Environmental and Social Impact Assessment (ESIA) Report (Draft) or Yunnan Kunming Changshui Green Airport Development Project

Presented to

Asian Infrastructure Investment Bank
Yunnan Airport Group Co., Ltd.

Prepared by

Consortium of Guangzhou Greenworld Engineering Technology Consultant Co., Ltd. & Hohai University
April 2023

Revision Records

Revision	Date	Remarks
01	March 26, 2023	First draft for review by AIIB and YAG
02	April 09, 2023	Disclosure for comments

Terms

S/N	Symbol	Meaning	Unit
1	*L*Aeq,*T*	Equivalent continuous A-weighted sound level	dB(A)
2	*L*d	Day-time equivalent A-weighted sound level	dB(A)
3	*L*n	Night-time equivalent A-weighted sound level	dB(A)
4	*Ldn*	Day-night equivalent sound level: the day-night equivalent sound level is obtained by increasing the aircraft noise during nighttime by a compensation amount of 10 dB(A), to account for the difference in sensitivity to noise between day and night	dB(A)
5	*L*Amax	Maximum A-weighted sound level: the maximum A-weighted sound level measured during a designated measurement period or for a particular isolated noise event	dB(A)
6	*L*A*w*	A-weighted sound power level	dB(A)
7	*Lw*	Octave band sound power level	dB(A)
8	*L*WECPN	Weighted equivalent continuous perceived noise level	dB(A)
9	*L*EPN	Effective perceived noise level	dB(A)
10	*L*A(*r*)	A-weighted sound level at a distance r from the sound source	dB(A)
11	*L*A(*r*0)	A-weighted sound level at reference position r0	dB(A)
12	*Lp*(*r*)	Octave band sound pressure level at a distance r from the sound source	dB(A)
13	*Lp*(*r*0)	Octave band sound pressure level at reference position r0	dB(A)
14	*A*div	Attenuation due to geometric divergence	dB(A)
15	*Daytime*	Between 6:00 and 22:00 every day	/
16	*Nighttime*	Between 22:00 and 6:00 of the next day every day	/
17	*YLdn*	Annual energy average of daily equivalent day-night sound level	dB(A)

Contents

Executive Summary

A. Project Overview

The People's Government of Yunnan Province has applied for a loan from the Asian Infrastructure Investment Bank (AIIB) for the implementation of the Yunnan Kunming Changshui Green Airport Development Project (hereinafter referred to as "the Project"). The Project will be implemented fro, 2023 to 2026.

The Project consists of four components:

- Component 1: The east airfield works include the construction of runway E2 and its corresponding perpendicular taxiways and parallel taxiways; a cargo apron in the east area which accommodates 16 aircraft stands; air traffic control (ATC) and navigation systems, instrument landing system (ILS), navigation lighting and power supply systems, drainage systems and fire stations; a smart runway, i.e. installation of sensing devices and monitoring systems on the pavement and base of runway E2.
- Component 2: Terminal 2 area works, including the construction of aprons (totaling 78) around Terminal 2, including base course treatment, civil works and pavement; airfield road and bridge works, including a northeast underpass, a northwest underpass, a terminal west underpass, and a terminal east underpass; supporting infrastructure such as lighting, drainage, power supply and fire fighting systems on the airside of Terminal 2.
- Component 3: Relevant equipment of green airport. New energy vehicles; installation of charging piles, aircraft ground AC works and 400 Hz ground power supply units on the apron, as well as automatic noise monitoring equipment and its installation.
- Component 4: Technical support and capacity building: 1) project implementation support, including environmental and noise monitoring and assessment; social impact and resettlement monitoring and evaluation; and other necessary support to improve the quality and efficiency of project implementation. 2) Institutional capacity building, including: (I) formulating the decarbonization roadmap and action plan for YAG; (ii) enhancing YAG's ESG information disclosure and capacity in green and sustainable development; (iii) enhancing the building of regional connectivity capacity by means such as holding aviation summits with countries in South and Southeast Asia and developing a roadmap for building the best international transit hub airport in the region.

The implementation period of the Project is from 2023 to 2026.

B. Environmental and Social Categorization

The project is based on the expansion of the existing Kunming Changshui International Airport. Given the relatively large scale of civil works and the potential noise impact of future operations, the Project is classified as environmental and social A under the AIIB's environmental and social policy requirements, requiring the preparation of an Environmental and Social Impact Assessment (ESIA) Report, including Environmental and Social Management Plan (ESMP). This report is the

Environmental and Social Impact Assessment for the proposed Yunnan Kunming Changshui Green Airport Development Project prepared in accordance with the PRC environmental and social regulatory requirements and AIIB's environmental and social policy (ESP). According to the findings of the ESIA, a separate ESMP was developed.

C. Methodology

The ESIA report is prepared to assess the potential environmental and social impacts and risks of the Project, evaluate alternatives, and design appropriate mitigation, management and monitoring measures to eliminate, offset or reduce adverse environmental and social impacts, and enhance and expand positive benefits of the Project. In November 2022, Yunnan Airport Group Co., Ltd. entrusted the Consortium of Guangzhou Greenworld Engineering Technology Consultant Co., Ltd. and Hohai University (hereinafter referred to as the "ESIA unit") to undertake the assessment of documents related to the environmental and social impacts of the Project.

The ESIA is carried out according to the following steps:

(1) Review relevant technical documents of the Project, conduct preliminary project analysis, identify key environmental and social impacts, and clearly evaluate key environmental and social protection objectives. The technical documents mainly include:

- Feasibility Study Report on Yunnan Kunming Changshui Green Airport Development Project (2022);
- Environmental Impact Report on Yunnan Kunming Changshui Green Airport Development Project (2022);
- Master Plan for Kunming Changshui International Airport (2019);
- Water and Soil Conservation Plan for Yunnan Kunming Changshui Green Airport Development Projec (2022).

(2) From November 2022 to March 2023, the ESIA unit conducted a site survey to investigate the proposed construction sites involved in the Project and operation of existing Kunming Changshui International Airport, aiming to gain a more objective understanding of the selected site, site conditions, land, environmental and social sensitive points, influence factors, population composition and needs of residents, and the social and economic conditions of affected communities in the project area.

(3) In February 2023, field investigation was carried out at the construction sites within the implementation scope of the Project:

- Institutional interviews and data collection.
- Interviews with key informants

(4) Based on technical analysis, focus group discussion and field studies, the draft of the Environmental and Social Impact Assessment of Kunming Changshui Green Airport Development Project has been prepared in accordance with relevant domestic technical guidelines and assessment methods, such as Technical Guidelines for Environmental

Impact Assessment - Civil Airport Construction Projects (HJ/T87-2002) and ICAO 1) Guidelines for Environmental Assessment of Proposed Changes in Air Traffic Management Operations (2014); 2) Noise Reduction Operation Procedures; 3) Aircraft Noise Management Balance Method Guide; 4) Airport Air Quality Manual (2011) and other international industry best practices to conduct environmental and social impact assessment. Technical methods such as mathematical model, analogical analysis and professional judgement are used to analyse the feasibility of the project's pollutant discharge to meet the standards and the degree of impact on the surrounding environment, and to propose environmental mitigation measures and proposals. This project focuses on predicting the impact of aircraft noise on the surrounding area of the airport, and analysing the compatibility of the airport construction with relevant planning.

(5) The first draft of the ESIA Report and ESMP will be revised and improved according to the public and experts' opinions.

D. Main Environmental Impacts and Mitigation Measures

The main environmental impacts of the project and proposed mitigation measures are as follows. Detailed mitigation measures and monitoring and reporting requirements are elaborated in the standalone Environmental and Social Management Plan for the Project.

(1) Impact on acoustic environment

The assessment is carried out according to the airport noise monitoring data from January 4 to 20, 2022 in the *Post-completion EIA Report for the Kunming New Airport Project Adjusted According to Approved Feasibility Study Report*. A total of twenty aircraft noise monitoring points have been established both below and alongside the airport route with the purpose of continuously monitoring the maximum A-weighted sound level (LAmax) and duration (Td) of noise produced whenever an aircraft flies over the monitoring points, the LEPN of each aircraft and the total number of flights passing through the monitoring points in seven days, to calculate the LWECPN. The monitoring results indicate that the noise level at N1 (Ganhaizi Village) exceeds the standard limit for Class I areas as defined in the *Standard of Aircraft Noise for Environment Around Airport* (GB9660-88) by 1.8 dB; the noise levels at N12 (Kunming Guanghua School), N18 (Xingyuan School), and N20 (Yunnan Vocational College of Agriculture) exceed the standard limit for Class II areas as defined in the Standard by1.6 dB, 1.1 dB, and 3 dB, respectively. It is noteworthy that Xingyuan School has ceased operations.

According to the airport noise contour map and in combination with the aircraft flight paths and the distribution of surrounding acoustic environment protection targets, a total of 12 online aircraft noise monitoring points are set up.

Among the 164 sensitive points (including 52,842 housholds/150,194 persons)within the noise assessment scope in this phase, 140 sensitive points (Class II sensitive receivers) are environmental protection targets of the project, including 108 (about 29,495 households/92,592 persons) are general sensitive recievers and 32 are schools and hospitals (Class I sensitive receivers) exceed the corresponding standard limits. As the remaining 6 settlements and 18 schools and hospitals are included in the previous EIA planning and control scope and will be constructed following approval of the previous EIA report, these locations are not included in the implementation scope of noise prevention and control measures in this phase.

Taking YLdn as the reference assessment indicator: Among all 160 acoustic environment sensitive points (receivers) within the assessment scope in this phase, there are 120 points where the YLdn exceeds the YLdn limit of 57 dB(A) to varying degrees. Compared to WECPNL, there is a significant increase in the number of non-conforming points of general settlements (Class II sensitive receivers) due to changes in the executive standard. However, there is a relatively small change in the number of non-conforming points of schools and hospitals (Class I sensitive receivers).

Based on the assessment results by Yldn, the aircraft noise from Kunming Changshui International Airport significantly affects the surrounding environment. In terms of development, planning and control recommendations for the land around the airport and Yldn limit of 57 dB(A) should be taken as key reference indicators for the planning and development of residential, educational, and medical land and land for other purposes, to ensure that the airport's future development has no additional negative impacts to the neighboring communities.

According to the varying responsibility subjects for construction and non-conformance, 140 of the 164 sensitive points within the noise assessment scope in this phase are assessed as environment protection targets. Included are 108 villages and general settlements (Class II sensitive receivers) and 32 schools and hospitals (Class I sensitive receivers). As the remaining 6 settlements and 18 schools and hospitals are included in the previous EIA planning and control scope and will be constructed following approval of the previous EIA report, these locations are not included in the implementation scope of noise prevention and control measures in this phase.

Excluding the new sensitive buildings according to the approved previous EIA report, after the implementation of the expansion project in this phase, the aircraft noise WECPNLs of 26 villages and settlements (Class II sensitive receivers) and 27 schools and hospitals (Class I sensitive receivers) in this phase will exceed the corresponding standard limits.

Among the 26 villages and general settlements (Class II sensitive receivers), there are 3 locations where the WECPNL exceeds 85 dB. For these locations, relocation measures will be implemented as an environmental protection effort. And installation of soundproof windows will be adopted for the other 23 sensitive points for noise prevention and control. Among the 27 schools and hospitals (Class I sensitive receivers), one with a WECPNL exceeding 80 dB should be relocated, while for the remaining 26, installation of soundproofing windows may be adopted.

Based on the analysis of implementation results of noise protection measures, it can be guaranteed that the indoor noise levels at the main acoustic environment sensitive points around the airport meet the prescribed limits required by the World Bank's EHS guidelines, specifically, Ld = 55 dBA in the daytime (07:00-22:00), and Ln = 45 dBA in the nighttime.

After the implementation of sound insulation measures in this phase, the indoor noise levels of the majority of residential, office and cultural, and educational buildings within the assessment scope of the airport in this phase can meet the limit requirements of Lden ≤ 45 dB and Lnight ≤ 40 dBA in the *Environmental Noise Guidelines for the European Region* (2018) issued by WHO.

(2) Atmospheric environment

Current atmospheric environment. Upon consideration of the pollutant generation of the Project and the prevailing wind direction of the airport, additional monitoring of non-methane hydrocarbons and total suspended particles (TSP) in the project area was conducted at Getenggou on the northeast side of the airport. Results indicate that the levels of conventional atmospheric pollutants, including TSP, within the assessment area comply with the Class II standard limits specified in the *Ambient Air Quality Standard* (GB3095-2012), and the hourly monitored non-methane hydrocarbon levels are below 2.0 mg/m^3.

The Project's construction area has an atmospheric environmental quality up to standard. The predicted ratio of maximum ground concentration (daily average under assurance rate, added by the current concentration) to standard concentration of pollutants, including NO_2, SO_2, CO, total PM10, and total PM25, is 63.58%, 9.25%, 29.54%, 54.89%, and 64.70%, respectively, which comply with the environmental quality standards. The ratio of maximum ground concentration, added by the annual average maximum regional environmental mass concentration, to standard concentration of NO_2, SO_2, CO, total PM_{10}, and total PM25 is 77.97%, 16.24%, 66.06%, and 77.88%, respectively, which also comply with the environmental quality standards. As for NMHCs, for which only short-term concentration limits are specified, the ratio of maximum ground concentration (short-term) to standard concentration is 94.65%, which complies with the environmental quality standard.

The impact of dust during construction can be effectively mitigated through the implementation of measures such as watering and covering. The waste gas generated during operation mainly includes aircraft exhaust, automobile exhaust, and waste gas emissions from the sewage treatment station, and all of which are fugitive emissions. Among them, the pollutants in aircraft exhaust and automobile exhaust mainly include NO_2, non-methane hydrocarbons, CO, etc. These pollutants are emitted intermittently and from mobile sources, so they are relatively well-dispersed, resulting in minimal negative impact on the surrounding air. According to the prediction, the levels of pollutants comply with the standards.

Control of aircraft exhaust: In terms of design of airport flight density, it is advisable that the airport avoids congested takeoff and landing schedules when designing flight density. This will help prevent high concentrations of atmospheric pollutants, such as CO and NO_2, in the airport area over a certain period of time. It is encouraged that airlines adopt aircraft models with lower pollution emissions.

(3) Surface water environment

Current surface water environment. Except for petroleum pollutants, all other indicators of pollutants in surface water bodies surrounding the airport, including Baoxiang River, Huazhuang River, and Yangguanzhuang Reservoir, comply with the Class III standards of *Environmental Quality Standard for Surface Water* (GB3838-2002). The non-conformance of petroleum pollutants in the water bodies is primarily a result of construction operations carried out in proximity to the area.

A new sewage treatment plant to be built under the Project, with a capacity of 15,000 m3/d, will work with the existing reclaimed water treatment plant in the treatment of the airport's domestic sewage from 2030. During the dry season, once the treated sewage meets the higher standard of water for "flushing of toilets and vehicles" and "urban greening, road cleaning, fire fighting and building construction" as specified in the *Reuse of Urban Recycling Water - Water Quality Standard for Urban Miscellaneous Water Consumption* (GB/T18920-2020), it shall be reused for road sprinkling, watering of greening space, and toilet flushing, instead of being discharged. And during the rainy season or in case of an accident, a portion of the sewage shall be discharged into the south sewage treatment plant in the airport area for treatment.

(4) Groundwater and soil environment

The construction of the Project has little impact on groundwater and soil quality.

(5) Solid waste

The site of the Project is basically level, and the amount of muck generated during the construction period is small. The solid waste generated during the operation period mainly includes aviation waste and domestic waste. After being sealed and disinfected, aviation waste from areas other than the quarantine area shall be transported and disposed of together with domestic waste by KSEC Environmental Protection Technology Co., Ltd.

(6) Ecological environment

The project site does not involve ecologically sensitive areas, including but not limited to, nature reserves, scenic spots, world cultural and natural heritage sites and scenic spots, or important ecologically sensitive areas, including but not limited to, forest parks, geological parks and wetland parks. The project site complies with the requirements in terms of planning and environmental protection management of the State, Yunnan Province and Kunming City.

The animal abundance in the whole Kunming Changshui International Airport and the monitoring and sampling area of 5 km in the vicinity is relatively low. The abundance of birds is the highest, but that of mammals and amphibians is relatively low.

Amphibians and reptiles have the lowest evenness, which indicates that their species distribution is relatively uneven and there is a phenomenon of "one species at one location" in some of the monitoring and sampling areas. The evenness of birds is relatively higher, but the survey records of some sampling routes also show relatively low evenness. This indicates that the species distribution of birds is also uneven.

Birds have relatively higher evenness compared to mammals and amphibious reptiles. Amphibious reptiles have low unevenness, with some species exhibiting clustering or living in specific habitats, and have highly varying population sizes.

There are 14 species of national Class II protected animals in the assessment area, including 12 species of birds and 2 species of mammals in China. There are 12 species of national Class II protected birds, namely, Glaucidium cuculoides, Otus sunia, Otus lettia, Halcyon smyrnensis, Falco tinnunculus, Falco subbuteo, Falco amurensis, Accipiter nisus, Buteo buteo, Milvus migrans, Elanus caeruleus, and Luscinia calliope. There is one species listed as vulnerable species by IUCN, namely, Halcyon pileata, and two species listed as near threatened species in the Red List of China's Vertebrates, namely, Falco amurensis and Elanus caeruleus.

Protection measures for birds:

1) Habitat control

To prevent and control bird strikes at airports, it is generally recommended to relocate birds from the airport area to a more suiTable habitat. This can be achieved through the creation of an artificial habitat designed to attract birds away from the airport, or by redirecting the migration routes of birds that intersect with the airport. It is suggested that the airport should reduce the complexity of the lawn vegetation in the airport by using herbicides, or planting local grass and tree species that birds do not like for greening. The airport lawn should be treated, trimmed and cleaned of rotten grass in a timely manner to control the grass height within 15~20 cm, making it difficult for birds to hide. One grass species that do not produce seeds should be planted to prevent flowering and attracting insects and seed-bearing vegetation from attracting herbivorous birds such as Alauda gulgula, Anthus godlewskii, and Chloris sinica. Low-toxicity, effective insecticides should be sprayed in a timely manner to minimize the number of soil animals and insects. Domestic waste in the airport area should be cleaned, and the drainage system should be improved to reduce the number of birds. Regular patrol inspection should be carried out and damaged fences should be repaired. Domestic waste produced in the airport and nearby areas should be properly disposed of. Rat poison and mousetraps should be used to prevent small mammals from entering the airport and attracting raptors.

In addition, it is recommended that the airport strengthen communication with the local government and residents, actively organize publicity of knowledge related to protection of aerodrome obstacle free space, enhance communication and liaison with the local government, village committees and pigeon associations, work together to regulate pigeon breeders, and standardize the management of domestic pigeon release and drone use within the aerodrome obstacle free space strictly according to the *Civil Aviation Law* and related regulations.

2) Biological control

Preventive measures must be taken during the breeding season for clustered birds, including domestic swallows. If nesting is found, the birds should be repelled and the nest should be destroyed immediately. If swallows are seen flying over the airport during takeoff or landing, bird repellers like bird scare cannons should be utilized. In addition, bird repellers shall be installed within a certain range of the airport. Comprehensive technological measures to prevent interference by wild animals, such as using artificial grass near runways, auditory and visual scare techniques such as colors, alarms, lights, sounds, fireworks, and propane explosions shall be used. Danger signals may be used to stimulate the visual and auditory systems of wild animals, to trigger the escape reaction, and thus repel wild animals and birds.

3) Catching ground birds with net traps

Small birds that appear within the airport can be controlled using bird net traps to reduce raptors attracted by them. For birds captured by bird net traps, it is suggested to release them at other places adhering to animal protection principles instead of killing them, especially for nationally protected species and other rare species.

4) Strengthen bird condition investigation and information management

Further monitoring shall be carried out for the west woodland where the number of birds is large. Timely monitoring of birds at the airport shall be carried out to understand the life habits of airport birds, and effectively prevent bird strikes. It is necessary to strengthen patrol inspection and management of the aerodrome obstacle free space of the airport and timely conduct basic work such as bird prediction and forecasting, standardize airport bird monitoring, keep bird monitoring records, gradually collect the information to establish a bird warning system to timely predict bird condition at the airport. Measures shall be taken in time to prevent and control new birds found in the vicinity of the airport. To facilitate the standardization of bird strike prevention at the airport, it is crucial to gain a comprehensive understanding of the current status and migratory habits of birds in the vicinity of the airport. Moreover, bird clusters that appear at the airport and high-flying birds should be closely monitored and promptly repelled to reduce threats to airport aviation safety.

E. Main Social Impacts and Mitigation Measures

The social impacts of the Project mainly include social benefit impacts and social risks.

The social benefits of the project mainly include: (1) expansion of airport capacity. (2) to enrich employment opportunities; (3) to increase residents' income; (4) Consolidating the achievements in poverty alleviation; 5) Promoting rural modernization

Social risks of project implementation mainly include: (1) Land acquisition impact. This project and related projects involve permanent occupation of 213.83 mu of collective land (67.36 mu for associated facilities), affecting the Wuxi Village and 13 people in 3 households in the village; The existing state-owned land basically belongs to the existing land of Yunnan Airport Group, which does not involve temporary land occupation, housing demolition, etc. Therefore, it is considered that the impact of land acquisition caused by the construction of this project belongs to low and medium risk. For details, see Resettlement Plan (RAP). (2) Risk of noise pollution. Field investigation has found that there are some problems in the project area, such as inadequate implementation of noise protection works during phase I construction and the residents are lack of awareness on the impact of noise. In addition, the project construction will bring cumulative impact of noise, so the risk is high. To this end, different measures will be taken according to different noise levels and different places, such as strengthening sound insulation protection, changing the take-off scheme, relocation, etc. Considering the likely cumulative impact of this project, it is recommended that it be managed in accordance with the noise management framework that has been prepared. (3) Air pollution, water pollution and other environmental impacts, such as air pollution risk, are divided into implementation period and operation period, including earthwork excavation, road construction, shuttle rolling of large mechanical vehicles during construction, increase of external vehicles, vehicle and aircraft exhaust emissions, etc. Risk of water pollution, such as disturbance and destruction of regional surface water runoff during construction and operation of the project, especially disturbance and pollution of drinking water sources in residential areas. Communication signal interference risk, for the residents near the airport, communication signal interference is a very common thing, but mainly the phased impact of aircraft takeoff and landing, so the impact on residents' daily life is not too great. (4) The influence of influx of migrant workers on local residents during the construction period. First of all, when migrant workers come to work near the airport, most of them choose to rent and live in the communities around the construction site. Besides work, their daily activities are also in the surrounding communities such as Wuxi Community, Changshui Community, Fuxing Community and Huajing Community. Due to different languages, local village rules and customs of local people are not recognized, which leads to social communication obstruction and social conflicts and problems. At the same time, during the construction period, migrant workers will be settled in the project area for a long period of time, which will increase the intensity of communication and interaction with local residents to a certain extent, and easily lead to certain health risks such as the spread of sexually transmitted diseases or epidemic diseases. (5) Traffic safety risk. During the construction period, large mechanical vehicles will shuttle and roll, and the number of external vehicles will increase, which will cause damage to the existing road surface around the community, and may also lead to the risk of traffic safety accidents in some villages lacking traffic signs. During the operation period, with the increase of operation personnel and vehicles in the project area, there will be risks of collision accidents, indiscriminate parking and other contradictions and disputes.

Based on the major social impacts identified, mitigation measures have been developed accordingly: (1) Reduce the risk of land acquisition, (2) reduce the risk of noise pollution, (3) air pollution, water pollution and other environmental impacts, (4) reduce the disturbance impact of the influx of workers during construction on local residents and society, (5) regulate traffic management, reduce traffic safety risks, (6) labor management, (7) development of ethnic minorities, (8) social gender action plan. For details, see the standalone ESMP for the Project.

F. Implementation Arrangements

Yunnan Airport Group Co., Ltd. will coordinate with other participants to promote the construction of the Project. Overall responsibilities of Yunnan Airport Group Co., Ltd. inlcude: (1)

Appoint an environmental and social coordinator for each lot to coordinate the participants in the implementation of the ESMP; (2) Ensure that the ESMP, monitoring plan and mitigation measures are included in the tendering documents and construction contracts; (3) Ensure the operation of the grievance mechanism; (4) Handle unforeseen adverse impacts and report to AIIB in a timely manner; (5) Employ a qualified external environmental supervision unit and a qualified external social supervision unit. Yunnan Airport Group Co., Ltd. shall regularly report on the implementation of the ESMP for the Project in the form of a standalone document as part of the project implementation report, on a quarterly basis during project implementation. Based on AIIB's assessment of the implementation of environmental and social measures, an environmental and social monitoring report shall be submitted on a quarterly basis during the first year of project implementation, and on a semi-annually basis thereafter.

G. Stakeholder Engagement

The social impact assessment of the Project is conducted for both the major and minor stakeholders of the Project. The major stakeholders of the Project are the direct beneficiaries within the scope of influence of the Project and the groups negatively affected by the construction of the Project, including residents, vulnerable groups, households affected by land acquisition, teachers and students in schools, employees of enterprises and public institutions within the scope of Changshui Subdistrict and Dabanqiao Subdistrict under the jurisdiction of Kunming Airport Economic Zone, as well as airport passengers, airport construction and operation personnel, airline employees and other groups. The minor stakeholders include Yunnan Airport Group Co., Ltd., Kunming Changshui International Airport Co., Ltd., Management Committee of Yunnan Dianzhong New Area, Natural Resources and Planning Bureau, Land Acquisition and Demolition Office, Housing and Urban-Rural Development Bureau, Comprehensive Law Enforcement Bureau, Transportation Bureau, Emergency Management Bureau, Health Commission, Human Resources and Social Security Bureau, Disabled Persons' Federation, Women's Federation, Changshui Subdistrict and Dabanqiao Subdistrict Offices, as well as design consultants (such as feasibility study/environmental impact assessment units), the Supervisor, contractors, media, etc. Meanwhile, attention should be paid to the situation of vulnerable groups and women in terms of livelihoods, development, and public participation.

During the early preparation stage of the Project, various units including the feasibility study, social impact assessment, and environmental impact assessment units conducted project information publicity and disclosure, as well as activities such as institutional interviews, field surveys, focus group discussion, interviews with key informants, and questionnaire surveys as part of the fully informed consultation and public participation process. The investigation found that the needs of stakeholders mainly include: (1) tourists' demand for the Yunnan Kunming Changshui Green Airport Development Project; (2) residents' demand for reducing noise pollution; (3) residents' demand for increasing income and employment opportunities; (4) stakeholders' demand for project information disclosure; (5) stakeholders' demand for participation in project development.

Based on questionnaire surveys, focus group discussions, in-depth interviews, and interviews with key informants, an information disclosure and public participation plan for the Project was developed through participatory observation. For details, see the Stakeholder Engagement Plan for the Project.

H. Grievance Redress Mechanism

During the preparation, construction, and operation of the Project, in order to timely understand and address the impacts and issues that the Project brings to stakeholders, and to ensure the residents' needs for information disclosure and community participation to the greatest extent, a project-level grievance channel will be established based on the current grievances situation of residents. All records of grievances and their resulting resolutions will be kept and reported to AIIB via the semi-annual environmental and social monitoring mechanism.

The grievance mechanism of the Project mainly includes:

- The first is the project-level grievance mechanism, which establishes a channel for residents, social organizations, and business entities affected by the Project to voice their concerns during the implementation and operation of the Project.
- The second is the grievance mechanism that operates at the project laborer level, which establishes a channel for direct laborers, contract laborers, as well as the employees of the project to voice their concerns.

In addition, AIIB has established a Project-affected People's Mechanism (PPM). The PPM will provide an independent and impartial review when the project-affected people (PAP) believe that the failure to implement AIIB's Environmental and Social Policy (ESP) has or may have adverse impacts on them, and their concerns cannot be satisfactorily addressed through the Grievance Redress Mechanism (GRM) or AIIB's governance mechanism. PPM-related information can be obtained by clicking the link below: https://www.aiib.org/en/policies-strategies/operational-policies/policy-on-the-project-affected-mechanism.html.

1 Introduction

1.1 Project Background

Kunming Changshui International Airport (hereinafter referred to as "Kunming Airport") is located near Dabanqiao Town, Guandu District, Kunming City, Yunnan Province, with a straight-line distance of 24.5 km and a highway distance of 34 km from the city center. It was completed and put into operation in June 2012.

