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The development of sustainable policies to manage noise around airports in Vietnam

Thi Thanh Vu[1]
Civil Aviation Authority of Vietnam
119 Nguyenson Street, Long Bien District, Hanoi, Vietnam

Thu Lan Nguyen[2]
Department of Architectural Design, Shimane University
Nishikawatsu-cho 1060, Matsue, Shimane 690-8504, Japan

Masaharu Ohya[3]
RION Co., Ltd.
3-20-41, Higashi-motomachi Kokubunji, Tokyo 185-8533, Japan

Keishi Sakoda[4]
RION Co., Ltd.
3-20-41, Higashi-motomachi Kokubunji, Tokyo 185-8533, Japan

Ichiro Yamada[5]
RION Co., Ltd.
3-20-41, Higashi-motomachi Kokubunji, Tokyo 185-8533, Japan

ABSTRACT

Before the outbreak of the Corona pandemic, Vietnam was one of the world's fastest-growing aviation markets. With the ambition that more than ninety percent of the population will have access to the airport within 100 km, the Vietnamese government approved developing the airport systems of 22 existing airports and six new airports. The rapid increase in air traffic in Vietnam has given rise to serious noise problems around airports. Preservation of the living environment for the areas around the airport was an urgent task for the Vietnamese government. Although the situation has entirely changed by the pandemic, environmental problems will be severe again as the aviation industry recovers. Therefore, a sustainable approach is to create a policy framework to prevent and decrease noise from air traffic parallelly with strengthening the air transport network. However, although Vietnam issued standards for general environmental noise, there had not been a legal and regulatory

[1] thanhvt@caa.gov.vn

[2] lan@riko.shimane-u.ac.jp

[3] ohya@rion.co.jp

[4] kcie@rion.co.jp

[5] i-yamada@aeif.or.jp

system that formed the basis of policies for aircraft noise. In this paper, the authors introduce Vietnam's viewpoints and efforts in developing the framework related to noise management around airports and discuss future issues and prospects. The authors summarize the activities that the Civil Aviation Authority of Vietnam has been working on with the support of Japanese experts for several years before the outbreak of corona on noise policy development in Vietnam, including evaluation methods and monitoring technologies. These efforts have formed the basis for Vietnam's aviation noise policy.

1. INTRODUCTION

In recent years, Vietnam has witnessed the development of the economy and the expansion of air traffic. Before the outbreak of the Corona pandemic, the air traffic passenger increased with an average growth rate of 16% per year [1]. After a period of business decline due to lockdown orders, recently, flight sectors are gradually recovered. It is predicted that the aviation industry will soon return to its previous growth rate. To meet the growing demand, The Vietnamese government is actively enhancing the serviceability of air transport. A newly released master plan for developing national airports and the air transportation system between 2021 and 2030 with a vision for 2050 focused on enhancing two significant hubs in Hanoi and Ho Chi Minh City and forming the airport transportation network connecting 14 international and 15 domestic airports [2]. However, the increase in the number of flight movements at airports located among densely populated areas has raised concerns about the impact on the living environment, especially the problem of noise pollution. The increased complaints urge the stakeholders to have suitable measures against aircraft noise. It is also challenging for the management authorities to minimize causes for complaints by reducing noise impact on people's lives while enhancing air transportation.

In 2018, the World Health Organization developed environmental noise guidelines and provided relationships between exposure to environmental noise and the proportion of people affected by specific health effects [3]. According to the guidelines, bringing together planners, environmental professionals, and public health experts with policy-makers and citizens is key to public acceptability and involvement and the successful guidance of the decision-making process in planning transport schemes, new infrastructures, noise reduction, and mitigation strategies. It is also advised that the communities potentially affected by a positive or negative change in noise exposure should be well informed and engaged from the outset to maximize potential health benefits.

The Vietnamese government also recognized that environmental protection in compliance with international principles is a condition for sustainable economic development. The aviation authorities, in particular, also want to apply WHO recommendations related to reducing the health impacts of aircraft noise. However, legal regulations regarding aircraft noise have not been established yet, so it is impossible to take legal action based on consultations with residents around the airport in Vietnam. It is urgent to propose and prepare legal measures and methods to address noise problems at existing airports and address various environmental issues during further airport expansion and new construction. Since 2014, the Civil Aviation Authority of Vietnam (CAAV) has taken the first steps to develop policies to mitigate the noise impact of the activities of the airports.

This paper presents Vietnam's viewpoints and efforts in developing the framework related to noise management around airports. The authors summarize the activities on noise policy development in Vietnam, including evaluation methods and monitoring technologies, and discuss future issues and prospects.

