A Metric Matrix Establishment for Cases Studies on the Effectiveness of the Key Environmental Protection Policies for Transportation Pollution Control

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ABSTRACT

In a study of the Effectiveness of the Key Environmental Protection Policies for Road Traffic Noise Control, the authors discussed 20 international case studies of road traffic and noise management. Although the key international environmental policies for road traffic noise control in developed countries are very technologically, economically, legally, and sociologically mature, these policies do not always result in compatible land use: roadways and highways are still built too close to existing residential areas, and vice versa. In China these issues are exacerbated due to its rapid urban growth and industrial expansion. In this paper, the authors expand their study to include non-noise policies (air pollution, public participation in the planning process, and other important factors) but the noise & vibration are the first impact metrics (e.g. airport, railway, shipping), and suggest a multi-dimensional matrix for such cases studies. At last, an airport case in China is employed to show the sharpened metric matrix emphasizing the compatible land use, because the noise metric dominates to the other ones in airport transportation construction demonstrating the matrix effectiveness. And the future work would be expanded to all transportation types cases.

Keywords: Moving noise sources:13; Community noise control:52; Economic effects:67; Environmental impact statements:68. National government legislation and regulations:82.

1. INTRODUCTION

In reference (1), the authors discussed 20 international case studies of road traffic and noise management. Although the key international environmental policies for road traffic noise control in developed countries are very technologically, economically, legally, and sociologically mature, these policies do not always result in compatible land use: roadways and highways are still built too close to existing residential areas, and vice versa. In China these issues are exacerbated due to its rapid urban growth and industrial expansion. In this paper, the authors expand their study to include non-noise policies (air pollution, public participation in the planning process, and other important factors) but the noise & vibration are the first impact metrics (e.g. airport, railway, shipping), and suggest a multi-dimensional matrix for such cases studies. At last, an airport case in China is employed to show the sharpened metric matrix emphasizing the compatible land use.

2. METRIC MATRIX ESTABLISHMENT FOR TRANSPORTATION POLLUTION CONTROL

A detailed metric matrix for the EIA of transportation projects is suggested & shown in Table 1.

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Table 1 − A Metric Matrix Establishment for Cases Studies for Transportation Pollution Control

Metric Matrix		Reference		Metric Matrix	Airport	Railway and Rail Transit	Highway and Urban road	Harbor/Shipping or River channel	Pipe line
1. Project Description	General Information	11	A	Project Name and Department	★	★	★	★	★
			B	Type of project (New development / Expansion / Alteration / Addition / Relocation)	★	★	★	★	★
			C	EIA information (Consultant; Issue date; Statutory approval date)	★	★	★	★	★
			D	Feasibility study & Design Institute	★	★	★	★	★
			E	Project Location (GPS, if available)	★	★	★	★	★
			F	Administrative Locality and s map of geographic Position, in an Appendix	★	★	★	★	★
	Project Type	12	A	Project Type	Civil /General	Railway/ Transit/Metro	Highway (Expressway, arterial & access roads	Harbor Work Area/Shipping or River channel	line of pipes
			B	Land zoning maps (sensitive uses & transportation)	★	★	★	★	★
	Construction and Operation schedule	13	A	Construction dates (Beginning / End)	★	★	★	★	★
			B	Operation period(Start / Mid-term / Long-term)	★	★	★	★	★
	Investment Cost	14	A	Design Engineering Investment and Environmental engineering Investment	★	★	★	★	★
			B	Post EIA New Engineering Investment and environmental Costs					
	Project variation and extension	15	A	Project variations and extensions	★	★	★	★	★
	Relationship with the planning scheme	16	A	Consistency with urban planning scheme / planning EIA	★	★	★	★	★
2 Characteristics	Design Specifications	21	A	Grade, Massing, dimensions, including aided engineering, such as important buildings, stations, bridges, tunnels, etc.	★	★	★	★	★
	Project	22	A	Traffic Volume and Speed	★	★	★	★	★
	Land use	23	A	Permanent and temporary land occupation	★	★	★	★	★
3. Assessment categories	Noise and Vibration	31	A	Noise/Vibration/Electromagnetic impact rating class (1~3)	★★★★★	★★★★	★★★	★★	★
			B	Noise/Vibration/Electromagnetic Assessment Range	200~5000m	200m/60m	200m/60m	200m	200m/
			C	Noise sensitive receptors: location ; number (household / population) /type (schools / hospitals / fauna)	★	★	★	★	★
	Water Quality	32	A	Surface water/ground water quality impact rating class (1~3)	★	★★	★★	★★★★★	★★★
			B	Sensitive water resources: location; distance; type (drinking water source; river; spring; well; fisheries)	★	★	★	★	★
	Air Quality	33	A	Air Quality impact rating class (1~3)/ Atmospheric risk class(1~2)	★★★	★	★★★	★★	★
			B	AQ sensitive uses: locations / number (household / population) / type (schools / hospitals)	★	★	★	★	★
	Ecological and Social Environment	34	A	Ecological impact rating (1~3)	★	★★★★	★★★★	★★	★★★
			B	Protected areas: location; distance; type (natural reserves, scenic areas, national parks, wetlands, fish spawning areas, flora, fauna and habitat, areas of cultural or heritage significance)	★	★	★	★	★
	Assessment Standard/ criteria	35	A	Confirmation of Assessment Standard/Criteria by local authorities	★	★	★	★	★
4. Baseline Environmental quality	Noise & vibration	41	A	Noise / vibration criteria and baseline levels at sensitive receptors	★	★	★	★	★
	Water Quality	42	A	Water quality criteria and baseline levels	★	★	★	★	★
	Air Quality	43	A	Air quality criteria and baseline levels	★	★	★	★	★
	Ecological environment	44	A	Ecological criteria and quadrate sample baseline levels	★	★	★	★	★