To accelerate the development of the radial center for South Asia and Southeast Asia, promote regional coordination and leapfrog development in Yunnan Province, and expedite the implementation of the strategy of building national strength in aviation, the People's Government of Yunnan Province and the Civil Aviation Administration of China jointly issued the *Notice on Issuance of the Strategic Plan for Kunming International Aviation Hub* (YZF [2017] No. 56) on September 5th, 2017 to approve the strategic plan for Kunming Airport. On September 9, 2019, the Civil Aviation Administration of China issued the *Reply of the Civil Aviation Administration of China on the Overall Plan for Kunming Changshui International Airport* (MHH [2019] No. 777) to approve the overall plan for the airport In May 2021, the National Development and Reform Commission approved the implementation of the Yunnan Kunming Changshui Green Airport Development Project. On September 28, 2022, the National Development and Reform Commission approved the feasibility study report for Yunnan Kunming Changshui Green Airport Development Project. The Yunnan Kunming Changshui Green Airport Development Project is expected to be completed in 2030, and is designed with an annual passenger throughput of 95 million and an annual cargo throughput of 1 million tons for this phase. The Yunnan Kunming Changshui Green Airport Development Project mainly consists of three parts:

- East area: Includes a new 4000-meter-long and 45-meter-wide runway E2 along with its corresponding taxiway system, located 380 m east of the existing runway E1; an air freight station and air freight parking apron in the east of the airport; aircraft stands around Terminal 2 and other infrastructure on the east area, such as drainage systems, fire stations, lighting, and instrument landing systems.
- Central area: Includes new Terminal 2 and APM system; civil and ground parts of the ground transportation center (GTC), which is to be undertaken by the airport.
- West area: Includes new runway W3 with a length of 4,000 m and a width of 45 m along with its corresponding taxiway system, located 1,730 m west of the existing runway W1; a new aircraft maintenance area; preparations for future expansion in the area.

To ensure uninterrupted airport operation, the Yunnan Kunming Changshui Green Airport Development Project will be implemented in phases. The People's Government of Yunnan Province has applied for a loan of USD 500 million from the Asian Infrastructure Investment Bank (AIIB) for the implementation of the Yunnan Kunming Changshui Green Airport Development Project (hereinafter referred to as "the Project"). The Project is a part of the medium-term plan (2030) for the

Yunnan Kunming Changshui Green Airport Development Project, and is mainly targeted at the construction of the east area.

The Project consists of four parts:

- Component 1: The east airfield works include the construction of runway E2 and its corresponding perpendicular taxiways and parallel taxiways; a cargo apron in the east area which accommodates 16 aircraft stands; air traffic control (ATC) and navigation systems, instrument landing system (ILS), navigation lighting and power supply systems, drainage systems and fire stations; a smart runway, i.e. installation of sensing devices and monitoring systems on the pavement and base of runway E2.
- Component 2: Terminal 2 area works, including the construction of aprons (totaling 78) around Terminal 2, including base course treatment, civil works and pavement; airfield road and bridge works, including a northeast underpass, a northwest underpass, a terminal west underpass, and a terminal east underpass; supporting infrastructure such as lighting, drainage, power supply and fire fighting systems on the airside of Terminal 2.
- Component 3: Relevant equipment of green airport. New energy vehicles; installation of charging piles, aircraft ground AC works and 400 Hz ground power supply units on the apron, as well as automatic noise monitoring equipment and its installation.
- Component 4: Technical support and capacity building: 1) project implementation support, including environmental and noise monitoring and assessment; social impact and resettlement monitoring and evaluation; and other necessary support to improve the quality and efficiency of project implementation. 2) Institutional capacity building, including: (I) formulating the decarbonization roadmap and action plan for YAG; (ii) enhancing YAG's ESG information disclosure and capacity in green and sustainable development; (iii) enhancing the building of regional connectivity capacity by means such as holding aviation summits with countries in South and Southeast Asia and developing a roadmap for building the best international transit hub airport in the region.

1.2Methodology for Environmental and Social Impact Assessment (ESIA)

According to the requirements of AIIB's ESF, the Yunnan Kunming Changshui Green Airport Development Project is categorized as a Category B project that requires an ESIA report with an ESMP. This report is the ESIA report with an ESMP for the Project.

The ESIA report is prepared to assess the potential environmental and social impacts and risks of the Project, evaluate alternatives, and design appropriate mitigation, management and monitoring measures to eliminate, offset or reduce adverse environmental and social impacts, and enhance and expand positive benefits of the Project. In November 2022, Yunnan Airport Group Co., Ltd. entrusted the Consortium of Guangzhou Greenworld Engineering Technology Consultant Co., Ltd. and Hohai University (hereinafter referred to as the "ESIA unit") to undertake the assessment of documents related to the environmental and social impacts of the Project.

The ESIA is carried out according to the following steps:

(1) Review relevant technical documents of the Project, conduct preliminary project analysis, identify key environmental and social impacts, and clearly evaluate key environmental and social protection objectives. The technical documents mainly include:

- Feasibility Study Report on Yunnan Kunming Changshui Green Airport Development Project (2022);
- Environmental Impact Report on Yunnan Kunming Changshui Green Airport Development Project (2022);
- Master Plan for Kunming Changshui International Airport (2019);
- Water and Soil Conservation Plan for Yunnan Kunming Changshui Green Airport Development Projec (2022).

(2) From November 2022 to March 2023, the ESIA unit conducted a site survey to investigate the proposed construction sites involved in the Project, aiming to gain a more objective understanding of the selected site, site conditions, land, environmental and social sensitive points, influence factors, population composition and needs of residents, and the social and economic conditions of affected communities in the project area.

(3) In February 2023, field investigation was carried out at the construction sites within the implementation scope of the Project:

- Institutional interviews and data collection.
- Interviews with key informants

(4) Based on technical analysis, focus group discussion and field studies, the draft of the Environmental and Social Impact Assessment of Kunming Changshui Green Airport Development Project has been prepared in accordance with relevant domestic technical guidelines and assessment methods, such as Technical Guidelines for Environmental Impact Assessment - Civil Airport Construction Projects (HJ/T87-2002) and ICAO 1) Guidelines for Environmental Assessment of Proposed Changes in Air Traffic Management Operations (2014); 2) Noise Reduction Operation Procedures; 3) Aircraft Noise Management Balance Method Guide; 4) Airport Air Quality Manual (2011) and other international industry best practices to conduct environmental and social impact assessment. Technical methods such as mathematical model, analogical analysis and professional judgement are used to analyse the feasibility of the project's pollutant discharge to meet the standards and the degree of impact on the surrounding environment, and to propose environmental mitigation measures and proposals. This project focuses on predicting the impact of aircraft noise on the surrounding area of the airport, and analysing the compatibility of the airport construction with relevant planning.

(5) The first draft of the ESIA Report and ESMP will be revised and improved according to the public and experts' opinions.

1.3Report Structure

The report consists of the following sections:

Chapter 1 Introduction: This section includes the project introduction, ESIA method and report structure description.

Chapter 2 Policies, Laws and Regulatory Frameworks: This section discusses national laws, regulations and policies applicable to the Project, AIIB's environmental and social framework requirements, and international best practices and standards.

Chapter 3 Project Overview: This section explains the background, construction scope and engineering design of the Project.

Chapter 4 Analysis of Associated Facilities.

Chapter 5 Alternatives: This section analyzes possible options from the environmental and social perspectives.

Chapter 6 Environmental and Social Baseline: This section introduces the relevant geographical, ecological environment and socio-economic conditions of the project area.

Chapter 7-12 Potential Environmental Impact Analysis and Mitigation Measures and Chapter 14 Potential Social Impact Analysis and Mitigation Measures: Chapter 13 Physical Cultural Resources. This sections predict and evaluate the possible positive and negative environmental and social impacts of the Project, and propose corresponding mitigation measures.

Chapter 15 Climate Change

Chapter 16 Public Consultation and Information Disclosure

Chapter 17 Grievance Mechanism: This section explains the ways and means of grievance handling.

2 Policies, Laws and Regulatory Frameworks

This report is prepared in accordance with the currently applicable environmental and social laws and regulations of the People's Republic of China, local and departmental regulations, technical guidelines and norms of Yunnan Province and Kunming City, and the requirements of AIIB's *Environmental and Social Framework* (2021 revision).

2.1 Applicable Environmental Laws and Regulations

China has established a complete system of environmental protection laws and regulations, which consists of laws, administrative regulations issued by the State Council, regulations issued by government departments, local regulations, and regulations issued by local governments, environmental standards, and international conventions on environmental protection.

According to Articles 16 and 25 of the *Environmental Impact Assessment Law of the People's Republic of China* and the *Regulations on the Administration of Construction Project Environmental Protection* (the State Council's Decree No. 682), the Project must undergo environmental protection procedures to effectively safeguard environmental protection of the Project, balance economic development with environmental protection, and ensure the Project's successful implementation. According to the *Classified Administration Catalogue of Environmental Impact Assessments for Construction Projects (2021 Revision)* (Decree No. 16 of the Ministry of Ecology and Environment of the People's Republic of China, issued on November 30, 2020), the Project falls under the category of "136 Airport - Expansion of Airfield to Increase Air Traffic Volume" under "LII. Transportation Industry and Pipeline Transportation Industry". Therefore, an environmental impact report is required. Yunnan Airport Group Co., Ltd. entrusted Beijing Zhongzi Huayu Environmental Protection Technology Co. Ltd. to undertake the environmental impact assessment of the Yunnan Kunming Changshui Green Airport Development Project and prepare an environmental impact report. The *Environmental Impact Report of Yunnan Kunming Changshui Green Airport Development Project* was approved by the Ecological Environment Bureau of Dianzhong New Area, Yunnan in November 2022.

The main environmental laws and regulations applicable to the Project are as follows:

Table 0-1 Applicable Environmental Laws and Regulations

S/N	Title	Effective Date
A. National-level laws and regulations		
1	Environmental Protection Law of the People's Republic of China	2015
2	Environment Impact Assessment Law of the People’s Republic of China	2018
3	Water Pollution Prevention and Control Law of the People’s Republic of China	2018
4	Law of the People’s Republic of China on the Prevention and Control	2022

	of Environmental Noise Pollution	
5	Law of the People's Republic of China on the Prevention and Control of Environmental Pollution by Solid Waste	2020
6	Law of the People's Republic of China on Prevention and Control of Soil Pollution	2019
7	Soil and Water Conservation Law of the People's Republic of China	2011
8	Law of the People's Republic of China on Promotion of Cleaner Production	2012
9	Law of the People's Republic of China on Energy Conservation	2018
10	Law of the People's Republic of China on Flood Control	2016
11	Wildlife Protection Law of the People's Republic of China	2018
12	Wetlands Conservation Law of the People's Republic of China	2022
13	Implementation Regulations of the People's Republic of China on the Protection of Terrestrial Wild Animals	2016
14	Implementation Regulations of the People's Republic of China on the Protection of Aquatic Wild Animals	2013
15	Regulation of the People's Republic of China on Wild Plants Protection	2017
16	Cultural Relics Protection Law of the People's Republic of China	2017
17	Regulations on Environmental Protection Management of Construction Projects	2017
18	Regulations on the Safety Administration of Dangerous Chemicals	2013
19	Regulations of the People's Republic of China on Natural Reserves	2017
20	Notice of the State Council on Issuance of the National Ecological Environment Protection Outline	2000
21	Notice of the State Council on Issuance of the Water Pollution Prevention and Control Action Plan	2013
22	Notice of the State Council on Issuance of the Water Pollution Prevention and Control Action Plan	2015
23	Notice of the State Council on Issuance of the Soil Pollution Prevention and Control Action Plan	2016
24	Catalogue for Guiding Industry Restructuring (2019 Version)	2020
25	Notice on Issuing and Implementing the Catalogue of Items for Which the Land Use Is Restricted (2012 Revision) and the Catalogue of Items for Which the Land Use Is Prohibited (2012 Revision)	2012
26	Classified Administration Catalogue of Environmental Impact Assessments for Construction Projects (2021 Edition)	2021
27	Measures for Public Engagement in Environmental Impact Assessment	2019
28	Notice on Further Strengthening Management of Environmental Impact Assessment and Prevention of Environmental Risks	2012
29	Notice on Effectively Strengthening Risk Prevention and Strictly Managing Environmental Impact Assessment	2012
30	Notice on Issuance of the Approval Principles for Environmental Impact Assessment Documents of Construction Projects in Airport, Port and Water Conservancy Industries (River and Lake Improvement, Flood and Waterlogging Control Projects)	2018
31	Regulation on the Administration of Civil Airports	2009
B. Local regulations, rules and policies		
1	Regulations of Yunnan Province on Environmental Protection	2004
2	Regulations of Yunnan Province on Administration of Environmental Protection of Construction Projects	2002
3	Regulations of Yunnan Province on Protection of Terrestrial Wild	2014

	Animals	
4	Regulations of Yunnan Province on Biodiversity Protection	2019
5	Regulations of Yunnan Province on Protection of Niulan River	2012
6	Outline for Protection of Rare and Endangered Plants in Yunnan Province	1995
7	Interim Provisions on Administration of Protection of Rare and Endangered Plants in Yunnan Province	1995
8	Ecological Function Zoning of Yunnan Province	2009
9	Notice of the People's Government of Yunnan Province on Issuance of the Implementation Plan of Action Plan for Water Pollution Prevention and Control in Yunnan Province	2016
10	Regulations of Yunnan Province on Prevention and Control of Air Pollution	2018
11	Notice of the People's Government of Yunnan Province on Issuance of the Implementation Plan of Action Plan for Air Pollution Prevention and Control in Yunnan Province	2014
12	Notice of the People's Government of Yunnan Province on Issuance of the Implementation Plan of Action Plan for Water Pollution Prevention and Control in Yunnan Province	2016
13	Notice of the People's Government of Yunnan Province on Issuance of the Work Plan for Soil Pollution Prevention and Control in Yunnan Province	2017
14	Regulations of Kunming City on Prevention and Control of Atmospheric Pollution	2012
15	Acoustic Environment Function Zoning in Kunming Airport Economic Zone (2019-2029)	2018
16	Implementation Plan for Zoned Administration of Ecological Environment According to "Three Lines and One List" in Kunming	2021

The *Law of the People's Republic of China on Noise Pollution Prevention and Control* (2022) stipulates that:

Article 52 The people's government of the place where a civil airport is located shall, according to the scope and extent of the impact of civil aircraft noise on the living environment around the airport determined based on the environmental impact assessment and monitoring results, designate the areas where the construction of noise-sensitive buildings are prohibited and restricted, and shall implement the control measures.

It is prohibited to construct any noise-sensitive buildings irrelevant to aviation in the construction prohibited area.

If it is really necessary to construct noise-sensitive buildings in construction restricted areas, the Employer shall provide building sound insulation design for noise-sensitive buildings according to the requirements of relevant standards for sound insulation design of civil buildings.

Article 53 Civil aircrafts shall meet the noise requirements in the airworthiness standards stipulated by the competent civil aviation authority under the State Council.

Article 54 The civil airport administration shall manage the noise of the aircrafts taking off and landing on the airport, and together with the air transport enterprise, general aviation enterprise, air traffic management department and other relevant units, take such measures as adopting low-noise flight procedures, optimizing take-off and landing runways, controlling aircraft operations and time periods, restricting the operation of high-noise aircrafts or taking sound insulation and noise reduction measures for surrounding noise-sensitive buildings, to prevent and reduce noise pollution of civil aircrafts.

The civil airport administration shall, according to national regulations, monitor the noise of civil aircrafts around the airport, keep the original monitoring records, be responsible for the authenticity and accuracy of the monitoring data, and regularly submit the monitoring results to the competent civil aviation and ecological environment departments.

Civil Aviation Law of the People's Republic of China (1996) stipulates that:

Article 55 Civil airport construction plans should fit in with city construction plans.

Regulation on the Administration of Civil Airports (Order No.553 of the State Council of the People's Republic of China, April 13, 2009) stipulates that:

Article 59 Civil aircrafts taking off and landing on civil airports shall comply with relevant national airworthiness standards for aircraft noise and turbine engine out-emission.

Article 60 The airport administration shall, together with the air transport enterprise, air traffic management department and other relevant units, take technical means and management measures to control the impact of civil aircraft noise on the surrounding areas of the airport.

Article 61 The local people's government of the place where the civil airport is located shall formulate the overall planning and urban-rural planning for use of the land in the surrounding areas of the civil airport, fully consider the impact of civil aircraft noise on the surrounding areas of the civil airport, and comply with the national environmental quality standards for noise.

The airport administration shall report the impact of civil aircraft noise on the surrounding areas of the transport airport to the land and resources, planning and construction, environmental protection, and other competent departments of the local people's government.

Article 62 The local people's government in the place where the civil airport is located shall designate the areas where the construction of noise-sensitive buildings are restricted in the surrounding areas of the civil airport, and shall implement the control measures. If it is really necessary to construct noise-sensitive buildings in such areas, the Employer shall take measures to reduce or avoid the noise impact generated by civil aircrafts during operation.

The local people's government in the place where the civil airport is located shall, together with the regional civil aviation administration, solve the problems caused by the noise impact of civil aircrafts taking off and landing on the civil airport.

2.2Applicable Laws, Regulations and Policies of Relevant Social Departments

Table 0-2 Applicable Social Laws and Regulations

SN	Title	Effective Date
A. Social risk policy		
1	Opinions on Strengthening the Construction of Social Stability Risk Assessment Mechanism for Major Policy Decisions under New Situations (China Office of the People's Republic of China (2021) No.11)	2021
2	Notice on Issuing Interim Measures of the National Development and Reform Commission on Social Stability Risk Assessment of Major Fixed Asset Investment Projects (2012) No. 2492)	2012
3	Notice of the General Office of the National Development and Reform Commission on Publishing the Chapter on Social Stability Risk Analysis of Major Fixed Asset Investment Projects and the Compilation Outline of the Evaluation Report (Trial) (Investment of the Development and Reform Office No.428, 2013)	2013
4	Interim Regulations on Major Administrative Decision-making Procedures (Order of The State Council No. 713)	2013
5	Notice of Yunnan Development and Reform Commission on Printing and Distributing Measures for Social Stability Risk Assessment of Major Fixed Asset Investment Projects of Yunnan Development and Reform Commission (Trial) (Yunfa Reform Investment [2013] No.1545)	2013
B. Land expropriation and demolition policy		
1	Land Administration Law of the People's Republic of China (the third amendment in 2019)	2019
2	Regulations on the Implementation of the Land Administration Law of the People's Republic of China (Revised in 2021)	2021
3	Regulations on the Expropriation, Compensation and Resettlement of Houses on State-owned Land (Decree No. 590 of The State Council of the People's Republic of China)	2020
4	Guidance of the General Office of Yunnan Provincial People's Government on Reforming and Improving the Basic Old-age Security of Farmers whose land has been expropriated (No.1, 2019)	2019
5	Notice of the Department of Natural Resources of Yunnan Province on the Announcement and Implementation of the Comprehensive Land Price Collection for Agricultural Plots, Yun Natural Resources [2020] No.173	2020
6	Yunnan Provincial Department of Natural Resources on the Implementation of the reform of "Multi-examination and Multi-Certificate Integration" for Planned Land Use (2020)	2020
7	Guidance on Collective Land Expropriation and Housing Demolition and Resettlement in Kunming Airport Economic Zone (Dabanqiao Street), Yunnan (Trial) (Yun Airport Guan Tong (2022) No. 22)	2020
8	Notice on Printing and Distributing the Implementation Measures of Collective Land Expropriation and Housing Demolition and Resettlement for Kunming Changshui Comprehensive Transportation Hub Project	2022

	(Yunnan Central Comprehensive Development (2022) No.48)	
C. Labor management policies		
1	Labor Law of the People's Republic of China (revised in 2018)	2018
2	Labor Contract Law of the People's Republic of China (2012 amendment)	2012
3	Regulations of The State Council on Supervision of Labor Security (2004)	2004
4	Trade Union Law of the People's Republic of China (2021)	2021
5	Law of the People's Republic of China on the Prevention and Control of Occupational Diseases (2018 Amendment)	2018
6	Law of the People's Republic of China on the Protection of Rights and Interests of Women (revised in 2018)	2018
7	Special Provisions on Labor Protection of Female Employees of the People's Republic of China (2012)	2012
8	Special Provisions of Yunnan Province on Labor Protection for Female Workers (2019)	2019
9	Rules for the Implementation of Provisions Prohibiting the Use of Child Labor of Yunnan Province (Yun Zhengfa [1992] No. 239	1992
10	Notice of the People's Government of Yunnan Province on Printing and Distributing Measures for the Implementation of the Regulations on Work-related Injury Insurance of Yunnan Province (Yun Zhengfa [2011] No. 255)	2011
11	Notice of the General Office of the Ministry of Human Resources and Social Security on Properly Handling Labor Relations Issues during the Prevention and Control of the Novel Coronavirus Pneumonia Epidemic (Department of Human Resources and Social Security Invention Electricity (2020) No.5)	2020
12	Notice on Printing and Distributing the Work Plan of Kunming City on Preventing the Risks of Labor Relations brought about by the COVID-19 Epidemic and Stabilizing Labor Relations (2020)	2020
D. Information disclosure and public participation policies		
1	Measures for Public Participation in Environmental Impact Assessment (effective from January 2019)	2019
2	Opinions of The General Office of the State Council on Promoting the Disclosure of Government Information in the Fields of Approval and Implementation of Major Construction Projects (2017) No.94	2017
3	Opinions of The General Office of the State Council on Promoting the Openness of Government Information in the Field of Public Resource Allocation (Guo Changfa (2017) No.97)	2017
4	Notice of the General Office of the CPC Central Committee and The State Council Issuing Opinions on Comprehensively Promoting the Openness of Government Affairs (2016)	2016
5	Notice of the General Office of the Ministry of Natural Resources on Issuing Standard Guidelines on Openness of Grassroots Government Affairs in the Expropriation of Rural Collective Land (Natural Resources Office Letter No. 1105)	2019
6	Notice of the General Office of the CPC Yunnan Provincial Committee and the General Office of the Yunnan Provincial People's Government on Printing and Distributing the Accountability Measures for Yunnan Province's Petition Work (2016)	2016
7	Notice Issued by the General Office of the CPC Yunnan Provincial Committee and the General Office of the Yunnan Provincial People's Government on the Implementation Opinions on Comprehensively Promoting the Openness of Provincial Government Affairs (Yun Changfa [2017] No.22)	2017
8	Regulations of Yunnan Province on Letters and Visits (2017)	2017
E. Other relevant policies		

1	Provisions on the Administration of Civil Airport Construction (Decree of the Ministry of Transport, PRC No. 47, 2016)	2016
2	Decision of the Ministry of Transport on Amending the Regulations on the Administration of Civil Airport Construction (Decree No. 32, 2018 of the Ministry of Transport)	2018
3	Civil Airport Operation Safety Management Regulations (CCAR-140 Part)	2016
4	Decision of the Ministry of Transport on Amending the Regulations on the Operation Safety Administration of Civil Airports (Decree of the Ministry of Transport, PRC, No. 33, 2018)	2018
5	Notice of the General Office of the People's Government of Yunnan Province on Printing and Distributing the "14th Five-Year Plan" Comprehensive Transportation Development Plan of Yunnan Province (issued by the Cloud Administration Office No. 1 (2022))	2022
6	The 14th Five-Year Plan for National Economic and Social Development of Kunming City and the Outline of Long-term Goals for 2035, April 2021	2021
7	Civil Aviation Administration of China (Notice on Printing and Distributing the Strategic Plan for Kunming International Aviation Hub) (Yun Zhengfa [2017] No.56)	2017

Yunnan Airport Group Co., Ltd. entrusted Yunnan Zhonglu Engineering Survey and Design Co., Ltd. to prepare the Social Stability Risk Assessment Report for Yunnan Kunming Changshui Green Airport Development Project, and the report was filed in July 2022.

2.3AIIB's Environmental and Social Requirements

As the Project will apply for a loan from the AIIB, AIIB's Environmental and Social Framework (ESF) applies to the Project. The ESF comprises the following key elements:

Environmental and Social Policy (ESP), Environmental and Social Standards (ESSs), and Environmental and Social Exclusion List (ESEL). The ESP sets out the mandatory requirements for identifying, assessing and managing environmental and social risks and impacts in projects undertaken by AIIB and its clients and AIIB-supported projects.

Environmental and Social Standard 1 (ESS 1): It aims to ensure the project's environmental and social robustness and sustainability, as well as integration of environmental and social considerations into decision-making and implementation. ESS 1 applies in cases where the project may pose environmental or social risks and impacts or both. The scope of ESIA and management measures shall be commensurate with the risks and impacts of the project. ESS1 provides effective mitigation and monitoring measures to ensure high-quality ESIA and management of risks and impacts during project implementation. ESS1 defines the specific criteria for conducting ESIA for all projects invested by AIIB.

Environmental and Social Standard 2 (ESS 2): It applies if the screening for the project indicates the involvement of involuntary resettlement, either recently or predictably associated with the project. Involuntary resettlement refers to both physical displacement, including relocation, loss of residential land, or housing, and economic displacement, such as the loss of land or access to land and natural resources, assets, and sources of income or livelihood due to (a) involuntary land acquisition or (b) involuntary restrictions on land use or access to legally designated parks and protected areas. It covers any displacement, whether it results from full or partial loss of or involuntary restrictions on land, and whether it is permanent or temporary. ESS2 outlines the specific criteria for developing a resettlement plan for a project involving involuntary displacement.

Environmental and Social Standard 3 (ESS 3). ESS3 applies in cases where there are indigenous peoples (ethnic minorities) or those attached to such groups in the proposed project area that may be affected by the project.

The Aiib Environmental and Social Policy (ESP) applicable to this project includes "Environmental and Social Criteria 1 - Environmental and Social Risks and Impacts (ESS1)" in the "Environmental and Social Assessment and Management Policy", "Land Acquisition and Involuntary Migration (ESS2)" and "Environmental and Social Exclusion List (ESEL)". The ethnic minority identification survey conducted during the ESIA preparation found that:

(1) There are no minority groups in the project impact area that trigger ESS3 criteria.

(2) The minority population in the project construction and implementation area is very small, and there is no traditional territory, no minority language and traditional culture, and no ethnic minority groups that consider themselves as such.

Therefore, there is no need to develop an Ethinic Minority Development Plan for this project and the ESS3 criteria for "Indigenous Peoples" do not apply to this project.

According to AIIB's Environmental and Social Framework (Revised in 2021), the Project shall adopt pollution prevention techniques and practices that comply with international good practices, and shall be subject to the following good international industry practices (GIIP):

•World Bank Group's *EHS Guidelines - General* and *EHS Guidelines - Airports* (2007); and

•International Civil Aviation Organization (ICAO): Guidance on Environmental Assessment of Proposed Air Traffic Management Operational Changes (2014); Noise Abatement Operational Procedures; Balanced Approach to Aircraft Noise Management; Airport Air Quality Manual (2011)

2.4International Conventions

The international conventions related to the Project that China has concluded or signed mainly include:

•Vienna Convention for the Protection of the Ozone Layer (March 22, 1985);

•Montreal Protocol on Substances that Deplete the Ozone Layer (Amended on September 16, 1987);

•United Nations Framework Convention on Climate Change (June 11, 1992);

•Convention on Biological Diversity (June 5, 1992); and

•Paris Agreement (2016).

2.5Applicable Assessment and Emission Standards

2.5.1 Environmental Quality Standards

(1) Air quality

China's *Ambient Air Quality Standard* (GB3095-2012) specifies two classes of standards for air quality. Class 1 standard applies to specific areas such as nature reserves and environmentally sensitive areas, while Class 2 standard applies to all other areas, including urban and industrial areas. The Project is located in a Class II ambient air quality functional area. The World Bank Group's *EHS Guidelines* is based on the *WHO Global Air Quality Guidelines*. 1The *WHO Global Air Quality Guidelines* provides guidance on thresholds and limits for key air pollutants that pose health risks. In addition to the guidance values, the *WHO Global Air Quality Guidelines* establishes transitional targets for the transition from high to low concentrations. Table 2-1 compares the Class 2 standard of *Ambient Air Quality Standard* (GB 3095-2012) with the WHO standard. The 24-hour SO2 limit under the Class 2 standard (0.15 mg/m3) in *Ambient Air Quality Standard* (GB3095-2012) exceeds the upper limit (0.125 mg/m3) set out in the World Bank Group's provisional standard. However, the 24-hour PM10 limit (0.15 mg/m3) and PM2.5 limit (0.075 mg/m3), annual NO2 mean (0.04 mg/m3) and PM2.5 mean (0.035 mg/m3) align with the upper limits specified in the WHO's transition standard. In general, China's standards are highly comparable to WHO's guidelines or provisional target values. Therefore, the Project adopts the Class 2 standard of *Ambient Air Quality Standard* (GB3095-2012), and the WHO standard for the 24-hour SO2 limit.