2. LEGISLATIVE FRAMEWORK FOR ENVIRONMENTAL PROTECTION IN VIETNAM

2.1. History of the noise policy

The regulatory context in Vietnam represents the government as a learning organization and a reliance on international standards regarding environmental regulation and planning. Following the adoption of the Law on Environmental Protection (LEP) in 1993, Vietnam issued its first important Resolution in Directive No. 36-CT/TW in 1998 to strengthen environmental protection in a period of national industrialization and modernization. Since then, Vietnam's national policies have been increasingly concerned with environmental protection. The issuance of the Resolution reflected the government's willingness to address environmental pollution as part of Vietnam's unprecedented growth.

Đổi mới is the name given to the economic reforms initiated in 1986 for a "socialist-oriented market economy." As a result of *Đổi mới,* many privately-owned enterprises were permitted in commodity production. At the same time, Vietnam has the disadvantage of legacy industrial equipment. Many old machinery and equipment with very high noise levels continue to be used in many production facilities. In a questionnaire survey of workers in factories with old technology and new technology, 85% in the old factories described themselves as noise-exposed compared with 47% in the newer factories [4]. As part of a renovation, the government anticipated that the introduction of Foreign Direct Investment (FDR) would cause adverse impacts on the working and community environment, which has occurred in some other developing countries due to FDR. Therefore, an environmental assessment was required for all the proposals for FDR[5].

Government officials recognized that regulations concerning the living environment and professional expertise were needed to implement the environmental and social protections against the adverse impact of FDR. Vietnam enacted its workplace regulation in 1979 with the issuance of TCVN 3150-1979 before the issuance of regulations on community noise exposure. On the other hand, community noise regulation began with the issuance of TCVN 5949-1998 [6]. The limits are given in Table 1. These criteria regulate the maximum permitted noise level in public and residential areas irrespective of the noise sources.

Table 1: Vietnamese National Standard "TCVN 5949-1998—Acoustics—Noise in public and residential areas—permitted maximum noise level."

Land use in receiving area	L_A (dB) by time		
	6:00-18:00	18:00-22:00	22:00-6:00
1. Areas that need special quietness: hospitals, libraries, kindergartens, nursing homes, schools, churches, and temples	50	45	40
2. Residential areas, hotels, hostels, and administrative offices	60	55	50
3. Residential areas that scatter in the areas of commerce, service, and production	75	70	50

To a large degree, these standards are based on the collective experience in Europe and Japan. Still, there is a doubt that the population of southeast Asia has the same sensitivity to noise as people who evolved in a quieter environment, such as the evergreen and deciduous forests of northern Europe. It is important to investigate the applicability of Western-generated community noise standards to Vietnam. The first step in this process was calibrating Chinese, Korean, and Vietnamese language

annoyance scales against the standardized Euro-American scale recommended by ICBEN 6 [7]. Further work has compared Vietnamese annoyance to traffic noise with and without the ubiquitous horns from motorbikes which characterize the sound of urban traffic [8]. This research is consistent with the hypothesis that Vietnamese habituate to the motorbike horns to the point that they have no effect on annoyance and become sensitive to the horns only after living in a Japanese city where such intrusive sounds are rare.

Since 2005, socio-acoustic surveys in Vietnam to accumulate data for the foundation of a noise policy framework have been conducted within joint research between Vietnamese and Japanese universities. As a result, representative exposure-response relationships have been established for the Vietnamese community and compared with those in the European Union (EU) and Japan as a prerequisite for formulating noise policies in Vietnam. Further comparison between Vietnamese reaction to road traffic and aircraft noise shows distinct differences, with a greater annoyance to aircraft noise [9]. These community noise regulations address the needs of the most vulnerable. As can be seen in Table 1, the Vietnamese standard provides extra protection for hospitals, kindergartens, and nursing homes. In addition, the issue of Vietnamese noise sensitivity has been addressed [10]. The results are consistent with Euro-American and Japanese research identifying the residents that are noise sensitive as a segment of the population that is more sensitive to environmental stimuli.

2.2. Review of current environmental standards relating to noise Policy

This part summarizes Vietnamese laws and regulations regarding the measurement and evaluation of aircraft noise. In 2010, TCVN 5949:1998 was superseded by a newer national technical regulation on noise QCVN 26:2010/BTNMT, issued by the Ministry of Natural Resources and Environment (Table 2) [11]. This regulation prescribes the maximum noise limits in areas where humans live and work. This regulation aims to control all man-made noise, regardless of noise sources and their location. With this standard, "special" areas are denoted as noise-sensitive areas such as medical establishments, libraries, kindergartens, schools, churches, temples, and pagodas, while "usual" areas contain apartment buildings, detached or terraced houses, hotels, guest houses, and administrative agencies. Dividing a day into three intervals in TCVN 5949:1998 was replaced by dividing a day into two intervals in QCVN 26:2010/BTNMT.

