BUILDING DIGITAL GOVERNMENT FOR ENVIRONMENT MANAGEMENT AND SUSTAINABLE DEVELOPMENT

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Abstract

Nowadays, the environment pollution situation in Vietnam has become much more seriously. Residents of big cities have faced the most serious air polution. In rural areas, using the pesticides without scientific guidance has caused the pollution of soil, water source and air as well as affected health of people. The domestic and industrial wastewater which is untreated or treated but not corresponded withs the Vietnam wastewater standards is discharged directly into the surrounding environment. Besides, along with the globalization, there are various types of invasive alien species in Vietnam due to the lack of knowledge in control of alien species. Since 2016, It has occurred in a series of environmental pollution causing annoyance in public opinion. This urges us how to manage effectively the environment problems and how to simultaneously mobilize all the resources of society to participate in environmental protection. To solve these problems, the need to quickly build the digital government in environment management is for all residents to contribute quickly, quality and transparency to help environment officers having sufficient information to serve the sustainable development in Vietnam.

Keywords: *digital goverment, environment management, sustainable development.*

1. Introduction

Vietnam is one of the most densely populated countries in the world, with the third largest population in Southeast Asia and the 14th in the world. The population increase entails increasing demand for living, education, training, health care, transportation, housing, jobs ... therefore increasing pressure on the natural and social environment. The load capacity of the natural environment is limited. The self-cleaning ability of the natural environment

will be exceeded because the population increases rapidly and untreated waste discharges into the surrounding environment (MONRE, 2017).

As of December 2015, the urban population (including the inner city and township) was about 31 million people with an urbanization rate of about 35.7%, an increase of 1.2% compared to 2014 (MONRE, 2015). In many areas with rapid urbanization, green belts to protect the environment have not been planned and protected. The target of land for planting green trees in urban areas is too low, only about $2m^2$ / person. In general, the green tree system is only formed and concentrated in big and medium cities. In the two biggest cities of Hanoi and Ho Chi Minh City, this figure is about $2m^2$ / person, does not meet the Vietnamese standards and only 1/10 of the target of green trees of advanced cities in the world. Along with the rapid urbanization process, the living environment is under serious pressure from issues such as: domestic wastewater, solid waste, water pollution, noise pollution, air pollution... According to statistics in 2015, in 787 cities of Vietnam, there are 40 cities of which have waste water treatment facilities followed Vietnam standards. In which, these projects are mainly in special-class urban areas (2/2), grade-I ones (8/15), grade-II ones (10/25), grade-III ones (7/42) and Class V ones (13/628) with a total capacity of handling 800,000 m^3 / day. The rate of treated domestic wastewater is 10 - 11% of the total amount of urban wastewater, increasing 4 - 5% compared to 2010. Along with rapid urbanization, the increase in the number of personal transports continues to put pressure on the air environment in urban areas, especially in big cities like Hanoi and Ho Chi Minh City. Dust and emissions from urban traffic remain one of the major pollution sources to the air in these areas. At the same time, the quality of vehicles in traffic is limited (old cars and motobikes, not regularly maintained) has significantly increased the concentration of pollutants in the air (MONRE, 2015).

The air environment in Hanoi (Ngoc Ha, 2016; Van Chuong and Quang Anh, 2017; Nguyen Hoai, 2019), Ho Chi Minh City and other major cities are also in serious pollution levels (Nguyen Tien, Yen Trinh & Ha Nhan, 2016). According to the UNEP study in 2015, 98% of the Vietnamese population is directly affected by suspended dust pollution PM2.5 beyond the WHO's permitted level. The vehicles caused 70% of suspended dust pollution and 95% of volatile organic matter in the air. Activities considered to be major sources of air pollution such as: coal mining and processing; steel production; producing construction materials (cement) and thermal power, especially coal-fired power plants.

Air pollution caused by coal-fired power plants has caused social unrest such as in Vinh Tan 2, Binh Thuan (Viet Quoc, 2015); Pha Lai, Hai Duong (Nguyen Hoai, 2017), Cao Ngan Thermal Power Plant, Thai Nguyen (Tran Son - Le Duc Anh, 2018) ... and many other coal-fired power plants. Steel factories also contributed to making air pollution worse such as steel factories in Da Nang (Doan Nguyen, 2018); in Ba Ria - Vung Tau (Linh Nga, 2018); in Hai Duong (Thuy Chi - Tien Manh, 2018)... Air environment is also polluted due to the production activities of cement plants such as factories in Ninh Binh (Minh Tham - Quang Huy, 2016); in Quang Ninh (Nguyen Hung, 2018); in Quang Ngai (Minh Hoang, 2018); in Tuyen Quang (Thanh Han, 2019)...