Table 0-3 China GB 3095-2012 vs. WHO Global Air Quality Guidelines

(Unit: mg/m3)0

S/N	Pollutant	Average period	GB 3095-2012 Class 2	WHO Global Air Quality Guidelines	
				Target for transition period	Target
1	SO_2	1 year	0.06	N/A	N/A
		24 hours	0.15	0.05-0.125	0.04
		1 hour	0.50	N/A	N/A
2	PM_{10}	1 year	0.07	0.02-0.07	0.015
		24 hours	0.15	0.05-0.15	0.045
3	$PM_{2.5}$	1 year	0.035	0.01-0.035	0.005
		24 hours	0.075	0.025-0.075	0.015
		1 hour	N/A	N/A	N/A
4	NO_2	1 year	0.04	0.02-0.04	0.010
		24 hours	0.08	0.05-0.12	0.025
		1 hour	0.20	N/A	N/A
5	CO	24 hours	4.0	7.0	4.0
		1 hour	10.0	N/A	N/A
6	O_3	Maximum daily mean of 8 hours	0.16	0.12-0.16	0.10

[1] https://www.who.int/zh/news-room/questions-and-answers/item/who-global-air-quality-guidelines

S/N	Pollutant	Average period	GB 3095-2012 Class 2	WHO Global Air Quality Guidelines	
				Target for transition period	Target
		1 hour	0.20	N/A	N/A

Source: WHO Global Air Quality Guidelines (2021) and GB 3095-2012 of People's Republic of China.

(2) Environmental quality standard for noise

a. Environmental quality standard for aircraft noise around airports in China

The *Standard of Aircraft Noise for Environment Around Airport* (GB9660-88) is applicable to the areas surrounding airports impacted by aircraft noise. It uses the A-weighted equivalent continuous perceived noise level over a 24-hour period represented by Lwecpn as the assessment indicator. Lwecpn is the assessment indicator for aircraft noise recommended by the International Civil Aviation Organization (ICAO). In the calculation process of Lwecpn, the nighttime and evening flight volumes are properly weighted, and the pure tone correction of aircraft noise is considered, thus the results well reflect the characteristics of aircraft noise.

The current standard limits for different areas around airports in China are listed in the Table below.

Table 0-4 Standard of Aircraft Noise for Environment Around Airport (GB9660-88)

Applicable area	Standard value (Lwecpn)
Class I area	≤ 70 dB
Class II area	≤ 75 dB

Class I area means special residential areas, residential areas, and cultural and educational areas. Class II area means the living areas other than Class I area.

Generally, the standard limit for Class I area shall be implemented for facilities or buildings with special requirements for acoustic environment, such as schools, hospitals, kindergartens and nursing homes. The standard limit for Class II area shall be implemented for general residential areas in cities and towns.

However, the Lwecpn cannot be directly measured by instrument, and shall be calculated based on the monitored results after monitoring. The *Standard of Aircraft Noise for Environment Around Airport* (GB9660-88) divides the applicable areas into two categories. However, there are no supporting documents that specify the use of land at different noise impact levels, and guidance and restrictions on planning the use of land around airports. According to the *Notice on Implementing the Formulating and Revising Projects of National Environmental Protection Standards in 2008* (HBH [2008] No. 44), the Chinese Research

Academy of Environmental Sciences takes the lead in organizing the revision of *Standard and Measurement Method of Ambient Noise around Airport* (revision of GB 9660-88 and GB 9661-88). The *Environmental Quality Standards for Aircraft Noise in the Surrounding Area of the Airport* (Second Draft for Comments) has not been officially released and is for reference only.

According to the *Environmental Quality Standards for Aircraft Noise in the Surrounding Area of the Airport* (Second Draft for Comments), the assessment of aircraft noise around airports in China primarily takes Ldn recommended by the FAA as the assessment indicator. The assessment value is obtained through mathematical conversion based on the existing Lwecpn standard limit. The Table below shows different limits based on the two indicators:

Table 0-5 Limits Based On Two Indicators

Applicable area	Standard value of aircraft noise around the airport	
	Current standard (Lwecpn)	Standard to be adopted (YLdn)
Class I land: urban and rural land sensitive to aircraft noise, including the land for residential buildings, education and scientific research, health and medical institutions and other similar land.	≤70	≤57
Class II area: urban and rural land relatively sensitive to aircraft noise, including the land for administrative office, culture and art, financial business and other similar land.	≤75	≤62
Class III area: urban and rural land relatively insensitive to aircraft noise, including the land for industrial production, logistics and warehousing, sports and entertainment, parks, squares and other similar land.	/	≤67
Class IV area: urban and rural land not sensitive to aircraft noise, including the land for agricultural production, mining production, transport facilities, public facilities and other similar land.	/	/

Note: 1) YLdn: annual average diurnal equivalent sound level; 2) The difference between LWECPN and Ldn depends on the division of time periods and the number of flights in each time period, generally ranging from 13 dB to 14 dB. The conversion method of LWECPN= Ldn+13 is adopted in the Environmental Quality Standards for Aircraft Noise in the Surrounding Area of the Airport (Second Draft for Comments).

According to different limits based on the two indicators for aircraft noise assessment, it can be seen that the adjustment is aimed at facilitating the practical work process without compromising the standard for airport aircraft noise emissions.

b. Internationally adopted standards for aircraft noise around airports

Currently, there are several aircraft noise prediction indicators commonly used abroad, and these can be categorized as follows:

(1) L_{WECPN} (Weighted Equivalent Continuous Perceived Noise Level)

The weighted equivalent continuous perceived noise level (WECPNL) is the recommended aircraft noise assessment standard by the International Civil Aviation Organization (ICAO). In its calculation process, the flight volumes during nighttime and evening are weighted. Moreover, the pure tone correction of aircraft noise is taken into account. Thus, the results can accurately reflect the characteristics of aircraft noise. However, WECPNL's complexity makes it difficult to understand during practical application, and it is difficult to use existing instruments to directly measure its value.

(2) Ldn (Day Night Average Sound Level)

The day-night continuous perceived sound level is a widely used aircraft noise assessment indicator. Most countries, including the United States, have adopted the aircraft noise assessment indicator for airports, and domestic efforts are underway to replace the existing indicator with it.

(3) Ld, Ln (15-hour Day-average Equivalent Sound Level, 9-hour Night-average Equivalent Sound Level)

Daytime equivalent sound level and nighttime equivalent sound level are recommended indicators by the World Bank EHS Guidelines. The United Kingdom and Germany use Ld and Ln as aircraft noise assessment indicators, but the definition of nighttime period in the United Kingdom is slightly different.

(4) Lden (CNEL): (Community Nosie Equivalent Level)

Lden additionally has evening as a period of assessment. This indicator is recommended by France, the EU and the WHO recommend for the assessment of aircraft noise in airports.

The internationally recognized indicators for aircraft noise assessment and their limits are as follows.

Table 0-6 International Aircraft Noise Prediction Indicators

S/N	Country	Indicator	Standard value (dB)		Administrative Provisions
1	UK	Ld, Ln	Daytime	Nighttime	/
			＜57	＜48	None
			57-66	48-57	Noise impacts should be considered for planning of land use, if necessary Appropriate noise protection is required
			66-72	57-66	Construction is generally not allowed, and adequate noise protection is required if construction is necessary
			＞72	＞66	Construction is not allowed
2	Germany	Ld	Proposed	Existing	/
			＞55	＞60	Construction of noise-sensitive buildings (hospitals, schools, etc.) is not allowed
			＞60	＞65	Construction of noise-sensitive buildings (hospitals,

					schools, etc.) and housing is not allowed
		Ln	＞53 ＞50*	＞55	Construction of noise-sensitive buildings (hospitals, schools, etc.) and housing is not allowed
3	USA	Ldn	＜65		None
			65-75		Construction of housing is restricted, and requires sound insulation facilities
			＞75		Construction of housing is not allowed
4	France	Lden	50-55/57		None
			55/57-62/65		Construction of housing is allowed provided that the limits are met The limits are set by the local government
			62/65-70		Construction of housing is not allowed, and the limits are set by the local government
			＞70		Construction of housing is not allowed
5	Japan	Lden	＜57		Exclusive residential areas
			＜62		Other living quarters
		L_{WECPN}	＜70		Exclusive residential areas
			＜75		Other living quarters
6	USA California	CNEL	＜62		None
			62-72		Construction of housing is restricted, and requires sound insulation facilities
			＞72		Construction of housing is not allowed
7	Canada	NEF	≤30		None
			30-40		Proposed housing shall have sound insulation facilities
			＞40		Construction of housing is not allowed
8	Australia	ANEF	＜20		None
9			20-25		Proposed housing shall have sound insulation facilities
10			＞25		Construction of housing is not allowed
11	China	L_{WECPN}	≤70		Special residential areas; residential, cultural and educational areas
			≤75		Other living quarters

Note: Germany prohibits the construction of noise-sensitive buildings (such as hospitals and schools) and housing around airports built after 2011 with an Ln greater than 50 dB.

The World Bank Group has no aircraft noise environmental standards for the surrounding areas of airports. The General EHS Guidelines of the World Bank divides these areas into two categories based on receiver types. The Class I areas are residential, office, cultural and educational areas. The Class II areas are industrial and commercial facility areas. This is basically similar to the *Standard of Aircraft Noise for Environment Around Airport* (GB9660-88). The World Bank's General EHS Guidelines uses the day-time equivalent sound level (Ld) and the night-time equivalent sound level (Ln) as the indicators.

Table 0-7 World Bank Group EHS Standards

Daytime (Ld) 07:00-22:00	Nighttime (Ln) 22:00-07:00
55 dBA	45 dBA
70 dBA	70 dBA

The World Bank General EHS Guidelines use the same indicators as the United Kingdom and Germany, but the standard values are slightly different. In addition, the United Kingdom's definitions of Ld (16-hour) and Ln (8-hour) periods are slightly different from that specified in the World Bank EHS Guidelines.

The *Environmental Noise Guidelines for the European Region* (2018) released by the WHO gives recommended values of Lden≤45 dB and Lnight≤40 dB for aircraft noise-impacted areas based on the results of the noise annoyance study.

The FAA of the United States sets a maximum limit of Ldn=65 dB (equivalent to LWECPN=78 dB) for residential areas, schools, and other building areas. This standard is more lenient than the current standard in China.

c. Determination of standard system

Principles for determining the standard system:

(1) Meet the current assessment requirements for aircraft noise around airports in China;

(2) On the basis of meeting the above requirements, meet the assessment requirements for aircraft noise around airports of international organizations such as the WHO's and the World Bank's EHS guidelines;

(3) Meet the assessment requirements for aircraft noise around airports in international major economies;

(4) Ensure that the noise prevention and control measures adopted in this phase of the Project can meet the regulations of the above organizations and economies on management of airport aircraft noise;

(5) Ensure that the planning of land use around the airport meets the management requirements for airport aircraft noise of the above organizations and economies.

Based on the works in this phase, the proposed standard system consists of the following parts:

(1) Environmental quality standards for different functional areas around the airport

(2) Specifications (standards) for implementation of noise pollution control measures

(3) Standard for sound insulation design of buildings

(4) Reference for land planning around the airport.

Based on the above analysis, three representative options are selected for the Project.

(1) Option I

Lwecpn: Adopt the current airport noise assessment indicator system in China, including the current *Environmental Quality Standards for Aircraft Noise in the Surrounding Area of the Airport*, and referring to the *Environmental Quality Standards for Aircraft Noise in the Surrounding Area of the Airport (Draft for Comments)*, take Ldn as an auxiliary indicator for comparison.

The advantage of this option is that it allows us to use the mature airport noise assessment system in China, and it ensures that the environmental quality standard for noise, the standard for sound insulation design of buildings, and other noise prevention and control measures can be coordinated for consistency so that the noise assessment time can be reduced and timely completion of the Project can be ensured.

Lwecpn is the recommended airport noise assessment index by ICAO. And current standards for airport noise assessment in China are similar to international mainstream airport noise assessment indicators and are even more stringent. Furthermore, by incorporating the Ldn as a subsidiary indicator in accordance with the *Environmental Quality Standards for Aircraft Noise in the Surrounding Area of the Airport (Draft for Comments)*, the requirements of the international mainstream airport noise standards can be basically met.

(2) Option II

Ld and Ln: Adopt the aircraft noise standard limits for airports in the United Kingdom, and refer to the World Bank's EHS Guidelines.

This option can ensure that the Project meets the requirements of the World Bank's EHS Guidelines, but the EHS Guidelines do not explicitly distinguish between the cases of new airport construction projects and airport reconstruction and expansion projects. For airport reconstruction and expansion projects, monitoring the current background noise can be challenging as sudden noise is hard to avoid. Thus, it may not be feasible to accurately determine the actual added values of Ld and Ln based on current background noise monitoring results. Therefore, the option cannot provide a solution for aircraft noise impact assessment that is specific to this phase of the Project. In addition, the periods of assessment for Ld (16-hour) and Ln (8-hour) in the United Kingdom differ from those in the EHS guidelines. This may limit the standard's referenceability, despite not having a significantly disruptive impact on the results.

(3) Option III

Lden and Lnight: Refer to the indicators and limits recommended by the EU and the WHO.

The recommended Lden and Lnight limits by the World Health Organization (WHO) are mainly based on the potential health risks associated with noise, and their standards are excessively stringent, making it challenging for most major transportation airports to comply. Lden, an aircraft noise assessment indicator recommended by France, Japan, and other countries, is similar to Ldn. The standard limit for Lden is almost equivalent to that specified in the *Environmental Quality Standards for Aircraft Noise in the Surrounding Area of the Airport (Draft for Comments)* in China. And it is included in Option I.

The composition of indicator systems of the options is shown in the Table below.

Table 0-8 Standard System Composition of the Indicator Options

Option	Assessment Indicator	Environmental Quality Standards	Specifications for Implementation of Noise Pollution Control Measures	Standards for Sound Insulation Design Of Buildings	References for Land Planning Around the Airport	Remarks
Option I	Lwecpn/Ldn	*Standard of Aircraft Noise for Environment Around Airport* (GB9660-88) and *Environmental Quality Standards for Aircraft Noise in the Surrounding Area of the Airport (Draft for Comments)*	1. Rural settlements around airports are generally subject to the standard limit of 75 dB (WECPN L), schools and hospitals are subject to the standard limit of 70 dB, and urban residential areas are subject to the standard limit of 70 dB. Measures shall be taken to control the noise where the above standard limits are exceeded. New residential areas, schools, and hospitals shall locate outside the WECPN L contour of 70 dB. 2. For hub airports and main line airports in China, settlements within the WECPN L contour of 85 dB and schools and hospitals where the LWECPN is above 80 dB shall be relocated. For feeder airports and small airports, villages, schools and hospitals within the WECPN L contour of 80 dB shall be relocated. Corresponding sound insulation measures shall be taken for settlements where the LWECPN is above 75 dB and schools and hospitals where the LWECPN is above 70 dB.	Refer to Code for Design of Sound Insulation of Civil Buildings (GB 50118-2010) for sound insulation of existing buildings; The sound insulation for new buildings shall be subject to the *General Code for Building Environment* (GB 55016-2021).	1. Within the coverage of the WECPNL contour of 70dB of aircraft noise at the airport, it is prohibited to construct buildings, such as schools, hospitals, and general residential areas with special requirements for acoustic environment. 2. Environmental Quality Standards for Aircraft Noise in the Surrounding Area of the Airport (Draft for Comments)	

Option II	Ld, Ln	Environment, Health and Safety (EHS) Guidelines.	Further study is required to determine which specification is more reasonable	Sound insulation of existing buildings shall be subject to the *Code for Design of Sound Insulation of Civil Buildings* (GB 50118-2010). The sound insulation for new buildings shall be subject to the *General Code for Building Environment* (GB 55016-2021).	Further study is required to determine the required reference specification.	
Option III	Lden, Lnight	Environmental Noise Guidelines for the European Region (2018)	Further study is required to determine which specification is more reasonable	Sound insulation of existing buildings shall be subject to the *Code for Design of Sound Insulation of Civil Buildings* (GB 50118-2010). The sound insulation for new buildings shall be subject to the *General Code for Building Environment* (GB 55016-2021).	Further study is required to determine the required reference specification.	

From the above options and comparisons, it is evident that neither Option II nor Option III stands out in terms of protection of the aircraft noise receivers around the airport. Option I utilizes the current assessment system while being compatible with international mainstream indicators such as indicators recommended by FAA, Japan, and France, and can ensure that the assessment results meet the protection requirements for noise around airports of most economic organizations, while also taking into account the domestic trend of change of noise standards.

To conduct a more objective and accurate assessment of the potential noise impact on the surroundings of the airport of the Yunnan Kunming Changshui Green Airport Development Project, it is proposed to adopt Option I for the assessment standard. This option is based on the aircraft noise standard currently in use in China and refers to the *Environmental Quality Standards for Aircraft Noise in the Surrounding Area of the Airport (Second Draft for Comments)*, that is, conducting the assessment according to a double-indicator system.

The work on noise prevention and control and airport surrounding land use planning is mainly based on the current noise standard system in China and the *Environmental Quality Standards for Aircraft Noise in the Surrounding Area of the Airport (Second Draft for Comments)*. Meanwhile, the effectiveness of noise protection measures shall be verified according to the recommended aircraft noise protection limits by the WHO.

(3) Surface water

The World Bank Group EHS Guidelines do not provide surface water quality reference standards. According to the environment functional zoning, the water quality of surface water shall be subject to the Class III standard of the *Environmental Quality Standards for Surface Water* (GB3838-2002).

Table 0-9Environmental Quality Standard Limit for Surface Water

Unit: mg/L (dimensionless pH)

Parameter	Water temperature	pH	BOD_5	CODcr	NH_3-N	DO	Sulfides	Petroleums
Class III	—	6~9	≤4	≤20	≤1.0	≥5	≤0.05	≤0.05
Parameter	Fluoride (written as F−)	Cyanide	Chrome (hexavalent)	Cadmium	Arsenic	Total phosphorus (written as P)	Total nitrogen (written as N)	
Class III	≤1.0	≤0.2	≤0.05	≤0.005	≤0.05	≤0.2	≤1.0	

2.5.2 Pollutant emission standards

(1) Air pollutants

During the operation of the Project, waste gas generated includes road dust from the port area, dust from loading and unloading operations, dust from storage yards, as well as tail gas emitted by transportation vehicles and loading and unloading machinery. Road dust from the port area, pollutants in tail gas emitted by transport vehicles and loading and unloading machinery are subject to the standards set out in Table 2 of the *Integrated Emission Standard of Air Pollutants* (GB16297-1996). See the Table below for details.

Table 0-10 Fugitive Emission Limits of Particulate Matter in Construction Projects

Source of waste gas	Standard source	Pollutant	Standard value
Tail gas from transport vehicles and loading and unloading machinery	Table 2 of GB16297-1996	SO_2	Fugitive emission monitoring point 0.4 mg/m3
		NO_2	Fugitive emission monitoring point 0.12 mg/m3
		Non-methane hydrocarbons	Fugitive emission monitoring point 4.0 mg/m3
Dust from loading and unloading operations, dust from storage yards and roads		Particulate matter	Fugitive emission d monitoring point 1.0 mg/m3

(2) Noise

The operation noise during the construction period shall be subject to the *Emission Standard of Environment Noise for Boundary of Construction Site* (GB 12523-2011) of China. In addition, the World Bank EHS Guidelines specifies that the increase in background noise from the nearest receiver outside the site should not exceed 3 dB.**错误!未找到引用源。**

Table 0-11 Noise Limits for Construction Activities (in Leq [dB(A)])0

Period	Major noise source	Noise limit	
		Daytime	Nighttime
Construction period	Bulldozers, excavators and loaders; pile drivers; concrete mixers, vibrators and electric saws; lifts	70	55

(3) Sewage discharge

Sewage discharge at the construction site shall subject to the *Integrated Wastewater Discharge Standard* (GB 8978-1996) of China. The Class I standard is applicable to discharges into Class III water bodies in GB 3838-2002. The Class II standard is applicable to discharges into Class IV and Class V water bodies. The Class III standard is applicable to discharges into the municipal sewage treatment plant for secondary treatment via municipal sewers. During the construction period, domestic sewage is treated by the existing municipal sewage treatment facilities, and the sewage discharged from the construction site is subject to the Class III standard.

Table 0-12 Integrated Wastewater Discharge Standard0

Parameter	Class I	Class II	Class III
	Applicable for discharges into Class III water bodies	Applicable to discharges into Class IV and Class V water bodies	Applicable to discharges into municipal sewers
pH	6–9		
SS mg/L	70	150	400
BOD_5 mg/L	20	30	300
COD mg/L	100	150	500
Volatile phenol (mg/L)	0.5	0.5	2.0
NH_3-N mg/L	15	25	---
LAS (= anionic surfactant) mg/L	5.0	10	

(4) Vibration

According to the *Environmental Vibration Standards for Urban Areas* (GB 10070-88), the vibration levels of different areas are listed in the table below.

Table 0-13 Standard limits of vibration levels in different regions 0-14Unit: dB

Applicable zone range	Daytime	Night
Special residential area	65	65
Residents, cultural and educational districts	70	67
Mixed zone, central business district	75	72
Industrial concentration area	75	72
Both sides of traffic arterial road	75	72
Both sides of the main railway line	80	80

(5) Solid waste

The disposal of hazardous waste shall be subject to the *Standard for Pollution Control on Hazardous Waste Storage* (GB18597-2001, with its amendment in 2013); The disposal of general industrial solid waste shall be subject to the *Standard for Pollution Control on the Non-hazardous Industrial Solid Waste Storage and Landfill* (GB18599-2020).

3 Project Description

3.1Project Background

Kunming Changshui International Airport (hereinafter referred to as "Kunming Airport") is located near Dabanqiao Town, Guandu District, Kunming City, Yunnan Province, with a straight-line distance of 24.5 km and a highway distance of 34 km from the city center. It was completed and put into operation in June 2012.

Yunnan, located on the southwestern border of China, is adjacent to South and Southeast Asia and boasts rich natural and cultural resources. Since the initiation of reform and opening up, Yunnan has witnessed rapid economic and social development and tremendous progress. Currently, Yunnan is presented with significant opportunities from national strategies such as the Belt and Road Initiative, the Yangtze River Economic Belt, and the Western Development Strategy.

As the capital of Yunnan Province, Kunming has experienced steady and rapid development in politics, economy, transportation, tourism, and other sectors. Additionally, its air traffic volume has been consistently increasing. At the same time, social development is increasingly reliant on air transportation, and the air transport industry is progressively evolving into a fundamental and crucial industry for economic and social growth.

The scale of Kunming Airport's route network and the number of accessible cities have expanded significantly. The total number of routes has grown from 186 in 2010 to 348 in 2018, comprising 270 domestic routes, 74 international routes, and 4 regional routes, thereby forming a comprehensive route network that links the entire nation and four continents. Since its completion and commencement of operation in June 2012, the passenger throughput has increased steadily at an average annual rate of approximately 15%. In 2019, Kunming Airport recorded a passenger throughput of 48.076 million person-times, a cargo throughput of 416,000 tons, and 357,000 flights, reflecting a year-on-year increase of 2.1%, along with a decline of 2.9% and 1.0% respectively. Among the national civil airports, Kunming Airport ranked 6th in passenger throughput, 9th in cargo throughput, and 6th in flights. In 2020, due to factors such as the COVID-19 pandemic, Kunming Airport recorded a passenger throughput of 32.991 million person-times, a cargo throughput of 325 thousand tons, and 274,000 flights, ranking 6th, 12th, and 7th respectively among all civil airports in China. In 2021, the airport achieved an annual passenger throughput of 32.221 million person-times, an annual cargo throughput of 377,000 tons, and an annual flights of 279,000, ranking 7th, 11th and 7th respectively among all civil airports in China, representing a year-on-year decrease of 2.3%, an increase of 16.1%, and an increase of 1.8% respectively. These Figure s have recovered to 67.0%, 90.6%, and 78.2% in 2019.

To accelerate the development of the radial center for South Asia and Southeast Asia, promote regional coordination and leapfrog development in Yunnan Province, and expedite the implementation of the strategy of building national strength in aviation, the People's Government of Yunnan Province and the Civil Aviation Administration of China jointly issued the *Notice on Issuance of the Strategic Plan for Kunming International Aviation Hub* (YZF [2017] No. 56) on September 5th, 2017 to approve the strategic plan for Kunming Airport. On September 9, 2019, the Civil Aviation Administration of China issued the *Reply of the Civil Aviation Administration of China on the Overall Plan for Kunming Changshui International Airport* (MHH [2019] No. 777) to approve the overall plan for the airport In May 2021, the National Development and Reform Commission approved the implementation of the Yunnan Kunming Changshui Green Airport Development Project. On September 28, 2022, the National Development and Reform Commission approved the feasibility study report for Yunnan Kunming Changshui Green Airport Development Project. The Yunnan Kunming Changshui Green Airport Development Project is expected to be completed in 2030, and is designed with an annual passenger throughput of 95 million and an annual cargo throughput of 1 million tons for this phase. The Yunnan Kunming Changshui Green Airport Development Project mainly consists of three parts:

- East area: Includes a new 4000-meter-long and 45-meter-wide runway E2 along with its corresponding taxiway system, located 380 m east of the existing runway E1; an air freight station and air freight parking apron in the east of the airport; aircraft stands around Terminal 2 and other infrastructure on the east area, such as drainage systems, fire stations, lighting, and instrument landing systems.
- Central area: Includes new Terminal 2 and APM system; civil and ground parts of the ground transportation center (GTC), which is to be undertaken by the airport.
- West area: Includes new runway W3 with a length of 4,000 m and a width of 45 m along with its corresponding taxiway system, located 1,730 m west of the existing runway W1; a new aircraft maintenance area; preparations for future expansion in the area.

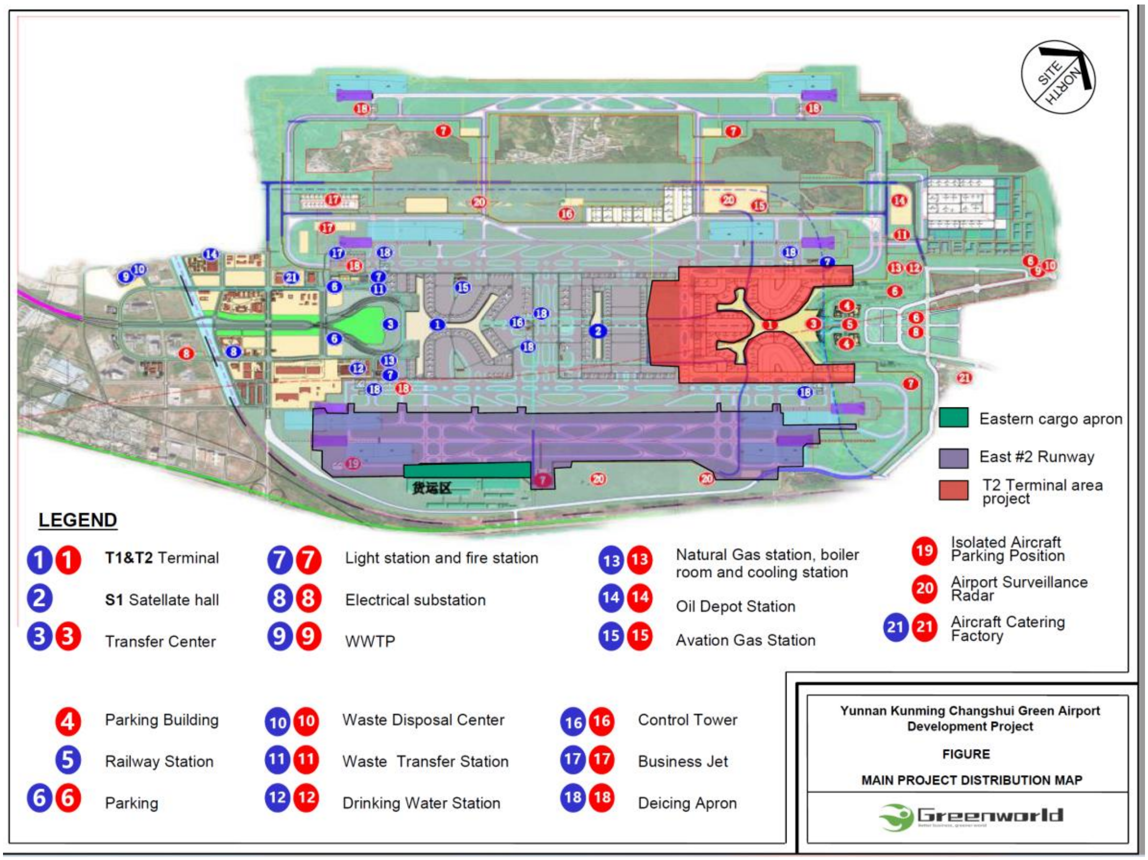
To ensure uninterrupted airport operation, the Yunnan Kunming Changshui Green Airport Development Project will be implemented in phases. The People's Government of Yunnan Province has applied for a loan of USD 500 million from the Asian Infrastructure Investment Bank (AIIB) for the implementation of the Yunnan Kunming Changshui Green Airport Development Project (hereinafter referred to as "the Project"). The Project is a part of the medium-term plan (2030) for the Yunnan Kunming Changshui Green Airport Development Project, and is mainly targeted at the construction of the east area.