Metric Matrix		Reference		Metric Matrix	Airport	Railway and Rail Transit	Highway and Urban road	Harbor/Shipping or River channel	Pipe line
5. Environmental Impact Assessment	Noise and Vibration Impact	51	A	Exceedence of noise/vibration criteria (Location; number; type)	★	★	★	★	★
	Ecological Environmental Impact	52	A	Earthworks (excavation/fill/backfill); water retentions	★	★	★	★	★
			B	Impact on protected flora and protected species fauna	★	★	★	★	★
			C	Impact on protected areas (natural reserves, scenic areas, national parks, wetlands, fish spawning areas, areas of cultural or heritage significance): incursion, boundary adjustment	★	★	★	★	★
	Water Quality Impact	53	A	water supply works, waste water generation, main sewage treatment volume	★	★	★	★	★
			B	Evolution of water quality indices (drinking water resources, rivers, springs, wells): location, distance; Emergency discharge incidents and emergency response plan and measures	★	★	★	★	★
	Air Quality Impact	54	A	Risk of exceedence of air quality criteria and evolution of air quality indices (Location; number; type); Emergency discharge incidents and emergency response plan and measures	★	★	★	★	★
	Solid waste	55	A	hazardous wastes; oil wastes, chemical and biological sludge; waste generation	★	★	★	★	★
6. Environmental Protection Measures	Noise & Vibration control measures	61	A	Specifications, cost and performance of noise and vibration control treatment, (e.g.: noise barrier, vibration dampers)	★	★	★	★	★
			B	Type and number of noise sensitive receivers displaced / relocated	★	★	★	★	★
			C	Type and number of noise sensitive receivers benefiting from architectural sound insulation treatment, (e.g. windows retrofitting)	★	★	★	★	★
			D	Total costs of noise and vibration mitigation treatment	★	★	★	★	★
			E	Total costs for displacement / relocation due to noise & vibration	★	★	★	★	★
			F	Ratio（%）of noise and vibration control cost to total environment protection investment	★	★	★	★	★
	Waste water control measures	62	A	Costs and its evolution of wastewater treatment and disposal, of risk prevention and emergency response.	★	★	★	★	★
			B	Ratio（%） of Waste water process cost to total environment protection investment	★	★	★	★	★
	Air control measures	63	A	Risk prevention and emergency response plans and measures	★	★	★	★	★
	Solid waste control measures	64	A	Solid waste management and disposal	★	★	★	★	★
	Ecology protection	65	A	Flora and fauna protection measures and optimization / Boundary optimization (natural reserves /Scenic areas / national parks/wetlands / fish spawning areas / areas of cultural or heritage significance). Relocation of borrow pits and disposal areas, creation of wildlife corridors Cost and effectiveness, ratio of the cost of the total environment protection investment	★	★	★	★	★
	Environmental protection investment	66	A	Total environmental cost and its evolution	★	★	★	★	★
7. Public consultation	Community groups	71	A	Number of community groups surveyed, their response, and approval %	★	★	★	★	★
			B	Number of community groups located within the noise EIA range	★	★	★	★	★
			C	Disapproval %	★	★	★	★	★
	Individuals	72	A	Number of individual surveyed, their response, and approval %	★	★	★	★	★
			B	Number of individuals located within the noise EIA range	★	★	★	★	★
			C	Disapproval %	★★★★★	★★★	★★★	★★	★