According to IQAir's air quality report 2018, Hanoi city ranked 12th in the level of suspended dust pollution PM2.5 in the air.

In addition, urban domestic solid waste currently accounts for more than 50% of the total domestic solid waste of the country every year. Urban domestic solid waste arises mainly from households, public areas (streets, markets, offices, schools ...). Not only that, domestic solid waste also has hazardous solid wastes such as batteries, tube lights, mercury thermometers, pesticide shells, insect sprays ... That are discharged into domestic solid waste and bring to landfill. Besides, in recent years, Vietnam has developed coal thermoelectricity. According to statistics of the Ministry of Industry and Trade, there are currently 20 coal-fired power plants, consuming 45 million tons of coal per year, with a generation capacity of nearly 13,110MW, discharging about 15.8 million tons of ash every year and must use a total area of about 700 ha of waste dumps. Coal-fired power plants are mainly concentrated in the northern region (Quang Ninh, Ninh Binh, Hai Duong...) and the southern region (Ba Ria - Vung Tau, Can Tho, Ho Chi Minh City). Most of the old coal-fired power plants mainly use thermal condensate to stop steam, natural circulating boilers, low capacity, failing to meet Vietnam environmental standards. The distribution of coal-fired power plants mainly concentrated in big cities along with outdated technology has been putting considerable pressure on the air environment of these areas (MONRE, 2017).

In 2016, a series of serious water pollution occurred in our country, affecting not only the health, property and beliefs of the people but also the economic growth, attraction of foreign direct investment and images of Vietnamese tourism... The series of fish deaths in Vietnam in 2016 started with the incident of Formosa (Vo Hai & Hoai Thu, 2016) with the phenomenon of mass mortality in Vung Ang sea (Ha Tinh) then the phenomenon of fish deaths discovered in the waters of Quang Binh, Quang Tri and Thua Thien - Hue; Da Nang (Ha Nam, 2018). The dead fish event occurred in Van Ninh sea, Khanh Hoa province (Hai Lang & Van Giang, 2016).

In addition, the phenomenon of dead fish due to water pollution also occurs in rivers and lakes across three regions of Vietnam such as Buoi river, Thanh Hoa (Le Hoang, 2016); Hinh river, Phu Yen (Hong Anh, 2016); Dong Nai river, Bien Hoa (Hung Anh - Le Van, 2016); Sa Lung river, Quang Tri (Hung Tho, 2016); Cha Va river, Ba Ria - Vung Tau (Nguyen Long, 2016); West Lake, Hanoi (Vo Hai & Anh Minh, 2016; Pham Truong and Ngoc Tan, 2018); Cho Hom river, Thua Thien Hue (Dien Quang, 2017); Hoang Mai river, Nghe An (Nguyen Phe, 2017). Most of the causes of fish death have not been determined correctly but water pollution and toxins can still be one of the main causes.

The continuous occurrence of serious environmental pollution cases in Vietnam is alarming because most of these cases are discovered and reflected by the local people, independent research and press agencies. State agencies on environment management are hardly able to detect the above environmental pollution cases. The environment management agencies only really get involved when things have happened. This requires breakthrough

changes in the state management of natural resources and environment in Vietnam. In this report, we propose solutions to build and use the digital government in environment management to serve the sustainable development in Vietnam. The solutions for environment management proposed by the authors focus on digital government model in terms of technology and core applications to early detection, warning and decreasing the environment damage.

2. Results

2.1. Introduction of digital government strategy

In the OECD comparative study (OECD, 2016), the Recommendation of OECD on Digital Government Strategies was adopted in mid-2014 ("the Recommendation"). The Recommendation is the first international legal instrument on digital government. This document offers approach of a whole-of-government that solves the potential cross-cutting role of digital technologies in the process of design and implementation of public policies, and in achieving policy outcomes. The whole direction for the digital transformation of public services was outlined in the Recommendation, including a change from the ICT use to support better public sector operations, to combining strategic decisions on digital technologies in the building of overarching strategies and agendas for modernisation of public sectors, and the management of digital government strategies. The Recommendation also shows some principles to support this culture change within the public sector. There are three pillars in these principles: engaging citizens and open government to maintain public trust, improve governance for better collaboration and results, and strengthen capabilities to achieve return on ICT investments (see in Box 1).

Box 1. OECD Recommendation of the Council on Digital Government Strategies

Engage citizens and open government to maintain public trust

1. Ensure greater transparency, openness and inclusiveness of government processes and operations;

2. Encourage engagement and participation of public, private and civil society stakeholders in policy making and public service design and delivery;

3. Create a data-driven culture in the public sector; Improve governance for better collaboration and results

4. Reflect a risk management approach to addressing digital security and privacy issues, and include the adoption of effective and appropriate security measures, so as to increase confidence on government services;

5. Secure leadership and political commitment to the strategy, through a combination of efforts aimed to promote inter-ministerial co-ordination and collaboration, set priorities and facilitate engagement and co-ordination of relevant agencies across levels of government in pursuing the digital government agenda.