The Project consists of four components:

- Component 1: The east airfield works include the construction of runway E2 and its corresponding perpendicular taxiways and parallel taxiways; a cargo apron in the east area which accommodates 16 aircraft stands; air traffic control (ATC) and navigation systems, instrument landing system (ILS), navigation lighting and power supply systems, drainage systems and fire stations; a smart runway, i.e. installation of sensing devices and monitoring systems on the pavement and base of runway E2.

- Component 2: Terminal 2 area works, including the construction of aprons (totaling 78) around Terminal 2, including base course treatment, civil works and pavement; airfield road and bridge works, including a northeast underpass, a northwest underpass, a terminal west underpass, and a terminal east underpass; supporting infrastructure such as lighting, drainage, power supply and fire fighting systems on the airside of Terminal 2.
- Component 3: Relevant equipment of green airport. New energy vehicles; installation of charging piles, aircraft ground AC works and 400 Hz ground power supply units on the apron, as well as automatic noise monitoring equipment and its installation.
- Component 4: Technical support and capacity building: 1) project implementation support, including environmental and noise monitoring and assessment; social impact and resettlement monitoring and evaluation; and other necessary support to improve the quality and efficiency of project implementation. 2) Institutional capacity building, including: (I) formulating the decarbonization roadmap and action plan for YAG; (ii) enhancing YAG's ESG information disclosure and capacity in green and sustainable development; (iii) enhancing the building of regional connectivity capacity by means such as holding aviation summits with countries in South and Southeast Asia and developing a roadmap for building the best international transit hub airport in the region.

The engineering design proposals for parts 1 and 2 of the Project are described in detail in Sections 3.2 and 3.3.



Note: Blue Figure s indicate the existing facilities of Kunming Airport; red Figure s indicate the proposed facilities in the medium and long-term development plan of Kunming Airport.

Figure 0-1 Layout of Proposed Facilities of the Project

3.2East airfield works

3.2.1 Runway E2 and its corresponding perpendicular taxiways and parallel taxiways

The existing runways of the airport are runway E1 and runway W1, of which the size of runway E1 is 4500×60 m, the size of runway W1 is 4000×45 m, and the runway spacing is 1950 m. The long-term development plan for Kunming Changshui International Airport includes the construction of runway E2 and runway W3, thus forming a four-runway configuration. The Project includes the construction of runway E2. The size of runway E2 is 4000×45 m, and the southern runway entrance is displaced by 300 m inward, and is aligned with the southern end of runway E1, with a spacing of 380 m. A parallel taxiway is set on both sides of runway E2 (Class F). A group of Class E vertical connecting passages are set between reserved S2 and Terminal 2.

Table 0-1 Main Dimensions of Airfield Pavement

Location	Item	Dimension (m)
Runway E2	Runway length × width	4000×45
	Runway shoulder width	15
	Total runway width	75
	Blast pad length × width	120×75
	Spacing between runway E2 and runway E1 (middle-middle)	380
	Spacing between runway and parallel taxiway W1 (middle-middle)	190
	Spacing between runway and parallel taxiway E1 (middle-middle)	Middle 185, both ends 295
	West rapid exit taxiway	Six in two directions, 1700 m, 2100 m and 2500 m from the runway threshold
	East rapid exit taxiway	Four in two directions, 2100 m and 2500 m from the runway threshold
Class F taxiway	Pavement width of straight section of taxiway	23
	Taxiway shoulder width	10.5
	Total width of taxiway	44
Apron	Width of aircraft stand taxiway	To be determined according to the design model

As runways, end links, rapid taxiways, parallel taxiway 1, and other parts are subject to repeated actions of large traffic volumes and high-strength loads for a long time, they are prone to slab bottom cavities, which are difficult to repair. Therefore, it is necessary to strengthen the durability design of the pavement structure. Therefore, a long-life pavement structure shall be adopted in these areas. The surface course shall be divided into upper and lower parts, both of which shall be made of dry and hard concrete materials. The flexural strength of the upper layer shall be greater than 7.0 MPa, while that of the lower layer shall be at least 5.0 MPa. Additionally, a 6 cm-thick large-pore asphalt macadam layer shall be set below the surface course to serve as a drainage asphalt base intermediate layer.

3.2.2 East cargo apron

Sixteen cargo stands (5C9E2F) are arranged in parallel in a linear manner in the east freight area of runway E2, consisting of five Class C aircraft stands, nine Class E combined aircraft stands, and two Class F combined aircraft stands.

3.2.3 Supporting infrastructure of east airfield

3.2.4 Smart runway

The smart runway system at Kunming Changshui International Airport consists of five modules: integrated foundation settlement sensing module for construction and operation, runway structural property sensing module, moving target behavior sensing module, pavement wetness and slipperiness and meteorological environment sensing module, and building elevation monitoring module in the aerodrome obstacle free space protection area. All data from these sensing modules are uniformly analyzed and managed through an integrated platform.

3.3Terminal 2 works

3.3.1 Apron around Terminal 2

The Project will construct 78 aircraft stands near Terminal 2 (51C25E2F) . The apron aircraft stands are designed with dimensions of Class F, Class E and Class C aircraft stands. The specific conditions of various aircraft stands are as follows:

- Class C: control models A321-211 (span 34.10× length 44.51) and B737-900W (span 35.80× length 42.11). Size of stand: 36×45 m. Considered models: A319, A320, A321, B737-300~900, 737-MAX/7/8/9/10, C919, EMB190, ARJ21, etc.
- Class E: control models B747-400 (span 64.92×length 70.67) and A350-1000 (span 64.75×length 73.79). Size of stand: 65×77 m, compatible with Class C and Class D aircraft.

3.3.2 Roads and bridges at airside

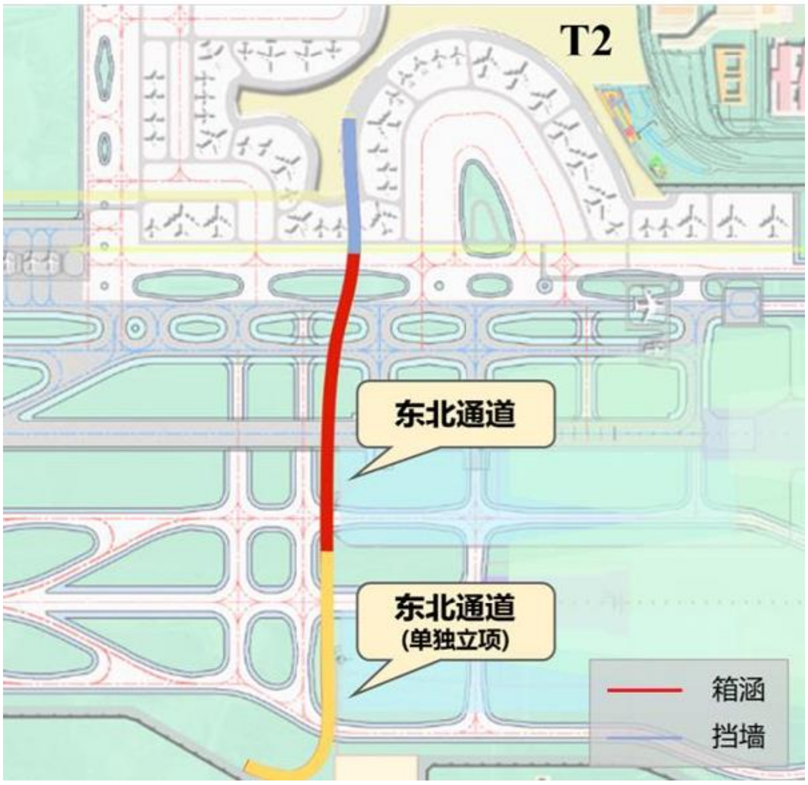
Roads and bridges at airside refer to the construction of bridges and underpasses in the airside area, which are used to create a grade-separated road system for aircraft and service vehicles for improving operational efficiency and safety in the airfield area. The Project includes the construction of 4 airside underpasses and bridges. There are side ditches for rainwater drainage in each underpass, and a sump is placed at the lowest point of the vertical section. The rainwater is then pumped and discharged into the nearby drainage ditch in the airfield area by the rainwater pump room.

Table 0-2 Design of Underpass Works

Description	Total length (m)	Length of buried section	Length of open section (m)	Clear width of underpass	Number of lanes

		(m)		(m)	
Northeast underpass	1057.5	817.9	239.6	20.9	Two-way four-lane
Northwest underpass	1288	918.5	369.5	20.9	Two-way four-lane
Terminal east underpass	1201.717	867	334.717	20.9	Two-way four-lane
Terminal west underpass	862	645.221	216.779	20.9	Two-way four-lane

• The northeast underpass is located on the northeast side of Terminal 2, and runs from east to west throughout the length. It begins at the perimeter road on the east side of the airport, passes underneath runway E2 and runway E1 to the west, and then ascends to the ground, connecting with the service lane of Terminal 2. The total length of the northeast underpass is 1730.5 m, which includes 27.718 m of the ground section, 434.952 m of the retaining wall section (of which the new section is 239.6 m long), and 1267.83 m of the box culvert section (of which the new section is 817.9 m long). The civil structures in the BK0+000-BK0+673 section (the yellow section in Figure 3-2) has already been reserved in the previous project. The design scope of the Project includes civil structures for other sections, as well as pavement structures, water, heating, electricity, and other necessary supporting facilities for the entire line.



Note: yellow line=northeast underpass that under construction funded by other project; redline=northeast underpass; blue line=retaining wall

Figure 0-2 Layout of Northeast Underpass

•The northwest underpass is located on the northwest side of Terminal 2, and runs from east to west throughout the length. It connects to the service lane of Terminal 2 and runs west underneath runway W1 before ascending to the ground. Finally, it connects to the service lane on the west side of the airport. The total length of the northwest underpass is 1,288 m, of which the open section is 369.5 m long and the box culvert section is 918.5 m long.

Note: redline=northwest underpass; blue line=retaining wall

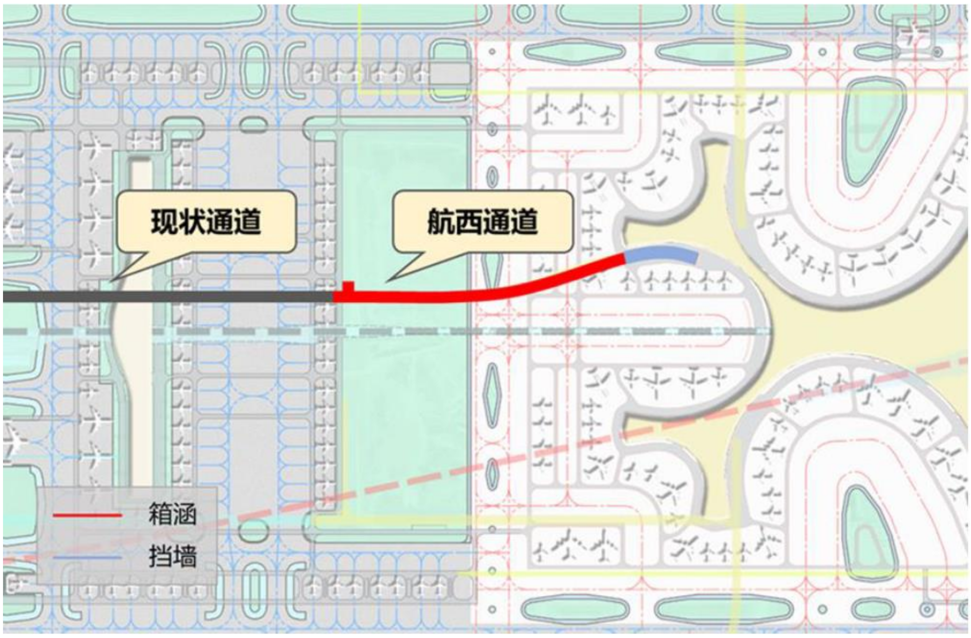
Figure 0-3 Layout of Northwest Underpass

•The terminal east underpass is located on the east side of the proposed Satellite Concourse 2, running from south to north throughout its length, and is connected to the existing freight channel. Its main function is to provide a rapid connection between the freight area and Terminals 1 and 2, and link the Satellite Concourses 1 and 2 (reserved). The total length of the terminal east underpass is 921.717 m, with 826 m of new box culvert section and 40m of retaining wall section within the design scope. In addition, branch line E1 is set with a total length of 280.0 m, including a ground section of 22.0 m, a retaining wall section of 168.0 m and a box culvert section of 64.0 m.

Note: gray line=existing cargo B line; redline=east underpass; blue line=branch passway

Figure 0-4 Layout of Terminal East Underpass

•The terminal west underpass is located to the west of the central axis of Terminals 1 and 2, and partially underpasses the proposed Satellite Concourse 2. It runs from south to north throughout the length and is connected with the existing west underpass. Its main function is to connect Terminals 1 and 2, and link Satellite Concourses S1 and S2 (reserved). The total length of the terminal west underpass is 862.0 m, including a 645.221 m box culvert section, a 156.0 m U-shaped trench section and a 32.264 m ground section.

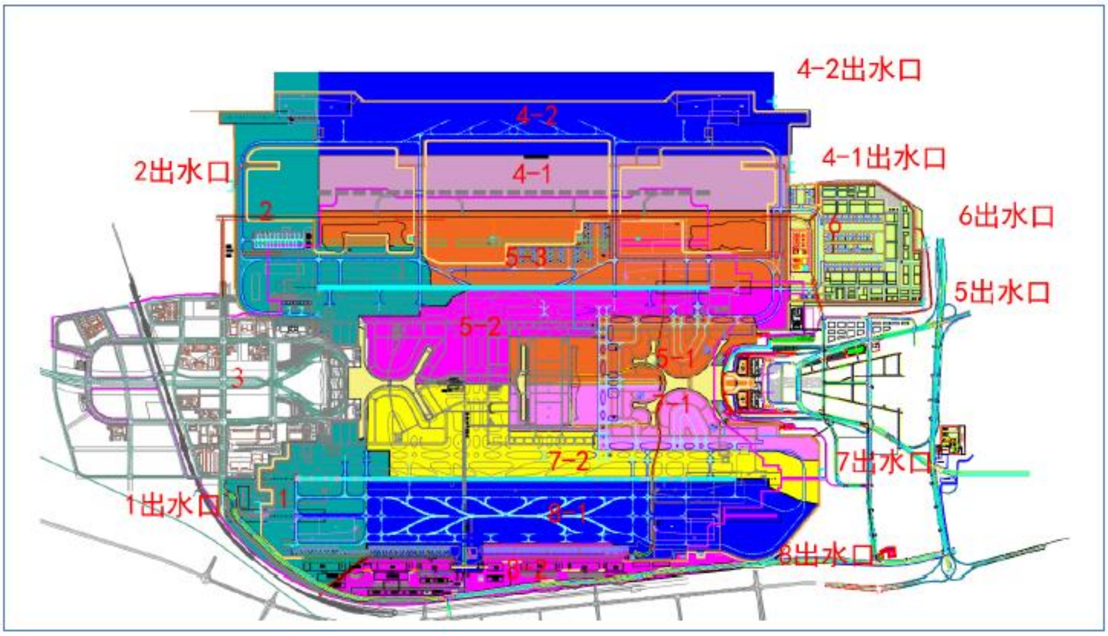


Note: gray line=existing passway; redline=west underpass; blue line=retaining wall

Figure 0-5 Layout of Terminal West Underpass

3.3.3 Airside drainage

According to the principle of rainwater being discharged into the nearby off-site drainage system, and taking into account the layout of off-site drainage facilities and the vertical planning of the airport, the rainwater system on the inland side of the site is divided into eight catchment areas. No. 8-1 water outlet receives most of the rainwater in the runway E2 area and a small part of the rainwater in the soil surface area and freight area outside the runway E2 area.



Note: the numbering refers to the code of the outlet

Figure 0-6 Layout of Water Outlets at Kunming Airport

Drainage routes are arranged parallel to the runway and the parallel taxiways, respectively, outside the runway, between the runway and the parallel taxiways, between the two parallel taxiways, and between the parallel taxiways and the apron. Drainage ditches are arranged on the east and west sides of the terminal in the apron area, converging at the water outlets or regulating pools in the north and south directions, respectively, before being discharged into the off-site drainage ditch. Rectangular or trapezoidal open ditches filled with mortar rubble should be placed outside the runway. Between the parallel taxiways, either mortar rubble rectangular open ditches or U-shaped concrete ditches capable of withstanding automobile loads should be installed. Drainage ditches within 75 meters from the centerline of the runway strip should be covered with concrete and capable of withstanding vehicle loads, while those within the leveling range of the taxiway strip should also be covered with concrete and capable of withstanding vehicle loads. Between the parallel slipway and the apron, a concrete cover ditch or box culvert capable of withstanding vehicle loads should be installed. Where the drainage ditches cross the taxiway pavement, blind ditches or box culverts capable of withstanding aircraft loads should be used. Drainage ditches crossing the road should be covered with blind ditches or box culverts capable of withstanding automobile or heavy vehicle loads, depending on the road grade. Cast iron grate box culverts capable of withstanding aircraft loads should be used to collect rainwater on the apron and near the de-icing liquid recovery tank of the de-icing apron. Within the protection area of glideslope, reinforced concrete cover plate open ditches capable of withstanding vehicle loads should be used to meet the site setting requirements of the navigation station. Mortar rubble open ditches are used for the rest of the soil surface area. Mortar rubble rectangular open ditches should be used for berm ditches on slope surfaces, slope top ditches in excavation areas, roadside ditches at slope toes in excavation areas, and slope toe ditches in filling areas. Fixed-section mortar rubble trapezoidal open ditches should be used for vertical intercepting ditches on slope surfaces. To accelerate the drainage of the local soil surface area and prevent water accumulation, V-shaped open drains paved with cement concrete precast blocks should be installed at the sharp corners of the soil surface area on both sides of each rapid exit taxiway. A drop structure should also be constructed on the exit slope.

3.3 Non-stop construction scheme

This project aims to expand the existing airport facilities and ensure the normal operation of the airport. The non-stop construction schedule has been tentatively formulated as follows:

In the open use of the area to take intermittent construction work, only in the airport during the night shutdown period for construction. The scope of construction mainly includes: the current situation of east and west a runway centre line on both sides of 75m, both ends outside within 300m; within the taxiway taxiing belt; within the safety line of apron stand. At the end of the day's work and before departure, appropriate measures should be taken (sandbagging or backfilling, etc.) to restore the area in time for normal operations the following day.

If the construction area of the existing fire protection, power, communication, drainage, underpass corridor, taxiway apron and navigation aid lighting rehabilitation works around the runway is outside the boundary of the current flight zone, the construction can be organised normally without affecting the operation of the airport, provided that the height of the construction machinery does not exceed the limit surface of the runway obstacle and the requirements of the sensitive area and the critical area of the navigation station. During construction, attention should be paid to controlling the height of the machinery and controlling the access of personnel and vehicles. Provided that the construction machinery meets the requirements of the airport clearance restriction, if the construction area is within the boundary of the current flight area, the construction should be carried out after the end of the night flight. If the construction area is within the boundary of the current flight area, the construction should be carried out after the end of the night flight. If the construction area is within the boundary of the current flight area, the construction should be carried out after the end of the night flight.

The implementation of part of the underpass and the extensive pipeline corridor in this project will also affect the operation of the airport's existing runway. The E2 runway has a small amount of excavation work, so priority should be given to the construction of the E2 runway for use by the airport. In order to ensure the safety and normal operation of aircraft in the North Flight Area, temporary barriers shall be erected in the relevant areas and the construction area shall be closed and managed in a uniform manner. During this period, effective measures shall be taken to ensure that construction personnel and vehicles do not enter the manoeuvring area without permission.

T2 terminal and supporting facilities outside the flight zone will be implemented throughout the day. A temporary boundary should be set up within the boundary of the current flight zone, and the relevant construction area should be isolated from the empty side for all-day construction.

4 Associated Facilities

4.1 Definition of Associated Facilities

"Associated facilities" refer to activities not included in the project description specified in the project management agreement but have an intrinsic connection with the Project's construction scope. The main principles defining associated facilities are as follows: (a) Directly and substantively related to the Project; (b) Implemented or planned with the Project; and (c) Necessary for the viability of the Project, and would not have been constructed or expanded in the absence of the Project.

4.2 Identification of Associated Facilities

According to the *Reply on the Feasibility Study Report of Yunnan Kunming Changshui Green Airport Development Project* (FGJC [2022] No. 1514) issued by the National Development and Reform Commission in September 2022, the scope of the Yunnan Kunming Changshui Green Airport Development Project is as follows:

Airport works: the construction of two new runways along with corresponding taxiways, Terminal 2 of 730,000 m2, an apron with 164 stands, a GTC of 80,000 m2, a parking building of 309,000 m2, cargo facilities covering 99,300 m2, as well as production and living auxiliary buildings and public support facilities.

Air traffic control works: the construction of a new regional control building, an approach control building, a west control tower and a podium building, reconstruction of the existing control tower, and construction of supporting facilities such as air traffic control, communication, navigation, surveillance and meteorological facilities.

Oil supply works: the construction of the second airport oil depot, three 20,000 m3 oil tanks, the second aviation refueling depot, construction of supporting business buildings, laying of apron refueling pipes, etc.

Table 0-1 Identification Matrix for Associated Facilities

Description of Facility	Definition of Associated Facilities			Description
	Directly and substantively related to the Project	Implemented or planned with the Project	Necessary for the viability of the Project, and would not have been constructed or expanded in the absence of the Project	
1. Airport works				
1.1 Runway W3 and corresponding taxiways	×	✓	×	Independent parallel operation
1.2 Terminal 2	✓	✓	✓	The Project includes the construction of aircraft stands around Terminal 2, so

				Terminal 2 is directly related to the Project.
1.3 GTC	×	✓	×	It serves the whole Yunnan Kunming Changshui Green Airport Development Project, and will be constructed in the absence of the Project.
1.4 Parking building	×	✓	×	It serves the whole Yunnan Kunming Changshui Green Airport Development Project, and will be constructed in the absence of the Project.
1.5 Freight facilities	✓	✓	✓	It is directly related to the 16 freight aircraft stands under the Project
1.6 Central substation (110 kV)	✓	✓	×	It serves the whole Yunnan Kunming Changshui Green Airport Development Project, and will be constructed in the absence of the Project.
1.7 1 Water supply station and 1 sewage treatment station	×	✓	×	The amount of water required and sewage generated by the operation of the Project is small, and the capacity of the existing water supply and sewage treatment facilities can meet the needs of the Project.
1.8 2 waste transfer stations	×	✓	×	It serves the whole Yunnan Kunming Changshui Green Airport Development Project, and will be constructed in the absence of the Project.
1.9 Airport operation center building and information center	×	✓	×	It serves the whole Yunnan Kunming Changshui Green Airport Development Project, and will be constructed in the absence of the Project.
1.10 Emergency rescue center	×	✓	×	It serves the whole Yunnan Kunming Changshui Green Airport Development Project, and will be constructed in the

				absence of the Project.
1.11 4 Underpasses	×	✓	×	/
1.12 A total of 164 new stands (of which 78 stands are included in the Project)	×	✓	×	/
1.13 Cooling and heating stations	×	✓	×	/
2. Air traffic control works	×	✓	×	The new west control tower mainly serves runways W1 and W3, and the existing air traffic control tower can be used in the Project.
3. Oil supply works	×	✓	×	The second airport oil depot and the second aviation refueling depot mainly serve runways W1 and W3, and the existing oil supply works can be used in the Project.

According to the analysis based on the Identification Matrix for Associated Facilities in Table 4-1, the associated facilities of the Project include Terminal 2 and cargo facilities.

4.3Overview of Associated Facilities

4.3.1 Terminal 2

The floor area of Terminal 2 is 730,000 m2, and the area of Terminal 2 equipment corridor is 33,000 m2. The main building of Terminal 2 is designed with two floors below the apron (with local interlayer) and four floors above the apron. The main elevations of aboveground floors are 0 m, 4.5 m, 8.5 m and 17 m respectively. The main structural system of the terminal is a reinforced concrete frame, and that of the roof is a large-span spatial steel structure.

4.3.2 Freight facilities

In this phase, the freight area is centrally arranged on the east side of runway E2, between runway E2 and the Zhanyi-Kunming Railway. The cargo warehouse is arranged in a liner manner along the runway and facing the apron, and provides an annual cargo throughput of 1 million tons together with the existing freight area. The airside area is located on the west side of the cargo warehouse and is primarily connected to the terminal area through an airside underpass. Additionally, a service lane is positioned on the ground, allowing access to the airside of both the north and south terminal areas. The landside area is located on the east side, where a primary passage for freight transport is situated to connect the south and north working areas. A passage, which provides access to National Highway 320, is set passing the Zhanyi-Kunming

Railway. The planned floor area of the freight area is 99,310 m2, the parking operation site is 85,300 m2, and the floor area is 52.24 hm2. In addition, 72.53 hm2 of land for long-term development is reserved on the southeast side of the freight area.

The freight area comprises various buildings and structures, including an air cargo station, a cargo warehouse, domestic and international cargo warehouse canopies, special cargo warehouses, vehicle maintenance and repair workshops, fumigation rooms, and freight area guard rooms, freight station operation site, freight area parking lot, freight area shift dormitory, freight area canteen, and comprehensive freight management room and other buildings.

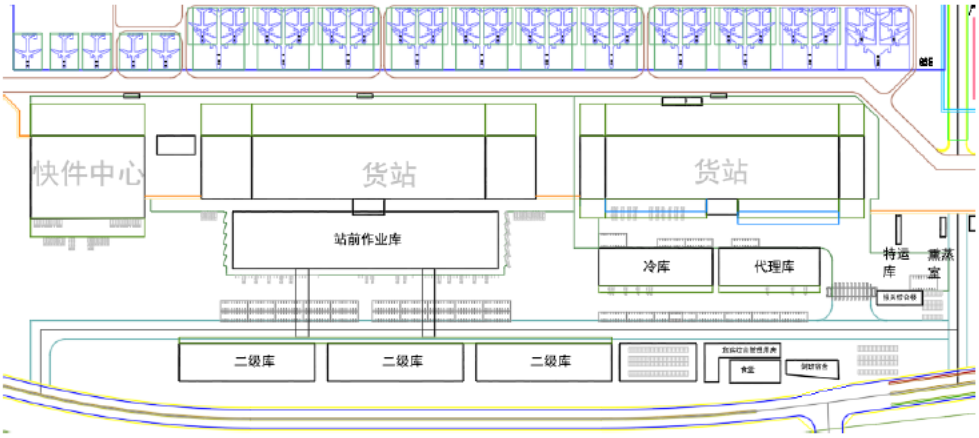


Figure 0-1 Layout of Freight Area

5 Alternatives

5.1No project Alternative

The Yunnan Kunming Changshui Green Airport Development Project have been included in the relevant plans:

- Kunming Airport is positioned as an "international aviation hub" in the *"14th Five-Year Plan" for the Development of Modern Comprehensive Transportation System* (GF [2021] No. 27), the *Layout Plan of National Civil Transport Airports* (FGJC [2017] No. 290), and the *"14th Five-Year Plan" for the Development of Civil Aviation* (MHF [2021] No. 56).
- The *Layout Plan of National Civil Transport Airports* specifies that concerning the southwest airport cluster: "The competitiveness of international hubs of Kunming, Chengdu and Chongqing airports should be gradually enhanced."
- The *"14th Five-Year Plan" for the Development of Civil Aviation* specifies that concerning the improvement of the functions of aviation hubs: "The construction of international aviation hubs such as Chengdu, Chongqing, Shenzhen, Kunming, Xi'an, Urumqi and Harbin should be improved."

According to the continuous strategic plan and master plan, Kunming Airport is positioned as:

- An international aviation hub radiating South Asia and Southeast Asia;
- A modern comprehensive transportation hub open to the outside world in Southwest China;
- A new drive for regional economic and social development.

According to the forecast of air traffic volume, the airport passenger throughput will be 95 million person-times in 2030, including 10 million international and regional passengers in China, and will be 120 million person-times in 2035. The Project is essential to the increasing aviation business demand, and the strategic goal of the construction of the international aviation hub of Kunming Airport. Therefore, this option will not be considered.

5.2Runway Configuration

Since the Kunming Changshui International Airport is located in a mountainous area, the change of runway location of the airport will cause great changes in runway operation mode, flight procedures, runway capacity, functional zoning and other factors. In the 2008 version of the airport master plan, four runways are planned, of which the east primary and secondary runways are short-spaced runways and the west primary and secondary runways are medium-spaced runways. The first phase of the Airport Project has constructed two main runways in the east and west.