Table 2: Vietnamese National Technical Regulation on Noise (QCVN 26:2010/BTNMT)—permissible noise limits (in decibel), L_A (dB).

No.	Area	From 6:00 to 21:00	From 21:00 to 6:00
1	Special areas	55	45
2	Usual (general*) areas	70	55

*noted by the authors.

The WHO guidelines recommend reducing noise levels produced by aircraft to below 45 dB L_{den} for average noise exposure, as aircraft noise above this level is associated with adverse health effects [3]. They also recommend levels below 40 dB L_{night} for night noise exposure, as nighttime aircraft noise above this level is associated with adverse effects on sleep. Vietnam's National Technical Regulation on Noise (QCVN 26:2010/BTNMT) regulates noise limits in the daytime and the nighttime to be 55 and 45 in special areas, respectively, and 70 and 55 in usual areas, respectively. This regulation is somewhat consistent with the WHO's guidelines, but only for special areas; it is much higher than what the WHO recommends for usual areas. According to the measurement results in the socio-acoustic surveys on the impact of aircraft noise, many residential areas around the three major airports

in Vietnam—NBIA in 2017, DAD in 2018, and TIA in 2019—have noise levels exceeding 55 dB [12, 13]. The regulation of permissible noise limit to be under 55 dB seems not to be applicable for the case if the noise source is aircraft noise that affects the population living near the airports.

In addition, the government also promulgates Building Standards regulating the maximum permitted noise level for public buildings – or Design standards (TCXDVN 175:2005). These standards regulate specific permissible noise limits depending on the function of the building. This standard requires that the noise level inside the patient room in the hospital is not more than 45 during the daytime (6~22) and 35 at night (22~6). Thus, the noise difference between inside and outside the buildings is at least 10 dB to meet the Technical Regulation on Noise (QCVN 26:2010/BTNMT) and this building standard. TCXDVN 175: 2005 is being revised and soon replaced by a new standard.

Regarding the noise measurement methods, Vietnam National Technical Standard Committee (TCVN/TC 43 Acoustics) composed a national standard of description, measurement, and assessment of environmental noise (TCVN 7878:2010), including two parts: Part 1: Basic quantities and assessment procedures; and Part 2: Determination of environmental noise levels. The content of TCVN 7878:2010 is compliant with ISO 1996-1:2003 and ISO 1996-2:2007. In general, international standards were adopted as they are when composing the corresponding national standards.

It can be seen that around Vietnam's major airports, not only residential areas, there is also a dense concentration of public buildings that strictly require quietness, such as hospitals and schools. Maintaining the environment around airports to meet Vietnamese standards and international guidelines is a challenge for aviation authorities.

3. PROGRESS OF THE AIRCRAFT NOISE POLICY FORMULATION

3.1. Context of aircraft noise policymaking

Advancements in aviation, motorization and social modernization are expected to accelerate in Vietnam in the 2020s. CAAV proposed an adjusted planning for the development of air transport by 2020 and the orientation towards 2030. This plan is after and according to the Law on Government Organization dated 19 June 2015 and the Law on Vietnam Civil Aviation dated 29 June 2006. At the request of the Minister of Transport, the Vietnamese government approved this plan and issued a decision on approval of the plan (Decision No.236/QD-TTg). By implementing this plan, Vietnam actively enhances air transport's serviceability and upgrades the airport system to accommodate approximately 278 million passengers. More than 95% of the population will have access to the port within 100 km. This plan includes gradual upgrades for 22 existing airports' effective utilization and investment in 7 new airports. However, the increased operation of night flights has raised awareness of the health effects of annoyance and sleep disturbance of the community in the vicinities of the airports. This service and infrastructure growth process need to be accompanied by environmental management policy system to ensure sustainable development.

Since 2014, the Civil Aviation Authority of Vietnam (CAAV) has taken the first steps to develop policies to mitigate the noise impact of the activities of the airports. Acknowledging the importance of predictive noise maps in devising environmental measures, CAAV has commanded major airports to create noise maps as the basis for land use planning and noise control for areas around airports. This task, in turn, requires suitable noise measuring systems that can perform continuous monitoring. The accuracy of noise maps can be verified by monitoring changes in the noise exposure around the airport over a long period. This duty was challenging because there were no equipment and experience operating aircraft noise monitoring systems. Other concerns are paying for issuing specific standards and regulations for aircraft noise and measures that suit the individual airport's actual situation. Vietnam's advantage in building its policy is that WHO and ISO have issued many international

standards and guidelines based on decades of research in the West. These policy systems have already been used and are available for adoption. A policy framework could be formed by referring to these available resources and adjusted to fit the country's situation.

