have not escaped from strong political influences (CIA, 2012; Kim, 2009).

² Jairo Acuna-Alfaro (Ed.), 2009. *Reforming Public Administration in Vietnam: Current Situation and Recommendations*. The National Political Publishing House. Hanoi. 427 pages.

³ Kwang-KooK Park et al., 2016. *Understading Korean Public Administration: lessons learned from practice*. Routledge. Page 28. Oxon.

⁴ Wouter Van Dooren et al., 2015. *Performance Management in the Public Sector*. Routledge. Page 11. Oxon.

⁵ Human Development Index (HDI) is a construct designed to measure human development of countries around the world. HDI is a composite statistic of life expectancy, education and income per capita indicators, which are used to rank countries into four tiers of human development. In other words, the HDI is a summary measure of average achievement in key dimensions of human development: a long and healthy life, being knowledgeable and have a decent standard of living. More information may be found here: <http://hdr.undp.org/en/content/human-development-index-hdi>.

⁶ Large soft-shell turtles, either of the species *Rafetus swinhoei* or a separate species named *Rafetus leloi* in honor of the emperor, had been sighted in the lake for many years. The last known individual was found dead on January 19, 2016. There are three remaining turtles of the species *R. swinhoei*.

⁷ The scoring of individual indicator was estimated by using the evaluating scale in column 5 in Table 2.

⁸ The weighted index was valued as the scale of 10.

⁹ The value of total score, by each individual score multiplied values in column 4 with column 5, cumulated the value of all indicators. Its value indicated that the individual DPSIR could be higher score than others in the group.

BIOGRAPHICAL NOTES

Working as a Trainer at the Department of Electronic Training in the Center of Foreign Languages-Computing and Information-Library, National Academy of Public Administration, I studied a Msc degree on Environmental Sciences and mid 2005 I started my PhD study at University of Greifswald, Germany. Now I do teaching and consulting on environmental risk management with several institutes, develop the GIS application for BA's program of urban management, and continue my applied research on spatial planning and development as well as supported to policy makers for '*good urban governance*'.

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