From March to September 2017, the business volume, infrastructure, airspace, and routes of Kunming Changshui International Airport were analyzed in the strategic planning of Kunming Changshui International Airport prepared by the Civil Aviation Administration of China and the People's Government of Yunnan Province. The runway system configuration was analyzed. After several meetings, it is determined to adopt the 5-runway configuration, i.e. from east to west in the form of medium-spaced, wide-spaced, medium-spaced and medium-spaced, i.e. the distance between the three runways on the west side of the existing terminal area is 880 m and 850 m respectively (from inside to outside), and the distance between the two runways on the east side is 760 m.

However, the scheme with two runways on the east side spaced at 760 m has the following issues: A. The cost is relatively high. It is conservatively estimated that the airport engineering cost at 760 m is about RMB 5 billion higher than that at 380 m. B. As the missed approach gradient of 5% at 760m reaches the upper limit of the current domestic operation standard, which may make Kunming Changshui International Airport a special plateau airport, the airline should increase the unit configuration accordingly, and the operation safety will also be affected, and this will limit the competitiveness of the airport in the future. C. Demolition of surrounding built urban areas, clearance treatment for Zhanyi-Kunming Railway Tunnel, urban planning adjustment and other issues are involved. D. The available depth of the available land in runways E1 and E2 is only 250 m, and there is a height limit of 15 m, so the land utilization rate is low.

In view of the above factors, the *Master Plan for Kunming Changshui International Airport* (2019 Edition) approved by the Civil Aviation Administration of China finally determines the location of runway E2 according to a spacing of 380 m with runway E1.

In terms of operation mode, runway E1 and runway E2 shall be used together, with runway E1 used for takeoff and runway E2 for landing during busy hours. When runway E1 is under maintenance or other non-service conditions, runway E2 should be able to realize the takeoff function to avoid a significant reduction in the takeoff and landing capacity of the airport runway. In order to meet the above operation mode, runway E2 is designed to be 4000 m long.

5.3Comparison of Pavement Structures

The airport pavement is generally of cement concrete or asphalt mixture structure. In terms of performance, the main advantages of cement concrete pavement are high rigidity, high strength and good durability; the main advantages of asphalt mixture pavement are no joints on the pavement, comforTable aircraft rolling, little wear on wheels and instruments, convenient capping and renovation, convenient maintenance and short construction period.

From a technical reliability standpoint, the design and construction technologies for cement concrete pavement are more mature. Nevertheless, due to the recent implementation of numerous airport pavement rehabilitation projects without flight suspension in China, experience in constructing high-performance asphalt mixture pavement has gradually been acquired. Therefore, the design and construction technologies of both pavement types are currently reliable.

From an economic standpoint, the initial and life cycle costs of asphalt pavement are relatively high compared to those of cement concrete pavement. Therefore, it is more cost-effective to employ cement concrete pavement.

Considering that the site has been relatively sTable after years of placement, it is proposed to use a more mature, economical, and durable cement concrete structure for the runway pavement. The taxiways and apron pavement is not limited by factors like construction without flight suspension. From an economic and durability perspective, cement concrete is a better option. For construction areas requiring flight suspension, an asphalt mixture structure is recommended to reduce the construction time. For large parking areas, special equipment placement areas, dolly support areas at the nose of contact stand, and service lanes at the nose of remote stand, cement concrete pavement is preferred to prevent aggregate falling, rutting or sinking caused by long-time placement of heavy equipment and foot support use. In other areas, an asphalt mixture structure is recommended for service lanes.

As runways, end links, rapid taxiways, parallel taxiway 1, and other parts are subject to repeated actions of large traffic volumes and high-strength loads for a long time, they are prone to slab bottom cavities, which are difficult to repair. Therefore, considering the risk of future climate change, it is necessary to strengthen the durability design of the pavement structure. Therefore, a long-life pavement structure shall be adopted in these areas. The surface course shall be divided into upper and lower parts, both of which shall be made of dry and hard concrete materials. The flexural strength of the upper layer shall be greater than 7.0 MPa, while that of the lower layer shall be at least 5.0 MPa. Additionally, a 6 cm-thick large-pore asphalt macadam layer shall be set below the surface course to serve as a drainage asphalt base intermediate layer.

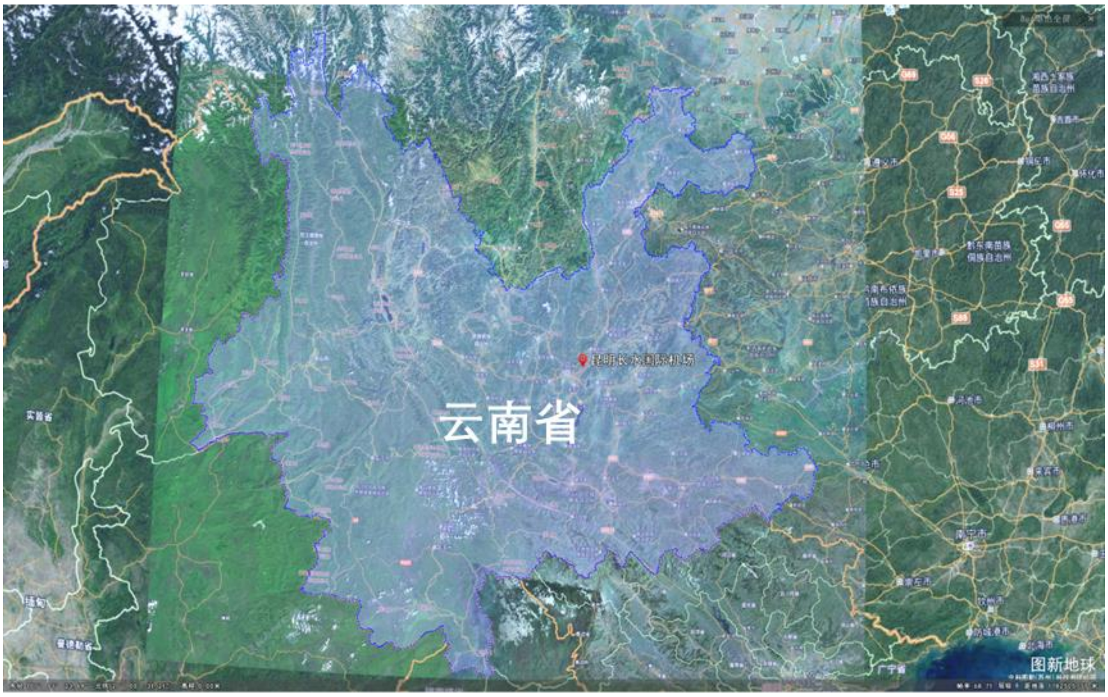
6 Environmental and Social Baseline

6.1Regional Background

6.1.1 Geographic Location

Kunming International Airport is located in Guandu District, northeast of Kunming City, Yunnan Province. Yunnan Province is situated on the southwestern border of China, sharing borders with Guizhou and Guangxi to the east, Sichuan to the north, Tibet to the northwest, Myanmar to the west, and Laos and Vietnam to the south. The province spans a total area of 394,000 square kilometers and has 8 cities, 8 autonomous prefectures, 10 prefecture-level cities, 80 counties, 29 autonomous counties, and 10 municipal districts. Kunming is the capital of Yunnan Province and one of the central cities in Southwest China, with a total area of 21,000 km2, and has jurisdiction over 5 districts, 1 city and 8 counties.

Guandu District is situated in the northeast of Kunming City and shares borders with Yiliang to the east, Chenggong to the south, Songming to the north, and Xishan District to the southwest and northwest. It also borders two urban areas in Kunming City. It is located between east longitude 102º38′50" to 103º03′10" and north latitude 24º54′0" to 25º17′10", with an east-west span of 41.5 km, a north-south span of 43 km and a total area of 1025 km2.



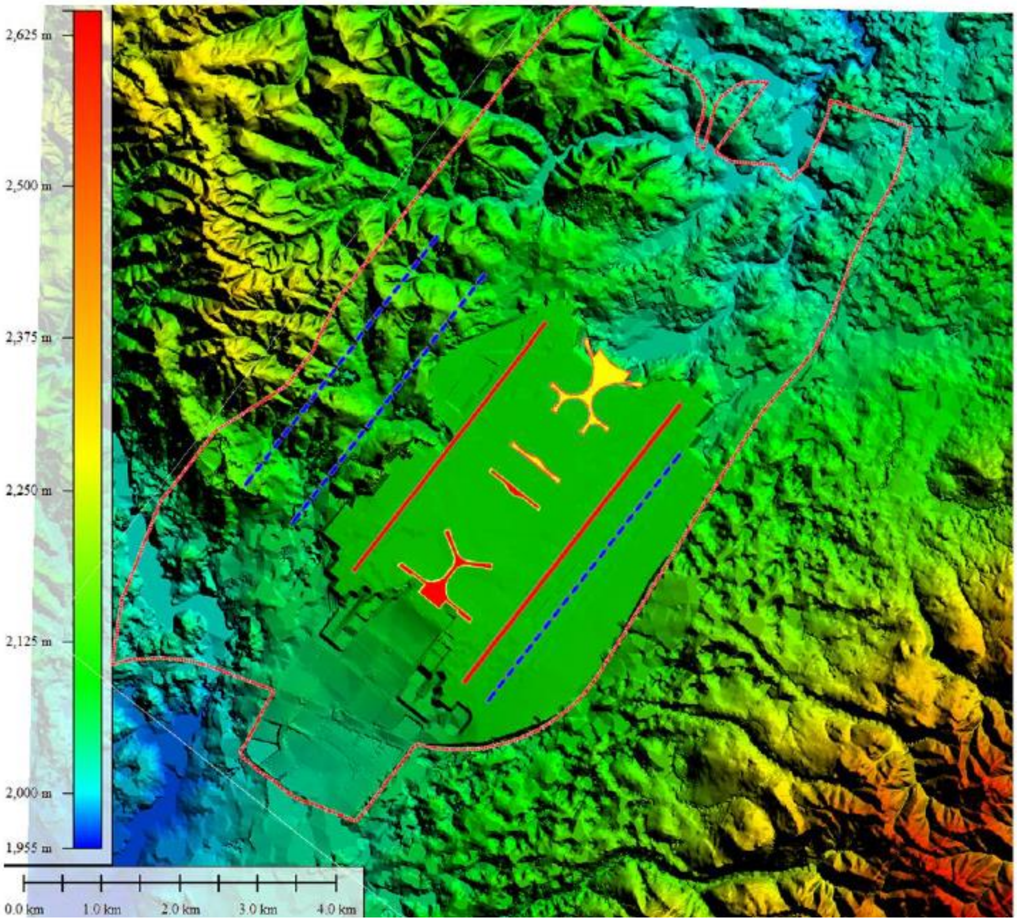
Source: Map World Satellite Image, March 2023

Note: the blue line=boundary of Yunnan Province; the red dot=location of Yunnan Kunming Changshui Airport.

Figure 0-1 Location Map of Kunming Airport

6.1.2 Topography and landforms

In terms of landforms within the airport's planning scope, the airport sits on the divide between the Dianchi Lake and Songming Basins. The site is also a northeast-southwest valley passage. The elevation of the airport airfield is about 2100 m, and the elevation of the operation area is between 2020 m and 2080 m. The elevation of Kunming urban area is about 1,900 m, the water level of Dianchi Lake is about 1,890 m, and there is a gentle slope with a total gradient of less than 1% between the Dianchi Lake and the airport. The elevation of Songming County is about 1,910 m, the elevation of Songming Plain is about 1,900 m, and there is a gentle slope with a total gradient of less than 1% between Songming County and the airport. The airport is about 200 m higher than the city. This provides good conditions for the increase of airport urban construction elevation and the reduction of noise impact.



Source: Master Plan for Kunming Changshui International Airport (2019, Shanghai Civil Aviation New Era Airport Design and Research Institute Co. Ltd)

Figure 0-2 Topography of Kunming Airport Site

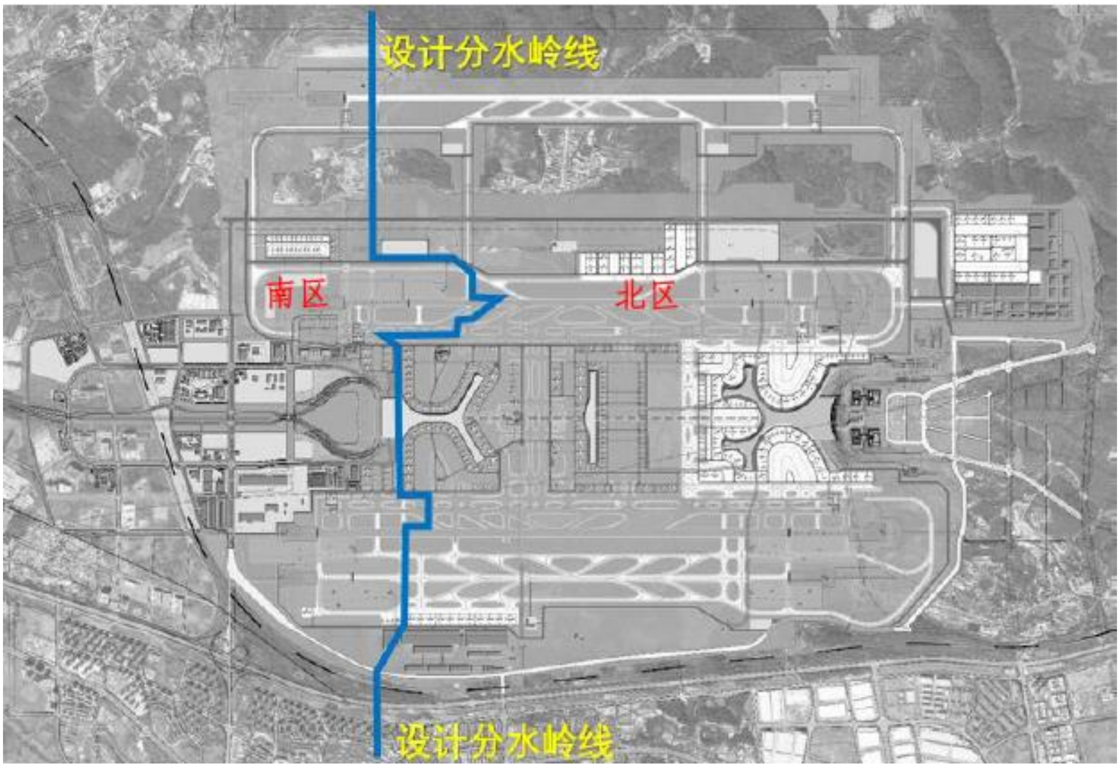
6.1.3 Climate & Meteorology

The project area is located in Dabanqiao Subdistrict, Kunming Airport Economic Zone, Yunnan Province. It has a subtropical-plateau mountain monsoon climate of low latitude north, with a mild climate, no intense heat in summer, no severe cold in winter, and the weather is spring all the year round.

According to data from the Meteorological Information Center of Dabanqiao Meteorological Station spanning from 1981 to 2012, the average annual atmospheric pressure in the site area is 810.5 kPa. The average temperature over this period is 14.0℃, with an average humidity of 74%. The hottest month is July, with an average maximum temperature of 22.7℃ and an absolute maximum of 34.0℃ on May 31, 1963. Meanwhile, January is the coldest month, with an average minimum temperature of 8.2℃ and an absolute minimum of -15.8℃ on December 29, 1983. The maximum recorded snow thickness is 17cm, and the annual average duration of sunshine is 2400 hours. The average number of days with gale (≥17 m/s) occurring yearly is 21, with over 90% of these gusts confined to winter and spring, chiefly from January to April, especially in late winter and early spring. The mean wind speed is 2.7 m/s, dominated for many years by southwesterly and west-southwesterly winds. The months of summer and autumn are typically rainy, while spring and winter tend to be dry, with an average annual precipitation of 1006.6 mm. Precipitation is concentrated from June to October, accounting for about 80% of the annual total. January's average precipitation is low, at 117 mm, whereas August sees the highest, at 2,059 mm. Finally, the dry season lasts from November to May of the following year, accounting for just 20% of the annual precipitation.

6.1.4 Hydrology

There is no river in the area of Kunming Airport. Kunming Airport is located in the watershed region between the Dianchi Lake Basin and Niulan River Basin, featuring a relatively high middle airfield area and relatively low operation areas at both the north and south ends. The airport's drainage system can be separated into the north and south areas by the transverse location of Terminal 1. The northern area belongs to the Huazhuang River water system of the Niulan River Basin, while the southern area belongs to the Baoxiang River water system of the Dianchi Lake Basin, and airport rainwater is discharged in the respective basin.



Note: blue line=watershed boundary; left side is the south area and right side is the north area.

Figure 0-3 Schematic Diagram of Drainage Separation Design of Kunming Airport

Shiqian Valley is a tributary of Huazhuang River. Huazhuang River originates from Laoba Mountain in Guandu District, and flows from west to east through Yangguanzhuang Reservoir, Huazhuang Reservoir, and Bajiacun Reservoir before converging with the Duilong River in the south and flowing into Songming County. It has a total length of 24 km and a catchment area of 170.81 km2.

The main branch of Baoxiang River originates from the western foot of Laoye Mountain and runs through Dabanqiao and Guandu before finally reaching Dianchi Lake. It has a total length of 38 km and covers a catchment area of 246 km2. The runoff of Baoxiang River is controlled by rainfall and varies greatly, with an annual total runoff ranging from 39 million m3 to 160 million m3. The average annual runoff is 99 million m3, with 73 million m3 during the rainy season, accounting for 73% of the annual total volume.

Source: Map World Satellite Image, March 2023

Figure 0-4 Water System Map of Kunming Airport Area

6.1.5 Soil

The soil types in Guandu District are complex and diverse, presenting obvious vertical distribution manifested as interlace horizontal zonal mountain plateau soil, vertical zonal soil, and intrazonal soil. Upon soil classification, the district can be divided into 5 soil groups, 9 subgroups, 10 soil genuses, and 25 soil species.

According to soil formation conditions, the soil can be classified according to the formation processes and properties into five categories: red soil, purple soil, limestone soil, paddy soil, and swamp soil. The 9 subgroups include red soil, yellow-red soil, red lime soil, submergienc paddy soil, acidic purple soil, lateral permeable paddy soil, waterloggogenic paddy soil, gleyic paddy soil, and swampy paddy soil. The 10 soil genuses include red soil, red purple soil, limestone red soil, basalt red soil, old alluvial red soil, sandstone, mudstone red soil, red clay soil, lateritic paddy soil, alluvial paddy soil and lacustrine paddy soil. The 25 soil species include red soil (limestone development), red ochre soil (limestone development), stone ballast soil, chicken manure soil, red ochre soil (basalt development), oil laterite, fragrant clay, yellow laterite, acid white soil, red sandy soil, purple lamb liver soil, red clay soil, red mud field, yellow mud field, white mud field, muddy field, mountain sand field, chicken manure soil field, oil sandy soil field, sandy mud field, river sand field, black mud field, cold waterlogged paddy field, thalassic field and red soil field (basalt development).

6.2Social and Economic Baseline

The Project involves Guandu District, Kunming City, Dianzhong New Area, and Kunming Airport Economic Zone in Yunnan Province. And the Project directly involves Changshui Subdistrict and Dabanqiao Subdistrict under the jurisdiction of the Airport Economic Zone. The Airport Economic Zone is located in Guandu District, and Dabanqiao Subdistrict originally under its jurisdiction is now governed by the Dianzhong New Area. On February 8, 2023, the Kunming Municipal People's Government approved the *Request for Approval of the People's Government of Guandu District, Kunming City on Dividing Dabanqiao Subdistrict into Dabanqiao Subdistrict, Changshui Subdistrict and Xiaoshao Subdistrict* (GZQ [2022] No. 78), agreeing to divide Dabanqiao Subdistrict into Dabanqiao Subdistrict, Changshui Subdistrict and Xiaoshao Subdistrict . Therefore, the Airport Economic Zone currently governs three subdistricts: Dabanqiao Subdistrict, Changshui Subdistrict and Xiaoshao Subdistrict.

6.2.1 Population situation

According to the statistical report on the national economic and social development of each district, by the end of 2022, Yunnan Province has a total registered population of 48.044 million and a permanent resident population of 47.2093 million, among which the male population is 24.4209 million, accounting for 51.73%. The female population is 22,788,400, accounting for 48.27 percent. The agricultural population was 23.628,600, accounting for 50.05%; And the non-agricultural population was 23.5807 million, accounting for 49.95 percent. The ethnic minority population was 15.636 million, accounting for 33.12 percent.

- Kunming has 5.886 million registered population and 8.502 million permanent residents, among which 4.349,600 are males, accounting for 51.16%; The female population is 4.152,400, accounting for 48.84%. The agricultural population was 1.658 million, or 19.50 percent; And 6.844 million, or 80.50 percent, of the non-agricultural population. The population of ethnic minorities was 1.176,700, accounting for 13.84 percent.
- Guandu District had a registered population of 621,800 and a resident population of 1,610,900, of which 858,700 were male, accounting for 53.31%, and 752,200 were female, accounting for 46.69%. The agricultural population was 11,300, accounting for 0.70%, and the non-agricultural population was 1,599,600, accounting for 99.30%. The minority population was 199,100, accounting for 12.36%.
- The Dianzhong New Area had a resident population of 820,000, of which 404,700 were male, accounting for 49.35%, and 415,300 were female, accounting for 50.65%. The agricultural population was 246,000, accounting for 30.00%, and the non-agricultural population was 574,000, accounting for 70.00%.
- The Airport Economic Zone had a registered population of 49,900 and a resident population of 106,500, of which 52,600 were male, accounting for 49.39%, and 53,900 were female, accounting for 50.61%. The agricultural population was

42,200, accounting for 39.62%, and the non-agricultural population was 64,300, accounting for 60.38%. The minority population was 8,200, accounting for 7.70%.

- Dabanqiao Subdistrict had a registered population of 20,100 and a resident population of 43,700, of which 21,600 were male, accounting for 49.43%, and 22,100 were female, accounting for 50.57%. The agricultural population was 16,800, accounting for 38.44%, and the non-agricultural population was 26,900, accounting for 61.56%. The minority population was 4,500, accounting for 10.30%.
- Changshui Subdistrict had a registered population of 17,200 and a resident population of 38,000, of which 18,800 were male, accounting for 49.43%, and 19,300 were female, accounting for 50.79%. The agricultural population was 14,500, accounting for 38.16%, and the non-agricultural population was 23,500, accounting for 61.84%. The minority population was 2,700, accounting for 7.11%.

Table 0-1 Population in Counties and Districts in the Project Area (2022)

(Unit: 10,000 People)

Demographic Index	Yunnan province	Kunming City	Guandu District	Dianzhong New Area	Airport Economic Zone	Dabanqiao Subdistrict	Changshui Subdistrict
Resident population by the end of the year (10,000 people)	4720.93	850.20	161.09	82.00	10.65	4.37	3.80
Registered population by the end of the year (10,000 people)	4804.4	588.60	62.18	——	4.99	2.01	1.72
Male population (10,000 people)	2442.09	434.96	85.87	40.47	5.26	2.16	1.88
Female population (10,000 people)	2278.84	415.24	75.22	41.53	5.39	2.21	1.93
Agricultural population (10,000 people)	2362.86	165.80	1.13	24.6	4.22	1.68	1.45
Urban population (10,000 people)	2358.07	684.40	159.96	57.4	6.43	2.69	2.35

Minority population (10,000 people)	1563.6	117.67	19.91	——	0.82	0.45	0.27

Source: Demographic data is from the Statistical Communiqué of the People's Republic of China on the National Economic and Social Development.

6.2.2 Baseline information of low-income groups in Project areas

As a result of targeted poverty alleviation and poverty alleviation campaigns, by the end of 2022, there are no poor villages, no poor households or poor people under the current standards in two streets within the project area, and absolute poverty has been historically eliminated. However, this does not mean that poverty does not exist, and poverty will still be manifested in many forms, such as relative poverty and low-income population. The poor population referred to in this paper is equivalent to low-income population, which mainly refers to the low-income population transferred to after poverty alleviation by the end of 2022.

By the end of 2022, there were 43,700 people in Dabanqiao Subdistrict, of whom 497 were low-income, accounting for 1.14 percent. Changshui Subdistrict had 38,000 people, with 352 low-income people, accounting for 0.93 percent. There are 81,700 people in the whole project area, and 849 low-income people, accounting for 1.04% of the total. See Table 6-2 for specific data and population composition.

Table 0-2 Low income population in the project area

Project Area	Airport Economic Zone		Total
street	Dabanqiao Street	Changshui Street	
Total population (10,000)	4.37	3.8	8.17
Female population (10,000)	2.21	1.93	4.14
Percentage of Women (%)	50.57%	50.79%	50.67%
Low income population (10,000)	0.0497	0.0352	0.0849
Percentage of low income (%)	1.14%	0.93%	1.04%

Source: Population data from the National Economic and Social Development Statistics Report.

6.2.3 Economic baseline of the project area

Table 0-3 4 Economic Situation of Project Counties (2022)

	Yunnan Province	Kunming City	Guandu district
Economic aggregate	The GDP of the province reached 2,714.676 billion yuan, an increase of 7.3% over the previous year, ranking among the highest in western China, and the two-year average growth rate was higher than that of the whole country. Its total economic output exceeded 2.7 trillion yuan, ranking the 18th in China and the fourth in western China.	Kunming's GDP reached 722.25 billion yuan, an increase of 3.7 percent over the previous year and an average growth of 3.0 percent in the two years based on comparable prices.	The region's gross domestic product (GDP) reached 144.137 billion yuan, up 0.3 percent year on year. Based on the permanent population, the per capita regional GDP was 89,707 yuan.
Per capita income	The per capita disposable income of the province's residents reached 26,000 yuan, an increase of 10.2 percent over the previous year and 2.9 percentage points higher than the growth of the GDP, ranking third in China and second in the western region. The per capita income of urban residents exceeded 40,000 yuan for the first time, reaching 40,905 yuan, an increase of 9.1 percent; The per capita income of rural residents was 14,000 yuan, up 10.6 percent, and people's sense of gain was significantly enhanced.	The per capita disposable income of permanent urban residents was 52,523 yuan, an increase of 9.4 percent over the previous year; The per capita disposable income of permanent rural residents was 19,507 yuan, up 10.1 percent.	The per capita disposable income of residents in the region was 52,698 yuan, of which the per capita disposable income of permanent urban residents was 53,505 yuan, up 9.2 percent year on year; The per capita disposable income of permanent rural residents was 26,319 yuan, up 9.3 percent year-on-year
Industrial development	The tertiary industrial structure of the province was 14.3:35.3:50.4, and the secondary industry accounted for 1.5 percentage points more than the previous year. The value added of the primary, secondary and tertiary industries contributed 16.4%, 30.2% and 53.4% to the economic growth respectively. The value added of the tertiary industry reached 1.37 trillion yuan, up 7.7 percent year on year, supporting half of Yunnan's economy.	The tertiary industry structure was 4.6:31.7:63.7, and the tertiary industry contributed 8.8%, -2.6% and 93.8% to GDP growth, respectively, contributing 0.3, -0.1 and 3.5 percentage points to GDP growth.	The ratio of the tertiary industrial structure was 0.6:33.6:65.8. The GDP grew by 15.9 percent in the first quarter, 7.1 percent in the first half of the year, and 3.3 percent in the first three quarters of the year.

Employment situation	Across the province, 533,100 new urban jobs were created, 159,900 urban unemployed people were re-employed, and 123,700 people with employment difficulties were employed, all exceeding their annual targets. The registered urban unemployment rate was 3.75 percent, down 0.17 percentage points from the previous year. Rural labor transfer employment reached a new high of 15.5819 million, 426,700 more than in 2020.	Over the year, 178,900 new urban jobs were created, 43,300 laid-off urban workers were re-employed, and the registered urban unemployment rate at the end of the year was 3.86 percent. A total of 121,700 rural workers were transferred to other jobs.	A total of 129,400 people received training in 2,438 shifts (including 91,700 online training). The government implemented the policy of "loan exemption and aid subsidy" and small guaranteed loans, and supported 286 people to start businesses. One-stop service centers for employment and entrepreneurship for college graduates have created more than 23,000 effective jobs, created 31,300 new urban jobs, and created 3.02 percent of registered urban unemployment. Zero employment families have been eliminated.
Poverty alleviation work	In Yunnan, 4.71 million registered households have been lifted out of poverty according to the current standards, 88 poor counties have been lifted out of poverty, 8,502 poor villages have been lifted out of poverty (including 27 deeply poor counties, 3,539 deeply poor villages, and 2,471,400 deeply poor people), and 11 "straight-through ethnic groups" and "ethnic groups with small populations" have been lifted out of poverty. Absolute poverty, which had been plaguing Yunnan for thousands of years, was historically resolved.	Kunming has three poverty-stricken counties: Dongchuan District (deeply impoverished), Luquan County and Xundian County, and six non-poverty-stricken counties: Panlong District, Jinning District, Fumin County, Shilin County, Songming County and Yiliang County, with a total of 404 poverty-stricken villages and 350,500 registered poverty-stricken people in 95,800 households. By the end of 2019, Kunming had achieved its poverty alleviation goal as scheduled. By 2020, Kunming had entered a new stage of consolidating and improving its poverty alleviation achievements, with no poverty-stricken population or newly added poverty-stricken	There are no national-level poverty-stricken villages. It has vigorously promoted the transfer and employment of poor rural labor in the districts of Yadian and Jiaozishan, Dongchuan District and Xundian County. Up to now, a total of 14.97 million yuan has been invested in special funds, providing 66,800 jobs and receiving and resettling 60,000 poor rural labor, including 40,800 registered households.

		population in the city.	