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6. Ensure coherent use of digital technologies across policy areas and levels of government;

7. Establish effective organisational and governance frameworks to co-ordinate the implementation of the digital strategy within and across levels of government;

8. Strengthen international co-operation with other governments to better serve citizens and businesses across borders, and maximise the benefits that can emerge from early knowledge sharing and coordination of digital strategies internationally; Strengthen capabilities to achieve return on ICT investments

9. Develop clear business cases to sustain the funding and focused implementation of digital technologies projects;

10. Reinforce institutional capacities to manage and monitor projects' implementation;

11. Procure digital technologies based on assessment of existing assets including digital skills, job profiles, technologies, contracts, inter-agency agreements to increase efficiency, support innovation, and best sustain objectives stated in the overall public sector modernisation agenda;

12. Ensure that general and sector-specific legal and regulatory frameworks allow digital opportunities to be seized.

Source: OECD (2014d), Recommendation of the Council on Digital Government strategies.

According to Digital Government Strategy of US Department of State, a comprehensive Digital Government Strategy aimed at delivering better digital services to the American people was launched on May 23, 2012. This strategy establishes on several initiatives, including Executive Order 13571, Streamlining Service Delivery and Improving Customer Service, and Executive Order 13576, Delivering an Efficient, Effective, and Accountable Government. U.S. Government agencies are demanded to "build a 21st century digital Government that delivers better digital services to the American people."

Open data is one of the components of the digital strategy which was further promoted though Memorandum M-13-13, Open Data Policy-Managing Information as an Asset. The goals of the Open Data Policy are to increase operational efficiencies at reduced costs, improve services and support mission needs, to safeguard personal information and to increase public access to valuable government information.

Achieving efficiency, transparency, and innovation through reusable and open source software as described in Memorandum M-16-21 Federal Source Code Policy (FSCP) is another component of the digital strategy. An inter-bureau working group within the State Department has drafted policy to address the technical implementation of the FSCP mandates in order to comply with the FSCP.

2.2 Some solutions to promote digital government development in environmental management and sustainable development

2.2.1 Building environmental information system based on the industrial revolution 4.0
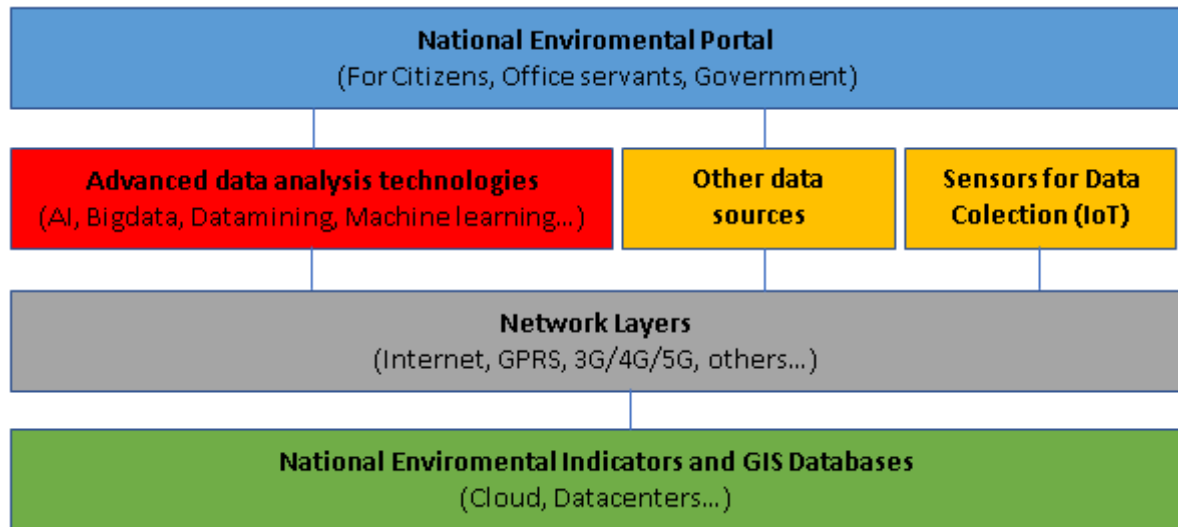

Figure 1. National Enviromental Information System Solution

- **Developing a national database on environment**. The national database is centrally managed, distributed according to administrative maps based on multi-layer GIS technology, reflecting updated information on the status of each geographical position being used with the function What, the legal entity is using … For each region, the geographical location will be associated with the corresponding environmental indicators. For example: urban areas: indicators such as temperature, noise, suspended dust, CO_2, Nox, HC and other environmental indicators. The national environmental database will be a shared data source for different applications for the purpose of managing, researching, evaluating and predicting issues related to environmental change and fluctuations. National database of environment can be stored with cloud computing technology (Cloud Computing) to serve anytime, anywhere with a large number of visitors.