3.2. Collaborative project with Japan

Against the above context, from 2017 to 2019, CAAV, the Japan International Cooperation Agency (JICA), and RION Co., Ltd. implemented a cooperation project on Airport Environment Preservation and Aircraft Noise Monitoring in Vietnam. Since the problem of aircraft noise was entirely new for most environmental experts in Vietnam, the project's first step is to promote understanding and sharing of awareness and knowledge about aircraft noise issues through a collaboration of experts from Vietnam and Japan. Vietnamese authorities had a field trip to inspect measurement equipment installation and operation status of Narita Airport in June 2018. During a field trip, seminars on Japan's experience in the implementation of aircraft noise policy were held. The Japanese team introduced measuring instruments for monitoring aircraft noise and guidance on measurement technology. A series of seminars to share knowledge regarding aircraft noise issues among Vietnamese and Japanese stakeholders was held in the 2018-2019 period. The guidance manual for Vietnam's aircraft noise monitoring and airport environment maintenance operations was built referring to technology and experience accumulated in Japan. A guidance manual for monitoring and evaluating aircraft noise around airports in Vietnam was issued as a national decision in Feb 2019 [14].

Next, to conduct practical training for data handling and practice measurement techniques guided in the manual, a system of four stations for the continuous monitoring of aircraft noise was installed around Noi Bai International Airport (NIA). In aircraft noise monitoring, methods of measurements, evaluations, and countermeasures are often proposed corresponding to the specific situation of each airport. Still, it is common to unify the device specifications and monitoring content of monitoring equipment at all airports. As a model case, a system installed for NIA includes the minimum-required equipment with four noise monitors. With these four sets of aircraft noise monitoring equipment, project members get an overview, assign a person in charge at Noi Bai Airport, and learn how to handle data. The operation of the aircraft noise monitoring system at Noi Bai provided tools for noise evaluation, noise modeling, and monitoring. Especially, specific practical skills were gained from using this introduced equipment.

3.3. Further progress in establishing environmental policies regarding aircraft noise

CAAV has recently drafted and issued two documents placing the basis for developing a policy framework to mitigate the impact of aircraft noise. First, the Law on amendments to some articles of the Law on Vietnam Civil Aviation, or an updated Vietnam Aviation Law, was issued. According to Article 14 of this new law, all the airport operators must make an aviation noise map and send it to the CAAV, airports authority, and provincial People's Committee. The airport operators also have to cooperate with local governments to reduce noise generated from the airport's operation to prevent it from affecting the surrounding residential community.

Next, the Decree on management and operation of airports and airfields (Decree No. 05/2021/ND-CP) was issued with contents regarding Environmental protection at airports and airfields. Notably, Article 54 regulates that (1) organizations and individuals operating at airports and airfields must comply with regulations on environmental protection at airports and airfields, and (2) The operation of aircraft, airports, airfields, and equipment serving flight operations and other ground technical equipment and the provision of services at airports and airfields must meet standards on noise, emissions, and other standards on environmental protection in civil aviation activities.

In the next phase, Vietnam will issue specific regulations for aircraft noise. For example, the maximum permissible noise level in residential areas around the airport, land use planning around the new airport, and strictly managing the construction and use of the land around the existing airports. CAAV will also provide regulations for the authorities to make adequate compensation for affected households and encourage airport operators to actively monitor and adjust flight activities to avoid negative impacts on the environment.

4. CONCLUSIONS

This paper introduces Vietnam's viewpoints and efforts in developing the framework of noise management around airports and discusses future issues and prospects. The Civil Aviation Authority of Vietnam has been working with the support of Japanese experts for several years, including aircraft noise evaluation methods and monitoring technologies, which are expected to be helpful in forming the basis for Vietnam's aviation noise policy. Although the sequence of noise regulation development in Vietnam appears to follow the international standard, there are still challenges in improving the applicability and practicality of environmental legislation in Vietnam. In addition, the health effect of environmental noise that has been paid much concern in Europe and North America appears to be of limited awareness in Vietnam. Vietnam is in the first step of laying the foundation for developing its aircraft noise policy. This work requires close cooperation between responsible domestic stakeholders and the consulting and support of international organizations and foreign experts.

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