Source: From the national Economic and social development statistical report.

6.2.4 Baseline condition of Kunming Changshui Airport

Kunming Changshui International Airport is located in Changshui Street, Guandu District, Kunming City, Yunnan Province, 24.5 km northeast of Kunming City. It is a 4F international airport operated and managed by Yunnan Airport Group Co., LTD. It is the only large-scale gateway hub airport approved for construction during the 11th Five-Year Plan period. It is one of China's eight major regional hub airports, an international aviation hub and one of China's two major national gateway hub airports.

By 2018, Kunming Changshui International Airport has opened 348 domestic and international routes (78 international and regional routes, including 65 routes to South Asia and Southeast Asia) and 173 navigable cities (122 domestic, 47 international and 4 regional), among which 41 navigable points to South Asia and Southeast Asia have reached the first place in China. It has basically realized full passenger transport coverage of the capitals and key tourist cities of South and Southeast Asian countries. By March 2019, China's airports had 10 all-cargo air routes, 301 weekly flights and 36 shipping points in South and Southeast Asia. A total of 44 airlines operate at Kunming Changshui Airport, with the fleet size of the five base airlines reaching more than 120 planes; There are 7 base airlines: China Eastern Airlines Yunnan Co., LTD., Yunnan Xiangpeng Airlines, Sichuan Airlines Yunnan Branch, Kunming Airlines, Ruili Airlines, Red Earth Airlines and China Southern Airlines Yunnan Branch.

Kunming Changshui International Airport accelerates the construction of Kunming as an international city and promotes the economic development of Yunnan. The construction of the new airport will play a facilitating role in optimizing the strategic layout of the national airport, promoting the economic development of Yunnan and improving the comprehensive competitiveness of the modern new Kunming central city. In addition to the economic development directly related to aviation, the completion and operation of Changshui International Airport will usher in the era of "airport economy". In addition, Kunming Changshui International Airport gives full play to the advantages of Kunming's special geographical location and promotes international trade. Kunming is the center of Asia's 5-hour aviation circle, which is China's front channel open to the five regions of South Asia, Southeast Asia, West Asia, Southern Europe and Africa. The completion of Kunming Changshui International Airport has promoted the economic and trade exchanges between China and Southeast Asia, South Asia and Eurasia.

Figure 0-5 Radiation range of Kunming Changshui International Airport

6.2.5 Other baseline conditions in the project area

The baseline status of labor management, ethnic minorities, and women's development and rights protection in the project areas is detailed in Chapter 14.

6.3Physical Cultural Resources

Yunnan Airport Group Co., Ltd. entrusted Yunnan Institute of Cultural Relics and Archaeology to complete the *Report on Archaeological Investigation, Exploration and Evaluation of Cultural Relics for Yunnan Kunming Changshui Green Airport Development Project*, and this Report was approved by Yunnan Provincial Bureau of Cultural Heritage in 2019. There are no protected physical cultural resources above or below the project site. Outside the project site, the registered cultural relic Huaqing Guanyin Temple is located in the core area of Runway W3, and the protection scope has not been determined. Shiquan Temple, a district cultural relics protection site, is located in the transport center, and the protection scope is the construction control zone formed by outward extending 20m in the east, south, west and north respectively. The ancient post road in Changpo Village is a municipal cultural relics protection site. With 6m extended on both sides of the ancient post road as the boundaries, 20m will be extended outward from both boundaries as the construction control belt. The construction can not bypass Huaqing Guanyin Temple and Shiquan Temple. Kunming Municipal Administration of Cultural Heritage approved the relocation and protection plans of the two temples in 2021. The two temples have been relocated to Changpo Village in November 2022.

Ancient Post Road Shiquan Temple

Figure 0-6 Photos of Some Cultural Relics Protection Sites around the Project Site

The Contractor shall establish incidental discovery procedures for the discovery of material and cultural resources: If any cultural relics are discovered during construction, in accordance with Article 32 of the Law of the People's Republic of China on the Protection of Cultural Relics, (1) construction shall be stopped; (2) the site shall be protected and immediately reported to the Kunming Cultural Relics Administration Department; (3) the construction plan shall be adjusted according to the opinions of the Cultural Relics Administration Department of Kunming Municipal Government; (4) construction shall not be resumed until approved by the Cultural Relics Administration Department.

6.4Ecological environment

6.4.1 Conservation area

According to the Key Biodiversity Area (KBA) database [2], no key biodiversity area is included in the project area and its surroundings. The nearest KBA is Yunnan Dashanbao National Nature Reserve for Black-necked Cranes, about 90km away from the project area.

Part of the medium and long-term planning area of Kunming Changshui International Airport is located within the third-level Dianchi Lake Protection Zone, about 26km away from the first-level Dianchi Lake Protection Zone. The facilities to be constructed under the project, such as the East No.2 Runway and the car park around the T2 Terminal, are located outside the third-level Dianchi Lake Protection Zone. According to Article 53 of the Regulations of Yunnan Province on the Protection of Dianchi Lake (2018), the following behaviours are prohibited in the third-level protection zone

(1) Discharging solid waste into rivers, ditches and other water bodies, discharging faeces, sewage, waste liquid and other sewage or waste water that exceed the discharge standards for water pollutants, or washing production and living equipment, vehicles and other items that may pollute water bodies in rivers;

(2) piling or storing solid wastes and other pollutants on river shoals and bank slopes or burying them in the soil within the catchment area;

(3) Illegal or indiscriminate felling of trees or other acts of damage to vegetation related to the protection of water sources;

(4) Destruction of forests for reclamation or illegal occupation of forest resources;

(5) Hunting wild animals;

(6) Reclaiming land within the prohibited reclamation zones;

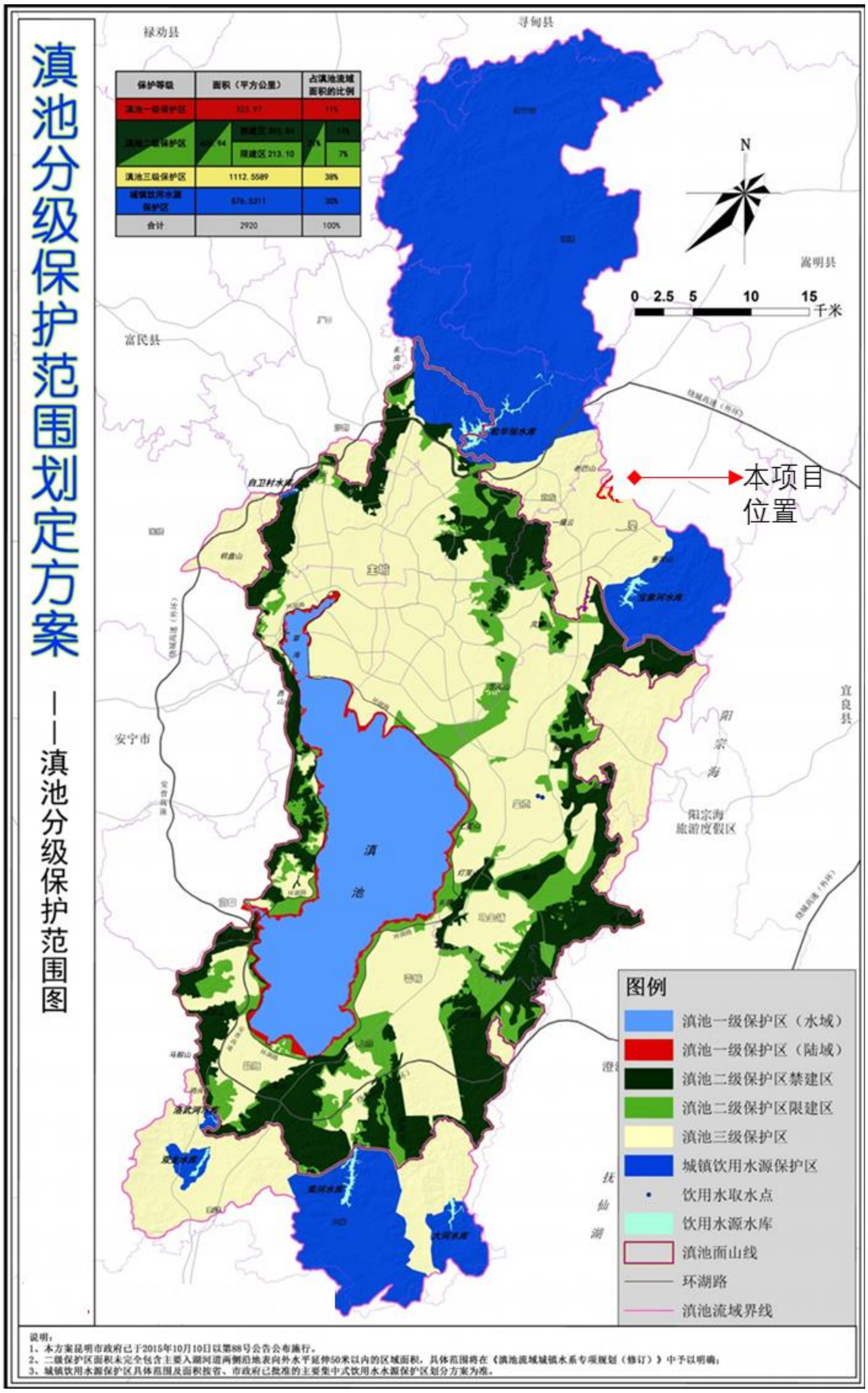
(7) Construction, reconstruction or expansion of industrial projects that discharge nitrogen and phosphorus pollutants into lakes and rivers, and other projects that pollute the environment or damage ecological balance and natural landscapes.

Kunming Airport will not cause serious environmental pollution and does not belong to the prohibited construction behaviour of the third level of the Dianchi Lake Protection Zone. After treatment, the effluent from this project can be classified as "Water Quality of Municipal Sewage Recycling and Municipal Miscellaneous Water" (GB/T 18920-2020), which can be used for road paving, greening, flushing toilets, etc. without external discharge.

---

2 Key Biodiversity Areas Partnership (2023). Developed by the Key Biodiversity Areas Partnership: BirdLife International, IUCN, American Bird Conservancy, Amphibian Survival Alliance, Conservation International, Critical Ecosystem Partnership Fund, Global Environment Facility, Re:wild, NatureServe, Rainforest Trust, Royal Society for the Protection of Birds, World Wildlife Fund and Wildlife Conservation Society.

The project complies with the Yunnan Provincial Regulations on the Protection of Dianchi Lake.



Note: light blue area= first class protection area (water body); yellow area=third class protection area

Figure 0-7 Location of the Dianchi Lake Protection Zoning and Project

6.4.2 Ecological baseline investigation method

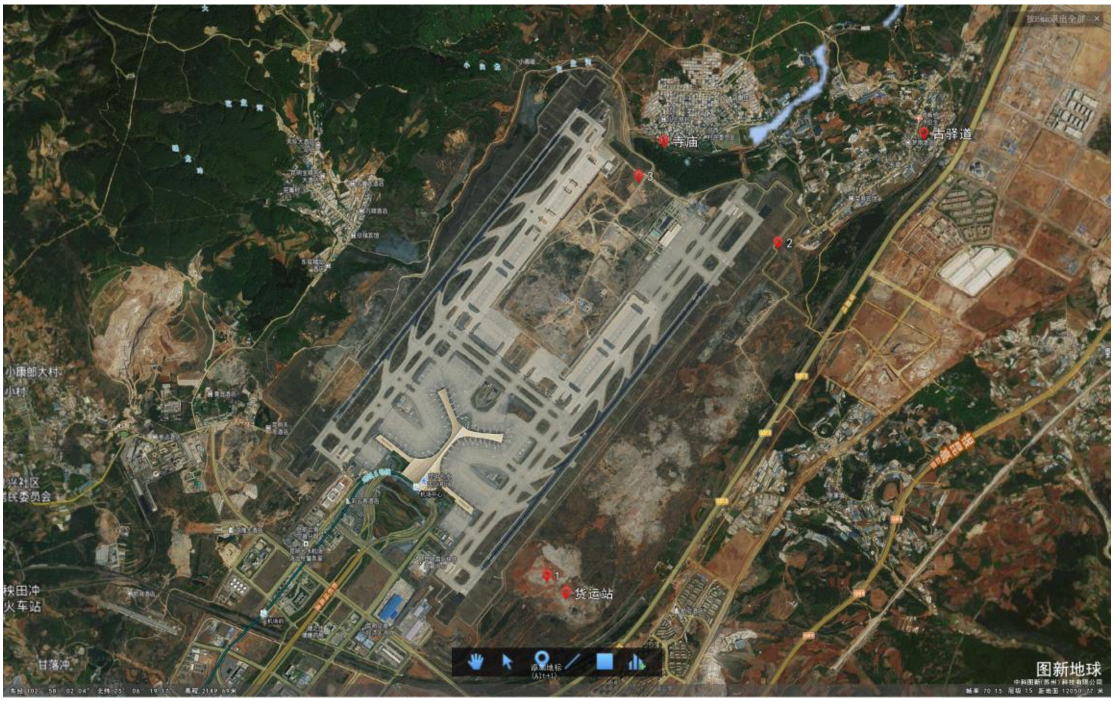
The vegetation investigation of the project area is based on the site investigation in November 2022 and February-March 2023, and the investigation scope is the land occupied by the Project. The animal assessment data come from the animal investigation carried out quarterly from August 2021 to July 2022 during the preparation of the *Bird Strike Data of Aviation Safety Information Network of Kunming Changshui International Airport in 2017-2021*, the *Investigation Report on Ecological Environment of Birds for Kunming Changshui International Airport in 2021* and the *Environmental Impact Report of Yunnan Kunming Changshui Green Airport Development Project*. The investigation covers Kunming Airport and its surrounding areas within 5km.

6.4.3 Vegetation

The Project covers a total area of 7,028.37 mu (=468.79 ha), where, 6,383.2 mu is located in Kunming Airport, and 498.59 mu is currently the maintenance base of China Eastern Airlines, without vegetation coverage. The site on the east of the Project has been leveled in 2020, with a low vegetation coverage, and the main vegetation are mainly sparse low shrubs and weeds, such as Rumex hastatus, Arthraxon hispidus and Setaria plicata. The remaining 146.46 mu is owned by Wuxi Community Village Base, including 20.68 mu of shrubs and 95.4 mu of arbors, which are artificially planted secondary forests, mainly including Keteleeria evelyniana and Quercus aliena.

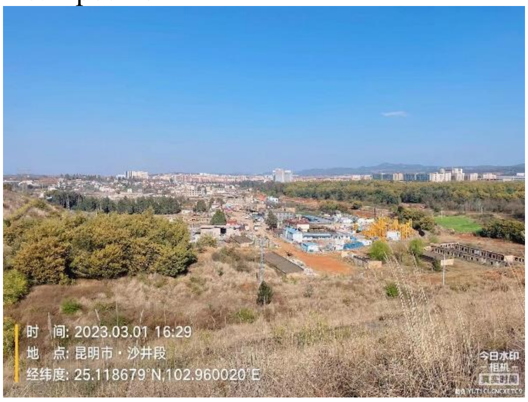
The east cargo area of the associated facility covers an area of 661.47 mu, and the construction has started in December 2022. The T2 terminal of associated facility covers a total area of 307.95 mu, including 240.59 mu located within the scope of Kunming Airport. The vegetation coverage is the same as that of the site of the Runway E2.

The 146.46 mu land for the parking aprons around the proposed T2 terminal and the 67.36 mu land for T2 terminal of associated facilities are collectively owned by Wuxi Community, including 0.56 mu of shrubs and 63.64 mu of arbors.




No. 1 position

East cargo area



No. 2 position


No. 3 position

Figure 0-8 Ecological Environment of Project Site and Surrounding Areas

6.4.4 Birds

According to the zoogeographical division, Kunming Airport is located in northeast of Yunnan Plateau in the southwest mountainous subregion of southwest region of China and India Sub-realm of the Oriental Realm. According to the survey, 92 species of birds are recorded. Widespread species are the most, including 58 species, accounting for 63.04%; oriental region species are relatively less, including 30 species, accounting for 32.61%; and palaearctic region species are the least, including only 4 species, accounting for 4.35% of the total number of birds.

From the perspective of bird migration, Yunnan is located on the East Asia-Australia flyway, one of the three important bird flyways in China. Currently, the known bird flyways in Yunnan mainly include the followings: Hengduan Mountains flyway in western Yunnan, including Gaoligong Mountains and Nujiang River migration routes; Meri Snow Mountain-Nushan Mountain-Biluo Snow Mountain and Lancang River Basin migration route; Yunling, Luoping Mountain, Diancang Mountain, Wuliang Mountain, Ailao Mountain and confluence route; eastern Yunnan-central Yunnan Plateau flyway, including northeastern Yunnan-central Yunnan-southeastern Yunnan clear flyway and Jinsha River Valley-central Yunnan Plateau unclear flyway; and unclear flyway in karst areas of northeastern Yunnan and eastern Yunnan. There are 19 important points along the migration route of birds through Yunnan, and the coordinates of the point nearest to Kunming on the migration route are 24º29´N and 102º38´E. The project affected area is located in the east of the northeastern Yunnan-central Yunnan-southeastern Yunnan clear flyway, with a straight-line distance of about 20~30km. No bird flyway is found in the assessment area during the investigation.

Note: the redline=clear flyway; the red dash line=unclear flyway

Figure 0-9 Location Relationship between the Project Area and Bird Flyways in Yunnan Province

Resident birds (expressed by R) of 47 species live in and around Changshui International Airport all year round, accounting for 51.09% of the recorded birds, including Falco tinnunculus, Glaucidium cuculoides, Streptopelia orientalis, etc.

Summer migrants of 22 species come here only in late spring and early summer, and leave in late summer and early autumn (expressed by S), accounting for 23.91% of the recorded birds, including Cuculus canorus, Vanellus cinereus, Dicrurus leucophaeus, etc.

Winter migrants (expressed by W) of 15 species fly here from the north to live through the winter in late autumn and early winter, accounting for 16.30% of the recorded birds, including Spodiopsar cineraceus, Callinago gallinago, Caprimulgus indicus, etc.

Passing birds (expressed by P), i.e. birds that pass through here without stop or only staying for a period of time during their migration process in spring and autumn, including 8 species, accounting for 8.7% of the birds in the assessment area, such as Anthus rufulus and

Turdus dissimilis.

6.4.5 Amphibians and reptiles

According to the field investigation, interview survey and comprehensive analysis of literature data, it is concluded that there are 2 orders, 8 families, 16 genera and 19 species of amphibians and reptiles in the impact assessment area. For reptiles, there are only 4 families, 11 genera and 11 species of reptiles, accounting for 57.89% of the total number of amphibians and reptiles, including 6 species of 6 genera of Colubridae, accounting for 31.57% of the total number of amphibians and reptiles in the assessment area; 2 species of 2 genera of Gekkonidae and Agamidae respectively, accounting for 10.53% of the total number of amphibians and reptiles in the assessment area; and 1 species of 1 genus of Scincidae, accounting for 5.26% of the total number of amphibians and reptiles in the assessment area. For amphibia, there are 4 species of 1 genus of Ranidae, accounting for 21.05% of the total number of amphibians and reptiles in the assessment area, 2 species of 2 genera of Micnohylidae, accounting for 10.52% of the total number of amphibians and reptiles in the assessment area; and 1 species of 1 genus of Bufonidae and Bombinidae respectively, accounting for 5.26% of the total number of amphibians and reptiles in the assessment area.

According to the Red List of China's Vertebrates (2016), seven species of animals in the assessment area are animals peculiar to China, including Bombina maxima, Kaloula verrucosa, Rana chaochiaoensis, Rana pleuraden, Hebius octolineatum, Macropisthodon rudis and Japalura varcoae.

One species is classified as endangered (EN) species, i.e. Elaphe carinata. One species is classified as vulnerable (VU) species, i.e. Ptyas nigromarginata. Besides, Hemiphyllodactylus yunnanensis is classified as near threatened (NT) species.

6.4.6 Beasts

According to the *List of Endangered and Protected Species of China* (2021) released recently, two species of wild animals under protection class II of China in the reserve are recorded, accounting for 14.29% of the number of mammalian species in the reserve, and they are Prionailurus bengalensis and Martes flavigula respectively. Besides, 3 species of mammals are listed as the threatened species in the *Red List of China's Vertebrates* (2016), accounting for 21.43% of the mammalian species in the assessment area. Among them, 1 species, Prionailurus bengalensis, is classified as vulnerable (VU) mammalian species, and the other two species, Martes flavigula and Phinolophus rex, are classified as near threatened (NT) mammalian species. Besides, two species peculiar to China, Eothenomys miletus and Rhinolophus rex, are distributed in the assessment area.

7 Atmospheric Environmental Impact Assessment and Mitigation Measures

7.1 Assessment Scope and Protection Targets

Considering the cumulative impact of the construction and operation of Kunming Airport on the atmospheric environment, the whole Yunnan Kunming Changshui Green Airport Development Project shall be the assessment object of atmospheric environmental impact. According to the assessment classification method in the *Technical Guidelines for Environmental Impact Assessment - Atmospheric Environment* (HJ2.2-2018), the atmospheric environmental impact assessment of the Project shall be classified as Level I, and D10% shall be 11km. The atmospheric environmental impact assessment scope shall be a rectangular area formed by extending D10% from the boundaries, with a north-south span of about 8.4km, and an east-west span of about 8km. Therefore, the assessment scope is a rectangular area of 30.4km×30.4km, and both the assessment area and prediction scope of the Project are a square area of 30.4km×30.4km. The investigation shall focus on the sensitive targets within 7km around the airport, and the investigation shall cover the townships and subdistricts within 7km~15km away from the airport.

A rectangular coordinate system is established with the south endpoint of the new Runway E2 as the origin of coordinates, the runway direction as the X axis and the direction perpendicular to the runway direction as the Y axis. In the runway direction, X axis is positive in the north and negative in the south of the south endpoint of Runway E2. Y axis is positive in the west and negative in the east of the south endpoint of Runway E2. See Table 7-1 for the ambient air protection targets of the Project.

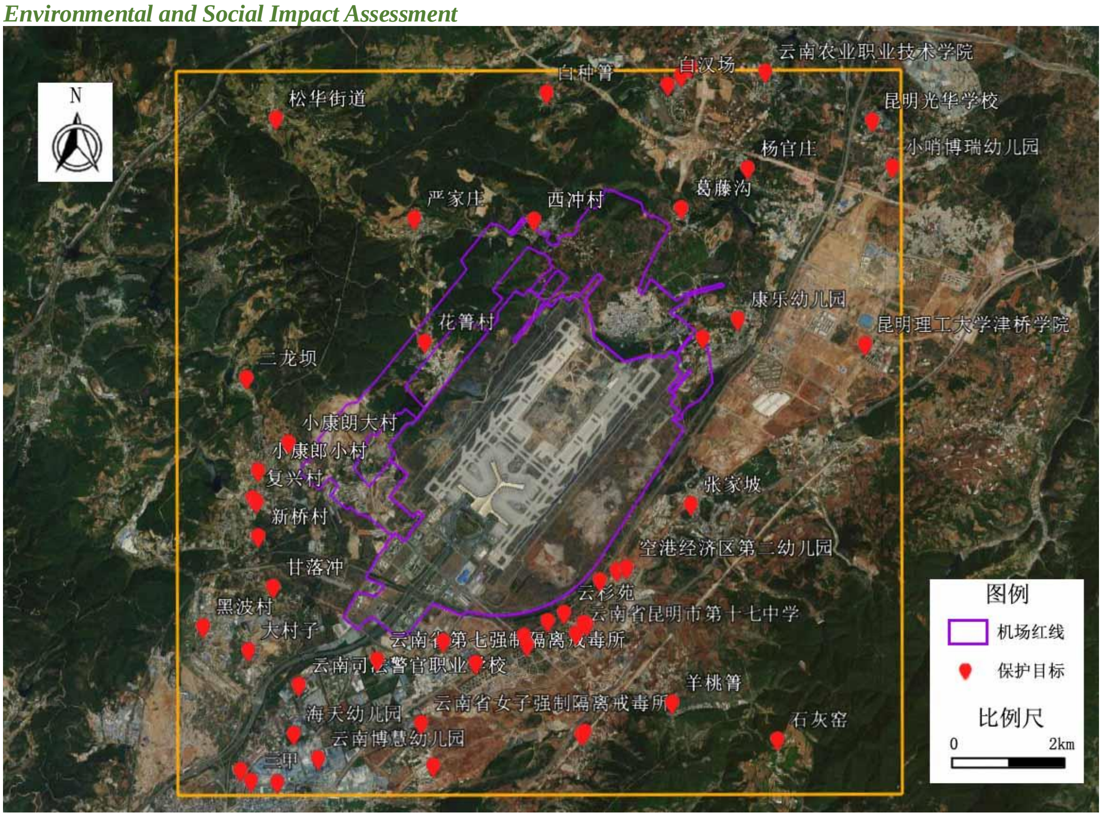
Table 0-1 Ambient Air Protection Targets

S/N	Site name	X(m)	Y(m)	Direction	Distance from project center (km)
1	Zhuangke Village	-6350.02	-7042.91	Southwest	9.5
2	Ala Subdistrict	-4710.49	-12315.8	Southwest	13.2
3	Changshui Central School	6696.76	3074.25	Northeast	7.4
4	Chance-Way Airport Town Shuihuaiyuan	142.82	-3614.27	Southeast	3.6
5	Chance-Way Airport Town Shuiheyuan	1080.43	-2884.33	Southeast	3.1
6	Chance-Way Airport Town	-228.24	-4043.13	Southwest	4.0
7	Changshui Chenxing Kindergarten	6643.44	3045.32	Northeast	7.3
8	Changpo Village	2935.28	1463.74	Northeast	3.3
9	Zhangjiapo	2714.89	-1524.39	Southeast	3.1
10	Yunxiangyuan	-1915.74	-6207.26	Southwest	6.5
11	Yunchanyuan	436.32	-3466.42	Southeast	3.5
12	Yunrui Community	6616.5	2952.1	Northeast	7.2
13	Yunqiao Village	6876.16	3443.68	Northeast	7.7
14	Yunnan Xixinan Technical School	-6639.38	-6682.25	Southwest	9.4
15	Yunnan Vocational College of Judicial Police	-4325.45	-4754.55	Southwest	6.4

16	The Seventh Compulsory Isolation Drug Rehabilitation Center in Yunnan Province	-2919.27	-4304.13	Southwest	5.2
17	Yunnan Vocational College of Agriculture	4065.07	6239.84	Northeast	7.4
18	Yunnan Bohui Kindergarten	-3982.13	-6076.6	Southwest	7.3
19	Qingyun Subdistrict	-12254	-4988.94	Southwest	13.2
20	Yincheng Jiayuan	-6450.2	-9462.33	Southwest	11.5
21	Yijia Central Yizi Kindergarten	-6569.49	-6782.62	Southwest	9.4
22	Yijia	-6492.72	-6576.49	Southwest	9.2
23	Songyang Subdistrict	642.7	17270.25	Northeast	17.3
24	Yangguanzhuang	3744.94	4503.43	Northeast	5.9
25	Yangtaoqing	2370.13	-5086.07	Southeast	5.6
26	Yanjiazhuang	-2237.99	3617.79	Northwest	4.3
27	Qidian Subdistrict	-3518.24	-16979.1	Southwest	17.3
28	Xingyuan Kindergarten	-5130.98	-6829.53	Southwest	8.5
29	Xingyue Lanwan	-1150.24	-4364.52	Southwest	4.5
30	Xinqiao Village	-5048.42	-2083.59	Southwest	5.5
31	Yanglin Town	9817.1	8484.2	Northeast	13.0
32	Xinfu Village	-2721.07	-10326.8	Southwest	10.7
33	Xinfa Primary School	802.38	-5603.9	Southeast	5.7
34	Xinfa Village	746.12	-5653.22	Southeast	5.7
35	Xiaoshao Township Hospital	2983.69	7360.23	Northeast	7.9
36	Xiaoshao Village	7123.98	5267.01	Northeast	8.9
37	Xiaoshao Borui Kindergarten	6344.33	4524.16	Northeast	7.8
38	Xiaokanglangda Village	-4499.97	-401.89	Southwest	4.5
39	Xiaokanglangxiao Village	-5045.77	-906.04	Southwest	5.1
40	Xiaozhaoyang Kindergarten	-6668.84	-6644.34	Southwest	9.4
41	Xiangshui Village	93.29	7137.64	Northeast	7.1
42	Xialiqi	-6790.84	-6584.02	Southwest	9.5
43	Xiaduilong	3760	12215.96	Northeast	12.8
44	Xichong Kindergarten	-6953.49	-8095.57	Southwest	10.7
45	Xichong Primary School	-6949.81	-7947.32	Southwest	10.6
46	Resettlement Area in Xichong Area	-6500.81	-7298.97	Southwest	9.8
47	Xichongkou	-6971.61	-8155.89	Southwest	10.7
48	Xichong No.2 Kindergarten	-7104.75	-8278.05	Southwest	10.9
49	Xichong Village	-86.63	3590.11	Northwest	3.6
50	Wutongyu Kindergarten	-4715.45	-6502.56	Southwest	8.0
51	Wujia	-5376.56	-6278.43	Southwest	8.3
52	Tangchi Subdistrict	7799.69	-12706.6	Southeast	14.9
53	Wulong Village	-8136	1200.16	Northwest	8.2
54	Wajiao Village	-8160.48	-7652.16	Southwest	11.2
55	Tanglipo	-9926.63	-5654.55	Southwest	11.4
56	Sijia	-5234.13	-6589.61	Southwest	8.4
57	Shihuiyao	4259.28	-5748.13	Southeast	7.2