- **Establishing automatically systems for collecting environmental indicators**. With the development of science today, especially the development of the sensor and connection technology (IoT), technology allows us to collect environmental indicators automatically, through the sensor system, that is connected to the database server in real time. Environmental observers and researchers can analyze data as quickly as possible through the collected software systems and databases. Here, environmental indicators are not only observed independently but can be linked to other data to be able to find the characteristics of the positions to be managed.

- **Applying the modern tools of Information Technology in analysis and forecasting**. With the national database of environment, researchers and managers can use advanced technologies for data processing and management such as Big data, artificial intelligence in analyzing, forecasting and early warning of environmental problems. In

addition to dealing with immediate situations, software systems can allow for early forecasting, building models and simulating environmental states under different conditions for alerting. Early, these systems can also minimize risks and damages when environmental incidents occur.

- **Developing a national environmental portal - Digital government portal on the environment**. This is a software system that allows managers to access real-time information about the state of the environment anywhere from a national database. At the same time, with the integration of modern data analysis technologies as mentioned above, it is possible to capture instant information to take appropriate management measures. The system will also be decentralized to be able to capture or receive early warning of environmental phenomena based on collected data. In addition to serving managers, the national portal on the environment also serves people. People can monitor and capture environmental information through this portal, and this is also the channel that people reflect and update the environmental status directly to managers. Applications on smart devices also need to be developed to meet the needs of government, regulatory agencies and people corresponding to the national environmental portal.

2.2.2. Developing a digital legal framework for environmental management and sustainable development

In order to be able to manage and protect the environment in a proactive and effective way, it is necessary to develop and improve the digital government, including the interaction between people who act as co-supervisors together with the goverment agencies. In addition to technological solutions, there is a legal corridor for environmental management and sustainable development based on the help of technology.

- It is necessary to have legal documents, regulating the functions and powers of state administrative units on environment in the exploitation, use and updating of the national database on environment as well as the update environmental information in the national database.

- There should be regulations for any legal entity when developing facilities for production and construction of factories and buildings… there must be environmental sensor systems connected to the national system, gradually taking shape forming cities, smart regions. It is also a useful source of information for national databases.

- There are processes to receive and respond to citizens' opinions and information when people update environmental information on the portal.

- Ministry of Natural Resources and Environment is the focal point to manage and supervise the updating of the national database on environment, through client / citizen feedback data to direct and establish plan, handle to minimize and timely monitor abnormal environmental developments.

- Granted the right to update data for sub-admin is the Department of Natural Resources and Environment of provinces and cities under central authority. Local

Departments of Natural Resources and Environment are the main focal points for updating databases in their localities. Responsible for responding through specific measures to minimize negative environmental impacts. Promptly preventing situations can lead to bad scenarios for the environment.

- Law on regulations for topics, projects, scientific research projects … related, using or having output products related to environmental situation in the territory of Vietnam must be update to the national database system on environment. Data, parameters of surface water quality, groundwater, sediment, soil, air, noise… must specify the date and time of sampling, weather, taking photos of the sampling area, sampling coordinates and sample analysis results can be convenient for assessing the evolution of the environment. This will be useful for forecasting future developments in the environment, as well as a scientific basis for making policy recommendations for management levels.

3. Discussion and Conclusion

Currently, we are entering the 4th industrial revolution, the design, construction and use of digital government in environmental management is the most necessary and urgent job in the context of Vietnam is facing a wide range of challenges in managing land, water and air environments. The inclusion of modern technology in the process of building the government is no longer an insurmountable challenge. The problem is that we need to have a team of experts in many fields to study together, find the best solution for building a number of governments, including a special service module for environmental management. In addition, functional units in charge of environmental management also need to propose mechanisms and policies so that people can participate actively, responsibly and transparently on management issues environment.

In this article, the authors have proposed building a digital government on environmental management through a model of environmental information system solutions that apply advanced technologies to serve management and early warning us against serious environmental issues. In addition to the construction of a digital government on the environment, we also need to create a legal framework, legalize the regulations for updating environmental parameters in sensitive areas. Clear and specific provisions for organizations and individuals on environmental responsibility. In subsequent articles, the authors will delve into each information system in the overall solution of the information system for digital transformation in environmental management.

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