Note: Factors that require consideration are marked using stars (★), the number of which if the weighting relative to the importance of the factor.

3. CASE STUDY

3.1 Background

In order to illustrate how the detailed metric matrix emphasizes compatible land use, the proposed new airport in Beijing, China is selected as a case study since for this project, noise issues dominate the other criteria. The Beijing new airport is proposed in the Daxing district, 46 km south of Beijing City centre. A location map and the airport layout plan are shown in Figure 1. Noise contour maps, in terms of the Weighted Equivalent Continuous Perceived Noise Level (WECPNL) predicted for 2025 & 2030 are shown in Figure 2.

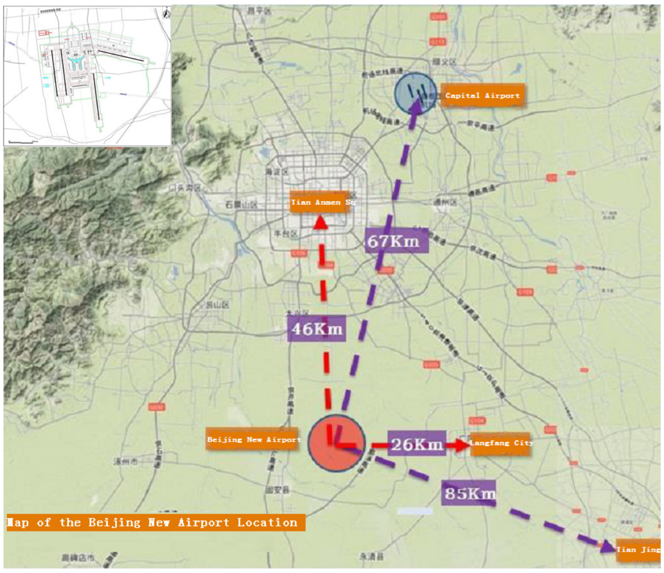

Figure 1 – Map of the Beijing New Airport Location and it's Plan Layout (2, 3)

3.2 Ratings based on the established metric matrix

Table 2 gives a detailed list of the impacts and their rating provided in the EIA report and its statutory approval. From an environmental protection perspective, the new airport construction is generally acceptable after implementation of environmental protection measures. Environmental mitigation measures, such as effective reduction of flight noise, treatment of disposal of waste gases，solid wastes and waste waters, can enable to control pollution so as to reach adequate standards. The impacts to the surrounding sensitive uses can be limited to acceptable levels.

3.3 Discussion on the effectiveness of airport noise policies

3.3.1 Planning control: highest level and the most effective approach

China has been benchmarking international practice for noise mitigation around airports, including the implementation of architectural treatment for improved sound insulation of residential buildings in zones where the noise levels exceed standard limits. Nevertheless, planning control is the highest level and most effective way to mitigate critical airport noise. In this context, flight paths generally avoid residential zones and other planned noise sensitive uses in Daxing district for 2025.

In 2015, the north to south landing flight paths will start approximately above the sixth ring road, at an altitude of 8,000m. The take-off paths will all avoid flying over Beijing City. There is therefore no conflict between flight paths and land planning, and the noise impact to the City is limited.

As a result, it can be concluded that the new airport is in agreement with the general urban planning schemes for both Beijing City and the Daxing district. While the planning scheme for the city of Langfang, adjacent to Daxing district includes a reservation for the airport, some residential zones or some cultural and educational areas are occasionally situated within the WECPNL contour 70 dB or more. The planning scheme needs to be optimized and adjusted.