58	Compulsory Isolation Drug Rehabilitation Center for Women in Yunnan Province	-2132.61	-5442.36	Southwest	5.8
59	Longquan Subdistrict	-15882.7	3420.59	Northwest	16.2
60	Shanjiao Village	-6298.13	-7917.93	Southwest	10.1
61	Shajing Village	7839.62	166.88	Northeast	7.8
62	Shagou Central School	-3521.08	-6814.02	Southwest	7.7
63	Shagou Village	-4503.03	-7552.6	Southwest	8.8
64	Sanjia	-5187.92	-6474	Southwest	8.3
65	Qingshui Community	-5186.7	-12931.3	Southwest	13.9
66	Qinglong School	-6904.98	-8333.21	Southwest	10.8
67	Qiliwan Community	8209.87	7740.77	Northeast	11.3
68	Mingzhu School	-6539.54	-6892.61	Southwest	9.5
69	Lingyuan Village	1459.18	7771.68	Northeast	7.9
70	Liziyuan	-7485.37	-8290.7	Southwest	11.2
71	Lizhi Primary School	-6712.05	-6637.72	Southwest	9.4
72	Liyun Hospital	-7118.83	-8694.97	Southwest	11.2
73	Luoyang Subdistrict	-10655.1	-16270.6	Southwest	19.4
74	Airport Campus of Kunming Self-study School	1384.27	-2708.4	Southeast	3.0
75	Kunming Yunqiao Hospital	-5188.72	-6643.77	Southwest	8.4
76	Airport Experimental School of Kunming No.3 Middle School	-7623.81	-9061.49	Southwest	11.8
77	Yunnan Kunming No. 17 Middle School	650.71	-3842.68	Southeast	3.9
78	Jinqiao College of Kunming University of Science and Technology	5846.91	1341.35	Northeast	6.0
79	Kunming Airport Economic Zone No.1 Kindergarten	784.65	-3648.57	Southeast	3.7
80	Kunming Airport No.1 Primary School	843.82	-3673.54	Southeast	3.8
81	No.4 Primary School of Kunming Economic and Technological Development Zone	-8930.95	-10220.3	Southwest	13.6
82	Kunming Guanghua School	5980.84	5354.46	Northeast	8.0
83	Airport Economic Zone No.2 Kindergarten	1557.31	-2662.92	Southeast	3.1
84	Konggang Jiayuan	-284.94	-3879.41	Southwest	3.9
85	Kangle Kindergarten	3565.46	1795.82	Northeast	4.0
86	Huaqing Village	-2051.25	1401.61	Northwest	2.5
87	Hongsha Beibei Kindergarten	-4683.52	-6703.96	Southwest	8.2
88	Hongshapo	-4354.83	-6794.55	Southwest	8.1
89	Heibo Village	-6041.34	-3700.57	Southwest	7.1
90	Haizi Village	-9047.76	-10233.8	Southwest	13.7

91	Haitian Kindergarten	-4419.05	-5632.73	Southwest	7.2
92	Xiaobanqiao Subdistrict	-16995	-14489.1	Southwest	22.3
93	Xiaoshao Middle School, Guandu District	3064.17	7122.2	Northeast	7.8
94	Dabanqiao Central Hospital, Guandu District	-6154.1	-6786.04	Southwest	9.2
95	Getenggou	2555.21	3792.31	Northeast	4.6
96	Gaoshitou	-3933.51	-7408.38	Southwest	8.4
97	Gaopo Branch	-10249.9	-9195.62	Southwest	13.8
98	Ganluochong	-4781.85	-2994.33	Southwest	5.6
99	Ganhaizi	-1731.14	-3972.76	Southwest	4.3
100	Fuxing Primary School	-5075.04	-1462.54	Southwest	5.3
101	Fuxing Village	-5144.29	-1397.34	Southwest	5.3
102	Erlongba	-5251.68	754.97	Northwest	5.3
103	Erjia	-6170.11	-6870.86	Southwest	9.2
104	Dongyuan Qicheng	-7521.14	-8668.76	Southwest	11.5
105	Dongfang Jinbaobei Kindergarten	-5288.93	-6646.37	Southwest	8.5
106	Dongda Village	-10190.4	-1780.82	Southwest	10.3
107	Dagaopo	-9969.93	-8506.71	Southwest	13.1
108	Dadongchong	-2569.6	-7865.93	Southwest	8.3
109	Dacunzi	-5227.18	-4132.5	Southwest	6.7
110	Dianyuan Subdistrict	-6697.89	10099.64	Northwest	12.1
111	Morningstar Kindergarten	-6121.92	-6953.11	Southwest	9.3
112	Caojiachong	-3068.15	-9045.97	Southwest	9.6
113	Beibei Kindergarten	-6547.63	-6451.73	Southwest	9.2
114	Beibei Feixing Kindergarten	-6130.73	-6617.13	Southwest	9.0
115	Banqiao Middle School, Xingjie Primary School	-6738.84	-6835.41	Southwest	9.6
116	Baizhongqing	144.66	5869.01	Northeast	5.9
117	Songhua Subdistrict	-4711.9	5417.64	Northwest	7.2
118	Baihanchang Central Kindergarten	2717.82	6323.38	Northeast	6.9
119	Baihanchang Central School	2554.51	6166.26	Northeast	6.7
120	Baihanchang	2317.88	6007.13	Northeast	6.4
121	Bakou	-989.83	-7442.58	Southwest	7.5
122	Aibeier Kindergarten	-9030.47	-8032.75	Southwest	12.1
123	Ayi Jiayuan	-8042.78	-8025.38	Southwest	11.4
124	Ayi Village	-7119.02	-7466.67	Southwest	10.3
125	Adi Village	-3691.19	-6857.51	Southwest	7.8
126	Yuntianyuan	7228.55	2680.38	Northeast	7.7



Note: the purple line=boundary of the Kunming Airport; red dot=sensitive recievers.

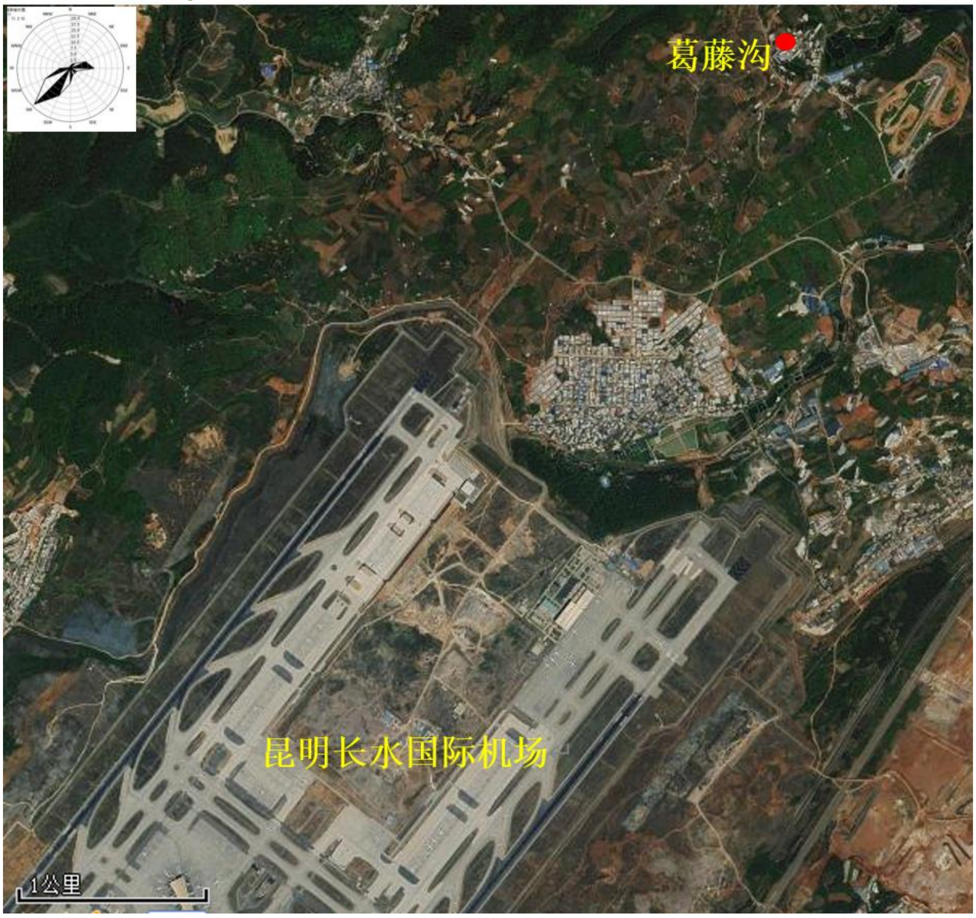
Figure 0-1 Distribution of Atmospheric Environmental Protection Targets in 13km×13km Area of Kunming Airport

7.2Current Environmental Quality

7.2.1 Current atmospheric environment quality

The Project is located in Guandu District, Kunming, and the atmospheric assessment involves Guandu District, Chenggong District, Panlong District, Songming County and Yiliang County of Kunming. The Kunming Environmental Statement 2021 pointed out that the ambient air quality of Kunming reached the national Level II standard, the good air quality rate reached 98.63% in the main urban area, and the ambient air quality in counties (cities) and districts remained good in general. Therefore, the atmospheric environmental quality of the project area is accepTable .

Yunnan Kunfa Environment Tech Co., Ltd. carried out the supplementary monitoring of atmospheric environment from October 1 to October 7, 2022. The prevailing wind in the area where Kunming Airport is located is southwest wind. One supplementary monitoring point is set in Getenggou (east longitude: 102.96204°; north latitude: 25.14711°) which is in the northeast of the airport, to monitor the non-methane hydrocarbon and TSP. Monitoring period: 7 consecutive days, from October 1 to October 7, 2022. Non-methane hydrocarbon: being sampled at 2:00, 8:00, 14:00 and 20:00 every day; TSP: being continuously monitored for 24h every day.



Note: red dot=Geteng creek.

Figure 0-2 Layout of Supplementary Monitoring Points for Specific Ambient Air Pollutants

For TSP, the Class II standard in *Ambient Air Quality Standards* (GB3095-2012) shall be implemented. For non-methane hydrocarbon, the limits in the *Detailed Explanation for Integrated Emission Standard of Air Pollutants* shall be referred to. The monitoring and assessment results of the current ambient air status in this area are shown in Table 7-2. The monitored values of TSP and non-methane hydrocarbon meet the standards.

Table 0-2 Statistics and Analysis of Monitoring Results of Specific Ambient Air Pollutants

Description of the monitoring point	Pollutant	Average time	Assessment criteria	Monitoring concentration range	Ratio of the maximum concentration to the standard concentration /%	Compliance
Getenggou	TSP	24h	300μg/m^3	109~151μg/m^3	50.3%	Yes
	Non-methane hydrocarbons	1h	2.0 mg/m^3	1.12~1.67mg/m^3	83.5%	Yes

7.3 Atmospheric Environmental Impact Assessment and Mitigation Measures During Construction Period

7.3.1 Dust

(1) Sources

The atmospheric environmental impact during the construction period is mainly the construction dust. The construction dust mainly comes from earthwork excavation and filling, site leveling, loading, unloading and stacking of building materials, vehicles transportation, concrete mixing, etc. In terms of the Project, earthwork excavation and vehicle transportation are involved, and the dust will affect the local atmospheric environment. The main pollution factor is TSP.

The amount of construction dust is related to many factors, and the amount of dust generated by excavators during operation is related to the pit excavation depth, height of the grab bucket of excavator relative to the ground, wind velocity, soil granularity, soil moisture content, etc. For the muck storage yard, the amount of dust is also related to the stacking method, threshold wind velocity and protective measures for the yard. The research results and analogy surveys at home and abroad show that the main factors affecting the amount of dust are: protective measures, wind velocity, soil humidity, excavation method or soil stacking method, etc. In addition, the amount of dust on the road is related to the running speed of vehicles. The faster the speed is, the greater the amount of dust will be.

(2) Impact analysis

During the construction process, the links with the greatest dust impact are excavation, soil stacking in the open air and vehicle transportation.

① Excavation

The experience shows that when the earthwork excavation of the Project is 400t/d, the dust (TSP) has a great impact on the atmospheric environment. Generally, its impact will extend to a range of about 500m. The concentration of TSP at a close range can exceed the Grade II standard by several times to more than ten times, but it can be reduced to the Level II standard at a range of about 600m.

② Soil stacking in the open air

Another kind of construction dust is soil stacking in the open air, and it is affected by the wind velocity during operation. The amount of dust is related to the wind force and climate to some extent. In the free wind farm, the construction dust can exceed the Level II standard in *Ambient Air Quality Standards* (GB3095-2012) within 150m, causing an adverse impact on the atmospheric environment, while it will generally have only a small impact when the distance is more than 150m.

③ Concrete mixing

To meet the special needs of aircraft taxiing, take-off and landing, concrete of special mix proportion is required, thus a concrete mixing station needs to be set up in the airfield area. Concrete mixing will generate dust, and the dust pollution caused thereby is concentrated around the mixing station, affecting a wide area around the mixing station with high concentration values. The comparison of relevant data shows that the TSP concentration is 11.652 mg/m^3 at 50m downwind of the concrete mixing station and 9.694 mg/m^3 at 100m, and can basically meet the requirements for Level II ambient air quality standard of China at a distance of 200m away. Therefore, the concrete mixing station shall be set in the downwind direction of the protection target as far as possible, and shall be 300m away from the protection target.

④ Vehicle transportation

During the construction period, the dust generated by vehicle transportation accounts for about 60% of the total dust. Generally, the dust generated on the construction site and construction roads under the effect of natural wind affects the area within 100m. During construction period, watering the roads on which vehicles run for 4~-5 times per day can reduce the flying dust by 70% and effectively control the impact of construction dust on the surrounding environment.

7.3.2 Construction waste gas

During the construction, all kinds of engineering and transport vehicles will come to and leave from the construction site, mainly including transport trucks, dumpers, excavators, forklifts, and bulldozers. The main pollutants in automobile exhaust include carbon monoxide (CO), hydrocarbons (HC) and nitrogen oxides (NO_x), which will have an adverse impact on the areas in the downwind direction and along the transport routes.

The impact of automobile exhaust on the construction site on the atmospheric environment has the following characteristics:

1) The exhaust gas from vehicles moving within the construction site causes non-point source pollution;

2) The exhaust pipes of the vehicles are relatively low, so that the exhaust gas has a small diffusion range, and has a little impact on the surrounding areas.

3) Since vehicles run in a discontinuous manner, the pollutant emission time is relatively short and pollutant emission amount is relatively small.

To sum up, the automobile exhaust, as flowing line sources, affects a large area, but its pollution is not concentrated and its diffusion is relatively fast, so it has only a small impact on the atmospheric environment.

7.4Atmospheric Environmental Impact Assessment and Mitigation Measures During Operation Period

7.4.1 Exhaust pollution source

Airport air pollutants in operation period mainly come from the exhaust gas produced during the parking on the tarmac, taxiing on the taxiway and taking off and landing on the runway. The exhaust gas of vehicles entering and leaving the parking lot and running vehicles on the approach road. Kunming Airport will use all APU replacement facilities by 2030, and airport auxiliary power equipment will no longer emit pollutants. The dispersion and emission model (EDMS) developed by the Federal Aviation Administration (FAA) and the United States Air Force (USAF) was adopted to calculate the dispersion model.

(1) Aircraft Exhaust

In view of the cumulative impact of emissions of aircraft exhaust pollutants, the forecast of aircraft exhaust pollutants includes the current East Runway 1, West Runway 1, the East Runway 2 constructed by this project and the West Runway 3 planned for the reconstruction and expansion of Kunming Airport in the medium and long term. It is estimated that by 2030, Kunming Airport is expected to make 633,000 takeoff and landing sorties annually. The forecast of annual takeoff and landing capacity of various aircraft types is shown in Table 7-3.

Table 0-3 4Take-off volume forecast of all aircraft types in 2030

Aircraft types	Take-off	Landing
A320	91542	91542
A330	8018	8018
A350	8018	8018
A380	163	163
B737	91542	91542
B747-400	8018	8018
B747-8	163	163
B777	8018	8018
B787	8018	8018
CRJ-200	465	465
CRJ-900	465	465
EMB-145	465	465
ERJ190	91542	91542

Runway number 03R for the southwest end of Runway 1 West and 21L for the northeast end; The southwest end runway of West Runway 3 is numbered 03L and the northeast end runway 21R; Runway 04L for the southwest end and 22R for the northeast end of runway East 1; Runway 04R for the southwest end and 22L for the northeast end of runway East 2. Under normal conditions, the West runway 1 adopts the operation mode of taking off from the East runway 1 and landing on the East runway 2. In view of the fact that West Runway 1 is near the central terminal area, it is mainly used for takeoffs; The East second runway is mainly used for landings, and the East second runway can also be used for takeoff of cargo planes if needed. Table 7-4 shows the takeoff and landing ratio of each runway port.

Table 0-4 5Take-off and landing ratio by runway port

Runway number	Landing (%)	Take off (%)
21L	7.336	35.49
22R	0	28
03R	0.864	15.324
04L	0	12.15
21R	25.06	6.51
22L	37.604	0
03L	15.786	2.526
04R	13.35	0

In the EDMS model, the pollutant produced by the operation of the aircraft in the airport emission refers to the pollutant emission of the aircraft in 1 LTO(landing - takeoff) cycle, in kg/LTO. The LTO cycle includes 6 working modes: Approach, Taxiin, Gate, Taxiout, Takeoff and takeoff.

In addition to the aircraft type, the exhaust emission is also related to the engines each type is equipped with. Combined with aviation business volume and aircraft combination, various types of aircraft used in Kunming Changshui International Airport are selected for prediction. Table 7-5 shows the emission coefficients of different pollutants during takeoff and landing of one type of aircraft A319. Fuel consumption per unit time during takeoff is greater than that during climbing, and NOx emission per unit fuel is much greater than other pollutants. The fuel consumption in the process of landing is smaller than that in the process of takeoff, and the pollutant emission generated is smaller than that in the process of takeoff. Table 7-6 lists the amount of pollutants in Kunming Airport during takeoff and landing in 2030.

Table 0-5 Emission coefficients of aircraft pollutants at different stages during takeoff and landing of A319 aircraft with CFM56-5B6/2 engines

Operation	stage	Flight mode	Time (s)	Fuel consumption (kg/s)	CO emissions (g/kg)	NMHC emissions (g/kg)	NOx emissions (g/kg)	PM emissions (g/kg)	SOx emissions (g/kg)
Take off	1	Getting Started	60.000	0.005097	N/A	1000.000000	N/A	N/A	N/A
	2	Slide out	1140.000	0.119730	47.030769	4.010567	3.851635	0.091266	1.171200
	3	Take off	5.220	1.140209	8.498184	0.176937	13.342460	0.055756	1.171200
	4	Take off	5.220	1.140209	8.498184	0.176937	13.342460	0.055756	1.171200
	5	Take off	5.220	1.140209	8.498184	0.176937	13.342460	0.055756	1.171200
	6	Take off	5.220	1.140209	8.498184	0.176937	13.342460	0.055756	1.171200
	7	Take off	5.220	1.140209	8.498184	0.176937	13.342460	0.055756	1.171200
	8	Take off	5.220	1.140209	8.498184	0.176937	13.342460	0.055756	1.171200
	9	Take off	5.220	1.140209	8.498184	0.176937	13.342460	0.055756	1.171200
	10	Take off	1.386	1.060175	8.501619	0.177008	13.344032	0.055756	1.171200
	11	Take off	1.652	1.059066	8.509159	0.177165	13.347446	0.055756	1.171200
	12	Take off	1.952	1.057741	8.518153	0.177353	13.351455	0.055756	1.171200
	13	Take off	2.472	1.056110	8.529221	0.177583	13.356294	0.055756	1.171200
	14	Take off	3.312	1.061751	8.543714	0.177885	13.362474	0.055756	1.171200
	15	Take off	4.899	1.058606	8.564402	0.178315	13.370992	0.055756	1.171200
	16	Take off	8.675	1.053350	8.598897	0.179034	13.384415	0.055756	1.171200

	17	Take off	8.257	1.043779	8.627823	0.179636	13.394937	0.055756	1.171200
	18	Take off	8.257	1.030954	8.642140	0.179934	13.399902	0.055756	1.171200
	19	Take off	8.257	1.017391	8.658134	0.180267	13.405262	0.055756	1.171200
	20	Take off	5.631	1.004246	8.672448	0.180565	13.409893	0.055756	1.171200
	21	Take off	2.134	0.952255	8.680670	0.180736	13.412483	0.055756	1.171200
	22	Climbing	2.850	0.903872	8.691695	0.180966	13.204169	0.077980	1.171200
	23	Climbing	27.787	0.888927	8.787027	0.182951	12.124891	0.077980	1.171200
Landing	1	Approach	25.644	0.000053	48.973212	4.176210	3.884095	0.077980	1.171200
	2	Approach	18.827	0.000054	48.736667	4.156039	3.881524	0.077980	1.171200
	3	Approach	18.827	0.000054	48.557668	4.140774	3.879343	0.077980	1.171200
	4	Approach	12.749	0.000054	48.422012	4.129206	3.877552	0.077980	1.171200
	5	Approach	4.854	0.132373	42.638060	2.838562	4.406972	0.077980	1.171200
	6	Approach	40.837	0.264937	21.486374	0.373781	8.825502	0.077980	1.171200
	7	Approach	132.918	0.264615	21.438150	0.381170	8.701052	0.077980	1.171200
	8	approach	4.677	0.263925	21.420204	0.388132	8.592040	0.077980	1.171200
	9	Approach	0.095	0.263921	21.418297	0.388302	8.588791	0.077980	1.171200
	10	Slide in	0.771	0.511004	11.289694	0.204321	10.236347	0.091266	1.171200
	11	Slide in	2.228	0.691356	8.498184	0.186882	10.263949	0.091266	1.171200
	12	Slide in	2.228	0.560448	10.374682	0.199133	10.244297	0.091266	1.171200
	13	Slide in	2.228	0.431855	13.434300	0.215426	10.220008	0.091266	1.171200
	14	Slide in	2.228	0.305575	18.917400	0.268601	9.747784	0.091266	1.171200
	15	Slide in	2.228	0.181609	31.632236	1.235585	5.771233	0.091266	1.171200
	16	Slide in	420.000	0.102967	47.030769	4.010567	3.851635	0.091266	1.171200

Table 0-6 Pollutant Emissions during takeoff and Landing (ton/year)

Operation mode	CO	NMHC	NOx	SO2	PM10	PM2.5
Take-off total	436.293	131.373	1435.773	90.044	6.698	6.698
Landing total	1131.409	163.901	333.662	64.315	3.368	3.368

(2) Automobile exhaust gas

1) On-field roads

The annual number of vehicles on the main road on the T1 side is expected to be 22.13 million in 2030 and 29.3 million on the T2 side. The preset mixed vehicle flow model (Default Fleet Mix) in EDMS is adopted.

2) Parking lot

In 2030, a new T2 parking building will be built at the airport, the near end taxi storage yard, the e-hailing car storage Yard 1, the e-hailing car storage yard 2, and the far end bus storage yard. The estimated number of vehicles is shown in Table 7-7.

Table 0-7 Number of vechles entering the parking lot on both sides of T1 and T2 in 2030

T1 side car parks	Annual vehicle	T2 side parking lot	Annual vehicle
T1 parking garage	5092346	T2 parking building	6743740
Taxi lot	1943860	Near end taxi lot	1710025
Existing airport bus with bus parking	191814	Ride-hailing storage yard 1	1683745
CIP parking lot	486962	Ride-hailing storage Yard 2	1184790
		Far end bus storage yard	237980

For taxis and cars in this evaluation, Light Duty Vehicle models in EDMS are used to calculate emissions. The main vehicles in long-distance and bus parking lots are Buses. Therefore, Transit and Urban Buses in EDMS are used to calculate emissions.

(3) Ground support system

After the renovation and expansion of Kunming Airport, the pollutant emission of ground support system in 2030 will mainly come from special vehicles. See Table 7-8 for the number of special vehicles in 2030. The ground support system of the corresponding vehicle type is selected in the EDMS model for simulation and prediction, and the relevant emission parameters are set by default in the EDMS database.

Table 0-8 List of special vehicles at Kunming Airport in 2030

SN	Name	Unit	2030
1	Water cart	car	12
2	Sewage truck	car	12
3	Garbage truck	car	15
4	Passenger ladder car	car	96
5	Handicapped car	car	3
6	Passenger shuttle bus	car	54
7	Minibus ferry	car	27
8	Staff ferry car	car	24
9	Lift platform car	car	45
10	Luggage transporter	car	180

11	Tractor	car	200
13	Gather the loading tug	car	1000
14	Bulk tug	car	3000
1	Aircraft tractor	car	24
2	Ac power car	car	6
3	Dc power car	car	3
4	Air source car	car	5
5	Air-conditioned car	car	2
6	Aircraft de-icing truck	car	33
7	Deicing fluid filling truck	car	6
8	Guide the car	car	15
9	High-altitude platform car	car	8
10	Move the repair tool cart	car	8
11	Work car	car	15
12	Integrated emergency rescue command vehicle	car	2
1	Bulldozer	car	6
2	Battery car	car	4
3	Transporter	car	4
4	Grader	car	6
5	Tractor	car	20
6	Forklift	car	6
7	Roller	car	14
8	Road maintenance vehicle	car	10
9	Loader	car	4
10	Wrecker	car	4
11	Lawnmower	car	4
12	Lawnmower	car	4
13	Forklift truck	car	4
14	Bird repellent equipment	car	18
15	Sprinkler	car	10
16	Snow remover	car	10
17	Deicing liquid spreader truck	car	8
18	Snow plow	car	8
19	Snowblower	car	8
20	Road sweeper	car	4
21	Track sweeper	car	6
22	Friction coefficient test car	car	6
23	Navigational light patrol car	car	12
24	Scribing car	car	9
25	Ambient noise monitor	car	2
26	Slicing machine	car	4
27	Dump truck	car	4
28	Roving car	car	15
29	Aerial work car	car	8
30	Lighting Car	car	18
31	Van	car	4
32	Pickup truck	car	4

(3) Boiler flue gas

In 2030, Kunming Changshui International Airport will build a new boiler on the basis of the boiler room (not the construction content of this project), located in the newly built energy center in the north work area. The new boiler room will be equipped with three 15t/h boilers and two chimneys, one of which is shared by two boilers with a diameter of 1500mm; The other one is 1000mm in diameter. The expected operation time is 1300h a year, and the annual emissions of SO2 and NOx are 0.53t/a and 1.58t/a, respectively.

Table 0-9 10Boiler parameters

Names	Longitude and latitude	Chimney height (m)	Chimney inner diameter (m)	Flue gas temperature (°C)	Flue gas rate (m3/h)	Pollutants	Emission rate (g/s)	Annual emissions (t/a)
New 1# boiler, 2# boiler	25.136263 102.95027	24.5	1.5	70	27000	SO2	0.075	0.351
						NOx	0.225	1.053
Create a new # 3 boiler	25.136248 102.95029	24.5	1	70	13500	SO2	0.0375	0.1755
						NOx	0.1125	0.5265

(4) Summary of various types of airport exhaust gases

See Table 7-10 for the summary of air pollutant emissions of Kunming Changshui Airport in 2030.