Table 2 − An application of the established Metric Matrix for an airport case study

Metric Matrix		Reference		Metric Matrix	Airport	EIA response
1. Project Description	General Information	11	A	Project Name and Department	★	Beijing New Airport. Development organizer, Air traffic administration of North China and China National Aviation Fuel Group Corporation Project Department No. 1
			B	Type of project (New development / Expansion / Alteration / Addition / Relocation)	★	New development
			C	EIA information (Consultant; Issue date; Statutory approval date)	★	Beijing Guohuan Tiandi Environ. Technology Development Center Co. Ltd. Reviewed by the State EPA May-June 2014, agreed upon during executive meeting of 16 June 2014; approved 19 June 2014
			D	Feasibility study & Design Institute	★	China Civil Aviation Construction Group Company
			E	Project Location (GPS, if available)	★	Location detailed in Figure 1. Slant distance to Tiananmen Sq.46 km
			F	Administrative Locality and map of geographic Position, in an Appendix	★	See Figure 1
	Project Type	12	A	Project Type	Civil/General	Large scale civil airport – international transportation hub
			B	Land zoning maps (sensitive uses & transportation)	★	See Figure 1
	Construction and Operation schedule	13	A	Construction dates (Beginning / End)	★	Completion of main works in 2017. Start of operation in 2018
			B	Operation period(Start / Mid-term / Long-term)	★	Current & future stages for year 2018, 2025 & 2030
	Investment Cost	14	A	Design Engineering Investment and Environmental engineering Investment	★	Total investment (Chinese Yuan): About ￥86.2 billion
			B	Post EIA New Engineering Investment and environmental Costs		
	Project variation and extension	15	A	Project variations and extensions	★	Where necessary, amendments to the EIA will be required
	Relationship with the planning scheme	16	A	Consistency with urban planning scheme / planning EIA	★★★	Yes
2 Characteristics	Design Specifications	21	A	Grade, Massing, dimensions	★	Airport engineering: Design aviation grade 4F, four runways with length 3,800m and width 60m; maintenance buildings; air traffic control tower; fuel tanks and supply facilities
	Project	22	A	Traffic Volume and Speed	★	2025 capacity objectives: 72 million passengers; 628,000 take-offs & landings, 2 million Tons of goods (Average daily operations: 1,721 take-off & landing). Aircraft types: A380, B747,A350,B777,A330, A340, B747, B787, B757, B367, B737, A320, C919, ARJ, EMB, CRJ.
	Land use	23	A	Permanent and temporary land occupation	★	New buildings: 70 ha gross area; Total land use: 3,031.9 ha; farm land 2,118.5 ha
3. Assessment categories	Noise and Vibration	31	A	Noise/Vibration/Electromagnetic impact rating class (1~3)	★★★★★	Class 1
			B	Noise/Vibration/Electromagnetic Assessment Range	200~15000m	3 km on both side along the axis runways or along the main flight trace (until 15km from the end of a runway) for every runway; and additional 15 km on the main flight trace of one north runway on the east side of the assessment range for building height control
			C	Noise sensitive receptors: location ; number (household / population) /type (schools / hospitals / fauna)	★	About 500 villages, 150 schools, 18 health centres, 9 aged care nursing homes
	Water Quality	32	A	Surface water / ground water quality impact rating class (1~3)	★	Tiantang river near the airport; Surface water: Class 3 ; ground water: Class 1.
			B	Sensitive water resources: location; distance; type (drinking water source; river; spring; well; fisheries)	★	Tangtang and Yongding River; new ground potable water source for Langfang City
	Air Quality	33	A	Air Quality impact rating class (1~3)/ Atmospheric risk class (1~2)	★★★	Air Quality Impact Class 2: 25km from centre of the airport precinct; Atmospheric risk Class 1: 5km from the boundary of the fuel tanks
			B	AQ sensitive uses: locations / number (household / population) /type (schools / hospitals)	★	Atmospheric risk: 29 sensitive uses; 8 schools; 1 health centre
	Ecological and Social Environment	34	A	Ecological impact rating	★	Class 2; risk assessment up to 5 km from the boundary of the airport precinct and 5 km from the fuel tank field
			B	Protected areas: location; distance; type (natural reserves, scenic areas, national parks, wetlands, fish spawning areas, flora, fauna and habitat, areas of cultural or heritage significance)	★	Not applicable
	Assessment Standard/ criteria	35	A	Confirmation of Assessment Standard/Criteria by local authorities	★	Yes

Metric Matrix		Reference		Metric Matrix	Airport	EIA response
4. Baseline Environmental quality	Noise & vibration	41	A	Noise / vibration criteria and baseline levels at sensitive receptors	★	Baseline noise levels were found to meet the requirement for Class 1 rating at 69 noise monitoring locations in the assessment range, except for one location at nighttime. Baseline noise levels are low due to rural situation. Baseline Electromagnetic field was monitored at 12 locations and was found to be lower than the good quality threshold of 0.001W/m^2 at all point.
	Water Quality	42	A	Water quality criteria and baseline levels	★	3 water quality monitoring section of the Tiantang River meet Environ. Quality Standard in China (GB3838-2002) except DO&BOD5. The ground water at 30 monitoring stations meet the Class III environmental quality in China (GBGB-T14848).
	Air Quality	43	A	Air quality criteria and baseline levels	★	The baseline concentrations of TSP/PM10/PM2.5/SO2/CO/THC at nine air quality monitoring stations meet the Class 2 environmental quality standard in China (GB3095-2012). There is a general air pollution in the Beijing-Tianjin- Hebei region, which was caused historically by coal burning fumes and is more recently linked to a combination of elements such as boiler exhaust gases, secondary dust, volatile organic compounds and vehicle fumes.
	Ecological environment	44	A	Ecological criteria and quadrate sample baseline levels	★	Not applicable
5. Environmental Impact Assessment	Noise and Vibration Impact	51	A	Exceedence of noise/vibration criteria (Location; number; type)	★	Predicted WECPNL for 2025 exceed 80 dB for nine villages and 75~80 dB for 22 villages. They exceed 70 dB for 16 schools and 75 dB for seven schools. Exceedance over 75 dB WECPNL is predicted for one health centre. The Electromagnetic impact is expected to be in the acceptable range.
	Ecological Environmental Impact	52	A	Earthworks (excavation/fill/backfill); water retentions	★	Part of the Tangtang river will be diverted for the sake of airline safety. The flood control standard is once every century.
			B	Impact on protected flora and protected species fauna	★	Not applicable
			C	Impact on protected areas (natural reserves, scenic areas, national parks, wetlands, fish spawning areas, areas of cultural or heritage significance): incursion, boundary adjustment	★	Not applicable.
	Water Quality Impact	53	A	water supply works, waste water generation, main sewage treatment volume	★	The project will not impact on the water quality of the assessed Tiantang River and its downstream branch in Yongding River.
			B	Evolution of water quality indices (drinking water resources, rivers, springs, wells): location, distance; Emergency discharge incidents and emergency response plan and measures	★	A ground source of potable water is located in Langfang City (Daguying source), with 18 wells, nine of which are located within the airport precinct, together with water pipelines. Relocation is required to prevent impact by the airport.
	Air Quality Impact	54	A	Risk of exceedence of air quality criteria and evolution of air quality indices (Location; number; type); Emergency discharge incidents and emergency response plan and measures	★	The main impacts on air quality relate to airplane exhaust gases (e.g. SO2, CO, THC, NO2. VOC and particles). Average daily maxima are predicted to exceed the standards for NO2. PM10 and PM2.5 due to the high pre-existing baseline concentrations in the area. On the other hand, the contribution of exhaust emissions of PM10 and PM2.5 from the airport only are expected to be at very low levels. A risk of fire and explosion is introduced by the kerosene storage tanks., Emissions of SO2 and CO present only a small risk.
	Solid waste	55	A	hazardous wastes; oil wastes, chemical and biological sludge; waste generation	★	A new waste water station is proposed with a 27,000 m^3 daily processing capacity.
6. Environ. Protection Measures	Noise & Vibration control measures	61	A	Specifications, cost and performance of noise and vibration control treatment (e.g.: noise barrier, vibration dampers)	★★★★	Villages, schools and health facilities for which aircraft noise exceed 80 dB WECPNL will need to be relocated. Balanced mitigation measures will be taken for sensitive uses impacted by levels between 70 dB and 80 dB. After 3-5 years of the beginning of operation, noise level & air quality monitoring should be undertaken.
			B	Type and number of noise sensitive receivers displaced / relocated	★★★★	By 2025, the 9 villages exposed to WECPNL exceeding 80dB should be relocated; Architectural sound insulation treatment should be provided to the dwellings within the 22 villages exposed to 75~80dB.
			C	Type and number of noise sensitive receivers benefiting from architectural sound insulation treatment, (e.g. windows retrofitting)	★	

Metric Matrix		Reference		Metric Matrix	Airport	EIA response
			D	Total costs of noise and vibration mitigation treatment	★	The 7 schools and the health-center exposed to over 75dB should be relocated; and the 16 schools exposed to levels exceeding 70~75dB should be retrofitted with architectural sound insulation treatment. Action plans, design details and funding for relocations and building retrofitting, their source of funding and finances, should be finalized in coordination with the local authorities (Beijing or Hebei province) and the construction department. The relevant authorities should ensure the relocation destinations are in accordance to the planning scheme. Relocation and retrofitting of all the sensitive uses must be completed before the start of airport operations.
			E	Total costs for displacement / relocation due to noise & vibration	★	
			F	Ratio（%）of noise and vibration control cost to total environment protection investment	★	
	Waste water control measures	62	A	Costs of wastewater treatment and disposal, of risk prevention and emergency response.	★	Construction of a fresh water supply station with daily capacity 32,000 m^3; Construction of a waste-water processing plant with daily capacity 27,000 m^3 and attached wetland cell.
			B	Ratio（%） of Waste water process cost to total environment protection investment	★	
	Air control measures	63	A	Risk prevention and emergency response plans and measures	★	It is necessary to establish a relative standard for aircraft exhaust gasses and implement a monitoring system. In order to follow the air quality around the airport and its emissions, the monitoring system should be set as a standard method so as to ensure consistency of the measurements.
	Solid waste control measures	64	A	Solid waste management and disposal	★	Construction of a waste transformation station with daily capacity of 500 ton.
	Ecology protection	65	A	Flora and fauna protection measures and optimization / Boundary optimization (natural reserves /Scenic areas / national parks/wetlands / fish spawning areas / areas of cultural or heritage significance); Relocation of borrow pits and disposal areas, creation of wildlife corridors Cost and effectiveness, ratio of the cost of the total environment protection investment	★	Not applicable
	Environmental protection investment	66	A	Total environmental cost and its evolution	★	Not applicable
7. Public consultation	Community groups	71	A	Number of community groups surveyed, their response, and approval %	★	a. Public engagement actions included the publication of environmental information; distribution of survey forms and specific meetings to collect feedback, suggestions and complaints. B (2). 8,000 individual survey forms were distributed, with an effective return rate of 99.4% (7,956 forms). 99.1% of the individuals and 99.8% of the community groups expressed a support to the project
			B	Number of community groups located within the noise EIA range	★	
			C	Disapproval %	★	
	Individuals	72	A	Number of individual surveyed, their response, and approval %	★	
			B	Number of individuals located within the noise EIA range	★	
			C	Disapproval %	★★★★★	

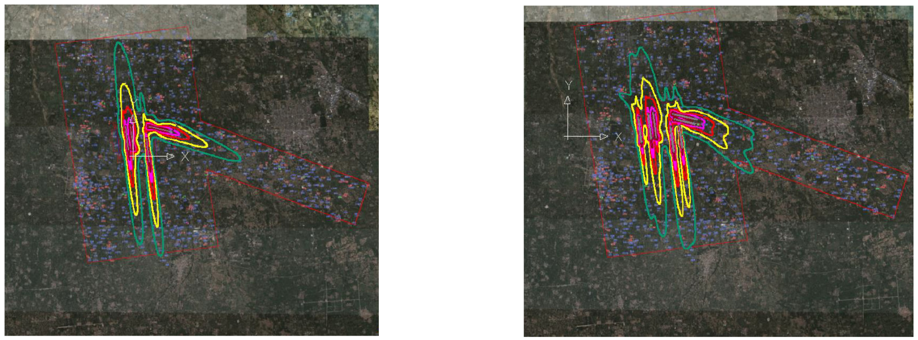

Figure 2 – Noise contour maps for the predicted WECPNL for Beijing New Airport in 2025 & 2030 (2, 3)

The EIA report recalls that the International Civil Aviation Organization (ICAO) has been conducting comprehensive investigations into aircraft noise control and has developed noise standards that were established in different stages through the course of time. Noise limits in China have similarly evolved in stages. For instance, the current Beijing Capital Airport still allows Stage 2 aircrafts (e.g. IL76, IL62, TU154, B74S, B72Y) which are particularly noisy. Although, their occurrence is very low, they can generate obvious impact (IL 76 aircrafts have, for example, been the object of numerous noise complaints). As a result, the EIA for the Beijing New Airport should set an emission noise standard for individual planes as soon as possible, and proscribe access to Stage 2 planes.

The establishment within the EIA of a future noise contour map is also necessary for incorporation in future planning and land use maps. In the long term, the development of incompatible uses around airports can result in unnecessary constraints on airport operations and negative impacts on community amenity. These impacts need to be managed in a balanced and transparent way.

3.3.2 Sound insulation treatment to residential buildings

As a result of globalization, airports are instrumental in the development of mobility and exchanges and a continual increase in flight volumes is unavoidable. This intensification is particularly acute in developing countries such as China, that have very large populations and in which the baseline air traffic volumes were previously low.

In this context, restoring the amenity of the outdoor living environment near existing airports has been difficult to achieve. Protecting the indoor amenity was therefore recommended as an interim objective. Some Chinese airports have allocated budgets so as to provide architectural improvement of the facade of residential dwellings located in areas where noise limits were exceeded.

In accordance with the environmental standard for aircraft noise around airport relevant to this EIA, relocation or architectural improvement should be considered for residential buildings within the WECPNL contour 75 dB or higher and the schools and hospitals with the contour 70 dB or higher. Given consideration to the practical situation of communal buildings in rural areas, to land management and urban planning, schools and hospital within the 75 dB contour should be relocated, and those situated within contours over 70~75 dB should be retrofitted with architectural sound insulation treatments. Balanced noise mitigation measures (relocation or architectural improvement) based on measurements should be given consideration for rural residences.

3.3.3 Public engagement and consultation

The government information disclosure guidelines of Construction project EIA（trial version, 2013.11.14, taking effect from first Jan. 2014）is a very important document from the State Environmental Protection Administration, which orders that all EIA reports should be fully accessible to the public, except when their publication breaches State or commercial confidentiality.

The new environmental law in China (NEL) is another framework law of utmost importance. Issued on 25 April 2014 and taking effect on the first Jan. 2015, it emphasizes the relative responsibility and the fact that the EIA report should be made fully public.

In China, environmental problems are becoming social and political issues. While in some regions, there was some improvement in environmental quality, there is an overall on-going deterioration. The solutions, the characteristic and the burden of environmental issues are probably more complex and severe than in any other country. By outlining the engagement of the different stakeholders and departments, the NEL stands out as the most powerful environmental protection law to date, and is instrumental in the fight against pollution.

Both law and regulation provide a great opportunity and challenge for new policies on transportation pollution control in China. The publication of the EIA reports in the public domain will stimulate the awareness and the engagement of the public and other stakeholders such as planning, development and operation management departments, and the environmental protection department in the EIA process and particularly in the establishment of environmental pollution control measures.

In the case of the Beijing New Airport (2), a total of 8,000 individual public survey forms were issued. This survey resulted in an effective feedback of 99.4% (7,956 forms were received). The results showed that 99.1% of the individuals and 99.8% of the group units supported the works. Such a large public consultation has rarely occurred in the history of EIA in China.

3.3.4 Metric Optimization for airport noise assessment

China is one of the few countries still using the L_{WECPNL} for the assessment of airport noise. However, index L_{den}, instead of WECPNL, is used for optimization in an informative version of a standard. The final version of this document will be prepared as soon as possible.

4. CONCLUSIONS

A comprehensive matrix for environment impact assessment is presented. The effectiveness of this detailed matrix is illustrated using the proposed new airport in Beijing as a case study. Since for airports, the noise metrics are predominant on the other factors, the matrix emphasizes the importance of the consideration of compatible land use in the urban planning scheme. Measures considered to address the noise impacts are presented and discussed, together with the regulatory framework, for this case study.

Future works considered include the extension of the study presented here to other typical transportation infrastructure projects.

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