Table 0-10 Sumary of waste gas pollutants of Kunming Changshui Airport in 2030 (t/a)

Pollutants	CO	NMHC	NOx	SO2	PM10	PM2.5
Aircraft exhaust	1567.702	295.275	1769.436	154.358	10.067	10.067
Ground support system	367.129	48.178	93.775	4.134	5.34	5.1
Auxiliary power equipment	48.021	4.746	67.556	9.215	8.637	8.637
Parking lot	44.955	2.496	0.886	0.031	0.08	0.04
Roads	1296.111	48.505	61.209	1.485	4.554	2.112
Boiler	N/A	N/A	3.83	0.72	0.2	0.1
Oil depot	N/A	28.462	N/A	N/A	N/A	N/A
Total	3323.918	427.662	1996.692	169.943	28.878	26.056

It is estimated that in 2030, the emission of CO, NMHC, NOx, SO_2, PM_{10} and $PM_{2.5}$ from

Kunming Changshui Airport will be 3323.918t/a, 427.662t, 1996.692 t, 169.943t, 28.878t and 26.056 t, respectively. The main atmospheric pollution source is aircraft exhaust. The second is automobile exhaust.

7.4.2 Air Pollutants Prediction during Operation

During the operation period, the air pollutants in the airport mainly come from the exhaust gas generated during the parking of aircraft operating in the airport on the aprons, taxiing on the taxiways, and taking off and landing on the runways, as well as the exhaust gas from vehicles entering and leaving the parking lot and vehicles operating on the access road. Predictive factors for atmospheric environmental impact assessment are CO, NMHC, SO_2, NO_2, PM_{10} and $PM_{2.5}$. The Level II concentration limits of atmospheric environmental pollutants in the *Ambient Air Quality Standards* (GB3095-2012) shall be used as the assessment criteria. For NMHC, please refer to the recommended value 2.0mg/m^3 in the *Detailed Explanation for Integrated Emission Standard of Air Pollutants* published by the Department of Science and Technology Standards of the State Environmental Protection Administration. The boundary standard of NMHC shall be 4mg/m^3 specified in the *Integrated Emission Standard of Air Pollutants* (GB16297-1996).

The prediction model of atmospheric impact prediction work will be the emission and diffusion model system (EDMS5.1.4.1) introduced by the Federal Aviation Administration of the United States in June 2013.

According to the requirements of the *Technical Guidelines for Environmental Impact Assessment - Atmospheric Environment* (HJ2.2-2018), the assessment scope of the Project includes Guandu District, Chenggong District, Panlong District, Songming County and Yiliang County. The daily monitoring data from monitoring stations within these administrative areas in the base year were collected, and the average daily data of these routine monitoring stations in 2021 were used as the current background superimposed concentration. For NMHC, the maximum value of the sampling results of the supplementary monitoring stations were used as the current background superimposed concentration.

① NO_2

See Figure 7-3 for the predicted daily means and predicted annual means at the guarantee rate after the superposition of NO_2 contribution concentration in this period. After superposition, the maximum daily and annual mean regional environmental mass concentrations at the guarantee rate to the standard concentrations are 63.58% and 77.97% respectively. Both of them comply with the standards. After superposition of protection targets, the concentrations comply with the standards.

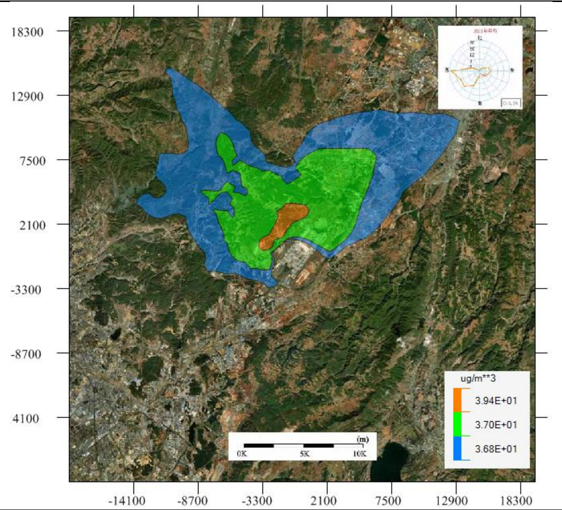
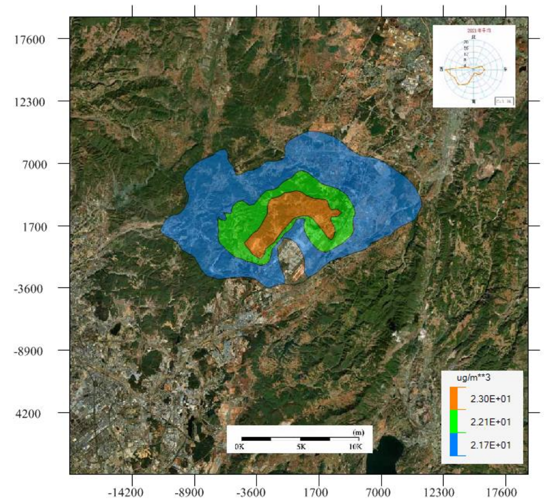
	
Prediction results of daily mean environmental mass concentration of NO_2 at the guarantee rate after superposition of the current concentration	Prediction results of annual mean environmental mass concentration of NO_2 after superposition of the current concentration

Figure 0-3 Prediction Results of Daily and Annual Mean Concentrations of NO_2

②SO_2

See Figure 7-4 for the predicted daily means and predicted annual means at the guarantee rate after the superposition of SO_2 contribution concentration in this period. After superposition, the maximum daily and annual mean regional environmental mass concentrations at the guarantee rate to the standard concentrations are 9.25% and 16.24% respectively. Both of them comply with the standards. The concentration of all environmental protection targets after superposition to the standard concentration is less than 100%.

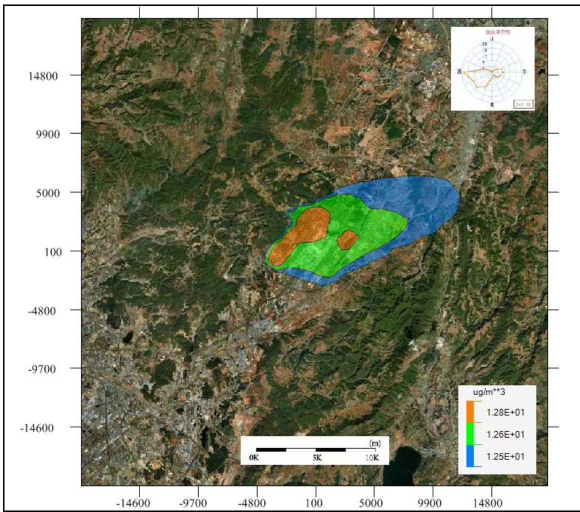
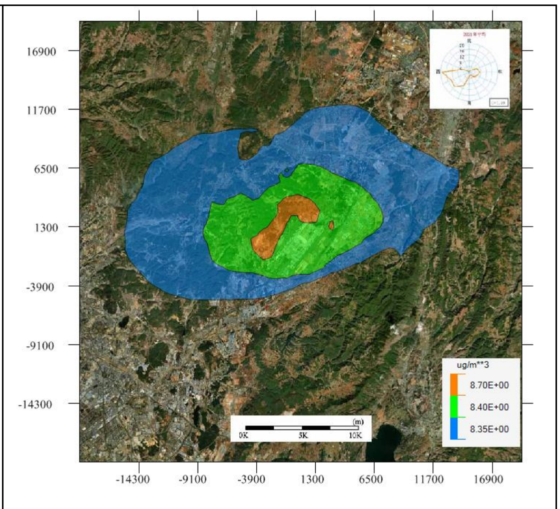
	
Prediction results of daily mean environmental mass concentration of SO_2 at the guarantee rate after superposition of the current concentration	Prediction results of annual mean environmental mass concentration of SO_2 after superposition of the current concentration

Figure 0-4 Prediction Results of Daily and Annual Mean Concentrations of SO_2

③CO

See Figure 7-4 for the predicted daily means of CO at the guarantee rate after superposition in this period. After superposition, the maximum daily mean regional environmental mass concentration at the guarantee rate to the standard concentration is 29.54%, complying with the standards. The daily mean concentrations of all environmental protection targets at the guarantee rate after superposition to the standard concentrations are less than 100%.

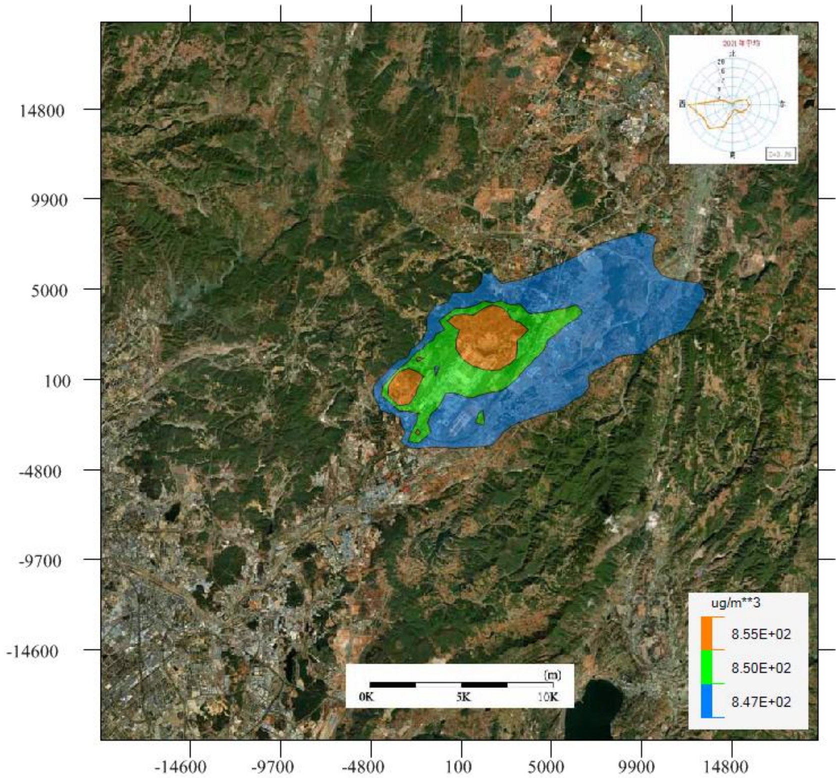


Figure 0-5 Prediction Results of Daily Mean Environmental Mass Concentration of CO at the Guarantee Rate After Superposition of the Current Concentration

④NMHC

See Figure 7-6 for the predicted hourly means of NMHC at the guarantee rate after superposition in this period. After superposition, the maximum hourly mean regional environmental mass concentration to the standard concentration is 94.65%, complying with the standards. The concentration of all environmental protection targets after superposition to the standard concentration is less than 100%.

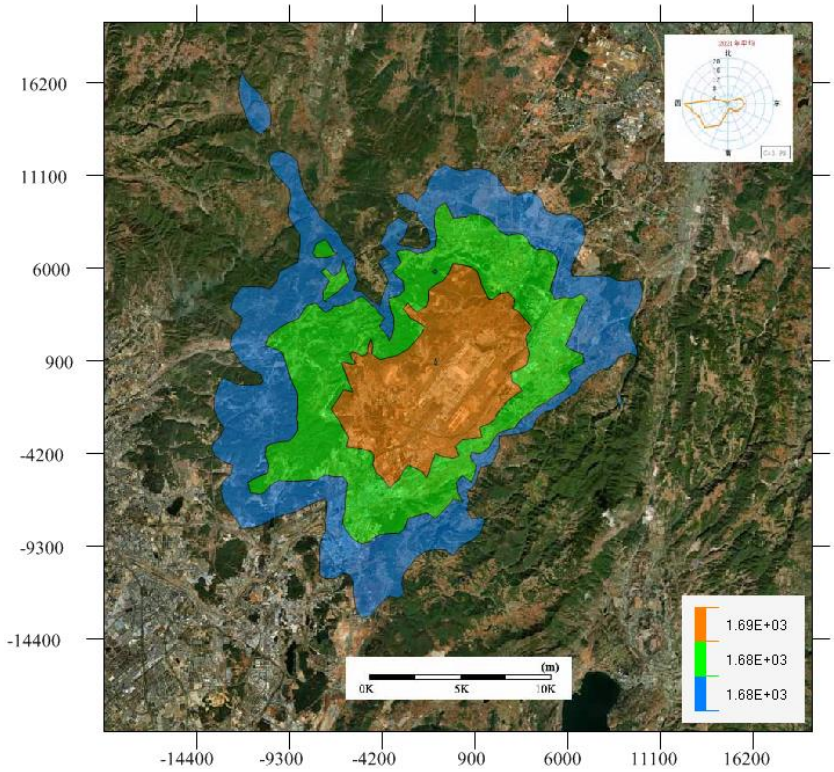
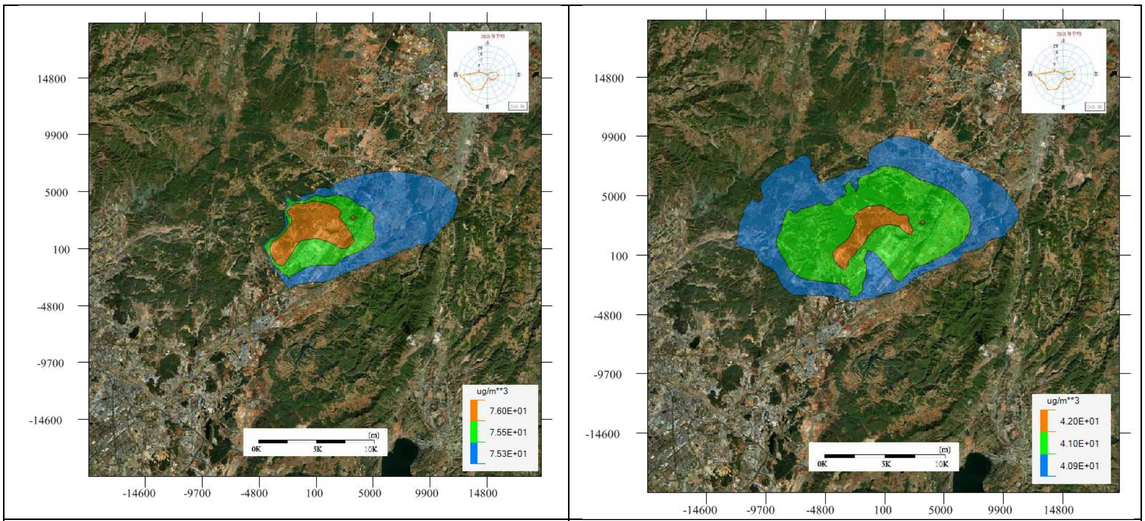


Figure 0-6 Prediction Results of Environmental Mass Concentration of NMHC after Superposition of Hourly Values

⑤ Total PM_{10}

See Figure 7-7 for the predicted daily means and predicted annual means at the guarantee rate after the superposition of total PM_{10} contribution concentrations in 2030. After superposition, the maximum daily and annual mean regional environmental mass concentrations at the guarantee rate to the standard concentrations are 54.89% and 66.06% respectively. Both of them comply with the standards. The concentration of all environmental protection targets after superposition to the standard concentration is less than 100%.

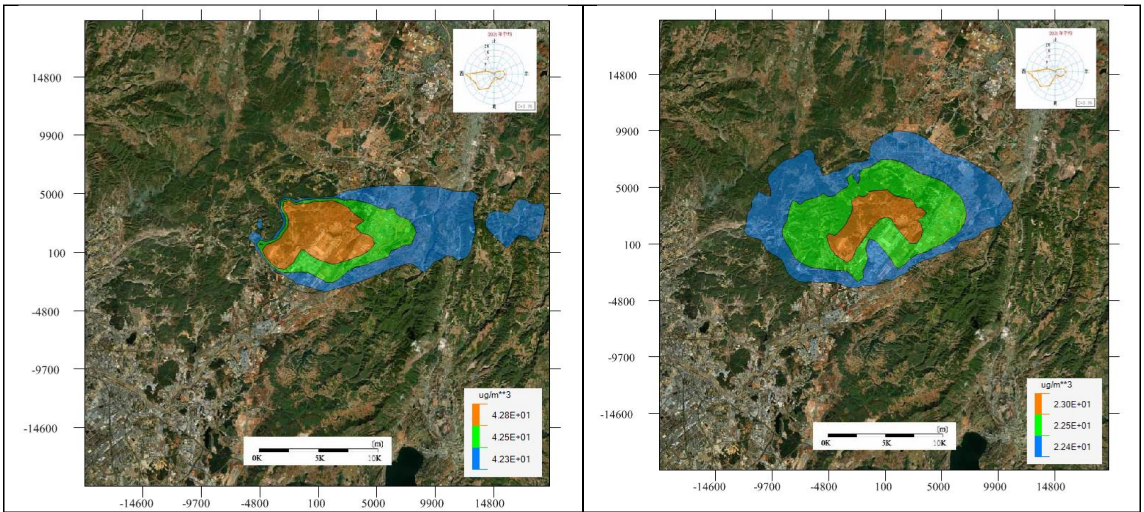


Prediction results of daily mean environmental mass concentration of total PM_{10} at the guarantee rate after superposition of the current concentration	Prediction results of annual mean environmental mass concentration of total PM_{10} after superposition of the current concentration

Figure 0-7 Prediction of Daily and Annual Mean Concentrations of PM_{10}

⑥ Total $PM_{2.5}$

See Figure 7-8 for the predicted daily means and predicted annual means at the guarantee rate after the superposition of total $PM_{2.5}$ contribution concentrations in 2030. After superposition, the maximum daily and annual mean regional environmental mass concentrations at the guarantee rate to the standard concentrations are 64.70% and 77.88% respectively. Both of them comply with the standards. The concentration of all environmental protection targets after superposition to the standard concentration is less than 100%.



Prediction results of daily mean environmental mass concentration of total $PM_{2.5}$ at the guarantee rate after superposition of the current concentration	Prediction results of annual mean environmental mass concentration of total $PM_{2.5}$ after superposition of the current concentration

Figure 0-8 Prediction of Daily and Annual Mean Concentrations of $PM_{2.5}$

<u>Summary</u>

The daily mean concentrations of NO_2, SO_2, CO, total PM_{10} and total $PM_{2.5}$ at the guarantee rate after superposition of their contribution concentrations to the standard concentrations are 63.58%, 9.25%, 29.54%, 54.89% and 64.70% respectively, complying with the environmental quality standards. The pollutant concentrations of NO_2, SO_2, CO, total PM_{10}, and total $PM_{2.5}$, after superposition of their maximum annual mean regional environmental mass concentrations, to the standard concentrations are 77.97%, 16.24%, 66.06% and 77.88% respectively, complying with the environmental quality standards. For NMHC with only short-term concentration limit, the short-term concentration after superimposition to the standard concentration is 94.65%, complying with the environmental quality standards. To sum up, the atmospheric environmental impact of the Project is accepTable .

8 Environmental Impact Assessment of Surface Water and Mitigation Measures

8.1 Surface Water Assessment Scope and Protection Targets

The surface water bodies around the airport area include Yangguanzhuang Reservoir (1.2km in the north), Huazhuang River (close to the airport) and Baoxiang River (2.2km in the south), all subject to Class III water body standards in the *Environmental Quality Standards for Surface Water* (GB3838-2002). Functions of water bodies: water for agriculture and landscape.

8.2 Assessment of the Current Status of Surface Water Environment Quality

The rainwater collected in the Project will be discharged into Baoxiang River, Yangguanzhuang Reservoir and Huazhuang River. Yunnan Kunfa Environment Tech Co., Ltd. monitored the surface water quality in the above water bodies from October 3 to 5, 2022. Monitoring factors: pH, DO, COD_{Cr}, BOD_5, suspended solids, ammonia nitrogen, total phosphorus, petroleum, animal and vegeTable oil.

Except for petroleum pollutants, all other indicators of pollutants in the New Baoxiang River, Huazhuang River, and Yangguanzhuang Reservoir comply with the Class III standards in the *Environmental Quality Standards for Surface Water* (GB3838-2002). The non-compliance of petroleum pollutants is primarily caused by the construction activities along these water bodies.

Table 0-1 Statistical Results of Surface Water Monitoring

Item			pH Dimensionless	Ammonia nitrogen mg/L	Petroleums mg/L	Chemical oxygen demand mg/L	Five-day biochemical oxygen demand mg/L	Total phosphorus mg/L	Dissolved oxygen mg/L
Huazhuang River	2022.10.3	Monitoring value	7.67	0.049	0.14	9	2.4	0.07	5.68
		Standard index	0.335	0.049	2.8	0.45	0.6	0.35	0.88
		Compliance	Yes	Yes	Exceed the standard	Yes	Yes	Yes	Yes
	2022.10.4	Monitoring value	7.67	0.059	0.11	10	2.2	0.09	5.72
		Standard index	0.335	0.059	2.2	0.5	0.55	0.45	0.87
		Compliance	Yes	Yes	Exceed the standard	Yes	Yes	Yes	Yes
	2022.10.5	Monitoring value	7.67	0.07	0.17	8	2.1	0.08	5.49
		Standard index	0.335	0.07	3.4	0.4	0.525	0.4	0.91

		Compliance	Yes	Yes	Exceed the standard	Yes	Yes	Yes	Yes
Yangguanzhuang Reservoir	2022.10.3	Monitoring value	7.64	0.094	0.18	18	3.2	0.05	5.58
		Standard index	0.32	0.094	3.6	0.9	0.8	1	0.9
		Compliance	Yes	Yes	Exceed the standard	Yes	Yes	Yes	Yes
	2022.10.4	Monitoring value	7.64	0.083	0.16	17	3	0.04	6.12
		Standard index	0.32	0.083	3.2	0.85	0.75	0.8	0.82
		Compliance	Yes	Yes	Exceed the standard	Yes	Yes	Yes	Yes
	2022.10.5	Monitoring value	7.65	0.11	0.18	19	3.4	0.03	5.93
		Standard index	0.325	0.11	3.6	0.95	0.85	0.6	0.84
		Compliance	Yes	Yes	Exceed the standard	Yes	Yes	Yes	Yes
New Baoxiang River	2022.10.3	Monitoring value	7.69	0.067	0.17	20	3	0.10	5.44
		Standard index	0.345	0.067	3.4	1	0.75	0.5	0.92
		Compliance	Yes	Yes	Exceed the standard	Yes	Yes	Yes	Yes
	2022.10.4	Monitoring value	7.69	0.058	0.18	17	3.4	0.13	5.48
		Standard index	0.345	0.058	3.6	0.85	0.85	0.65	0.91
		Compliance	Yes	Yes	Exceed the standard	Yes	Yes	Yes	Yes
	2022.10.5	Monitoring value	7.7	0.078	0.14	18	3.3	0.11	5.60
		Standard index	0.35	0.078	2.8	0.9	0.825	0.55	0.89
		Compliance	Yes	Yes	Exceed the standard	Yes	Yes	Yes	Yes
Standard value			6～9	≤1	≤0.05	≤20	≤4	≤0.2 (0.05	≥5

						for lakes and reservoi rs)	

8.3Impact on Surface Water Environment and Mitigation Measures During Construction Period

The wastewater during the construction period mainly includes construction and production wastewater, sediment-containing rainwater from construction surface runoff and domestic sewage generated by construction personnel.

During the construction period, site cleaning, pipeline laying, concrete mixing, and the implementation of construction and installation works will generate a certain amount of construction wastewater. According to the nature and chemical composition of construction wastewater, the main pollutants are suspended solids. A three-stage sedimentation tank shall be constructed at the construction site. Through the treatment of the three-stage sedimentation tank, the supernatant liquid of the construction wastewater can be reused for dust control, machine and vehicle washing, etc.

For the Project, the surface runoff sewage is mainly the sediment-containing surface runoff that may be generated when the rainwater scours the bare surfaces as a result of earthwork excavation, as well as the topsoil stacking areas, stockyards, prefabrication yards, slopes, etc. in summer when the rainfall is abundant. Its main pollution factor is SS. If it directly flows into rivers, it will affect the water quality of rivers. It is required to cover the topsoil stacking areas, stockyards and other similar sites, construct intercepting and drainage ditches around the site, set up grit chambers in low-lying areas. Surface runoff in rainy seasons shall be reused after sedimentation, and if it can not be completely reused, the extra part can only be discharged after obtaining the permission of competent departments. It is forbidden to discharge any wastewater that contains a large amount of sediment or is not treated into the municipal pipe network or water bodies. Water retaining, interception and drainage works shall be arranged on the construction site.

Besides, since a large number of construction personnel will be required during the construction period, and they will generate a certain amount of domestic sewage in their daily life during the construction period. Domestic sewage generated by construction personnel comes from each construction camp, mainly including the sewage from dining and washing activities of construction personnel and fecal sewage, mainly containing COD, BOD_5, SS, NH_3-N and oil. Environment-friendly mobile toilets or anti-seepage septic tanks shall be provided on the construction site. The domestic sewage, after treatment, will be regularly cleaned and transported out by the environmental sanitation department.

After the above measures are taken, the impact of surface water on the environment during the construction period will be small.

8.4Impact on Surface Water Environment and Mitigation Measures During Operation Period

With the centerline of the terminal as the boundary, the airfield area is divided into the east part and west part. According to the terrain and functional zoning of the new airfield area and the design principle of sewage drainage by gravity flow as far as possible, the sewage pipe network system is divided into three drainage zones: west airfield area drainage system, east airfield area drainage system and central apron area drainage system.

- The west airfield area drainage system is high in the middle and low at both ends in the north-south direction, and high in the west and low in the east in the east-west direction. The sewage is discharged to the working area and the aircraft maintenance area by gravity flow. A total of 2 drain outlets are set to discharge the sewage into the existing sewage treatment plant in the south area and the new sewage treatment plant to be constructed respectively.
- The terrain of central apron area drainage system is high in the south and low in the north in the north-south direction. The sewage is discharged to the working area by gravity flow. A total of 2 drain outlets (pipe diameter: DN400) are set to finally discharge the sewage into the new sewage treatment plant to be constructed.
- East airfield area drainage system: The east airfield area sewage pipe network system is designed with one drain outlet according to the terrain and the off-site sewage pipe along the municipal road. It is laid from north to south along the perimeter road on the east side of the airport. The starting point of the system is located on the way to receive the sewage from the cargo area and the airfield area supporting rooms. The sewage is discharged into the municipal pipe network under the new off-site road to be constructed, and finally enters the existing sewage treatment plant of the airport. The maximum daily and hourly sewage discharge volumes are 272m^3/d and 21m^3/h respectively in the short term and 475m^3/d and 33m^3/h respectively in the long term. The diameter of the main sewage pipe is DN300.

The wastewater from the project involves east airfield area that connecting to the existing wastewater treatment system and the central apron area that connecting to the new wastewater treatment plant.

① Current conditions of existing reclaimed water treatment plant in south working area

In the south working area, there is a 10,000 m^3/d reclaimed water treatment plant, which mainly adopts SBR (CASS) + advanced treatment process. Process flow: The sewage, after being collected by the sewage pipe network in the site, flows into the sewage treatment plant under gravity. It first enters the coarse screen-lift pump house to remove the large solid particles in the sewage. Then, the sewage is lifted by the lift pump. The lifted sewage enters the fine screen-horizontal flow grit chamber to reduce solid matters and sand particles in the sewage. The pretreated sewage enters the CASS reaction tank for biological denitrification and phosphorous removal, and then enters the secondary sedimentation tank for mud-water separation. The supernatant enters the flocculation and sedimentation tank for further phosphorus removal, and then enters the filter for further denitrification. The effluent enters the disinfecting tank for disinfection, and finally enters the reclaimed water pump room for greening. After treatment, the effluent quality can meet the standard *Reuse of Urban Recycling Water - Water Quality Standard for Urban Miscellaneous Use* (GB/T18920-2020).

According to the *Monitoring Report on Environmental Quality of Kunming Changshui International Airport* issued by Hebei Tongxiu Environmental Testing Co., Ltd. in June 2022, the concentration of each pollutant in the existing reclaimed water treatment plant meets the standard for urban greening water specified in the *Reuse of Urban Recycling Water - Water Quality Standard for Urban Miscellaneous Use* (GB/T 18920-2020).

② Process of new sewage treatment plant to be constructed

In this expansion works, a new 15,000 m^3/d sewage treatment plant is planned to be constructed in the north working area, and the two-stage biochemical treatment + advanced treatment process will be adopted for sewage treatment. Compared with the reclaimed water treatment plant in the south working area, the reclaimed water treatment plant in the north working area will be optimized. To be specific, the horizontal flow grit chamber will be optimized as an aerated grit chamber, CASS reaction tank will be optimized as an A^2O biochemical tank, the flocculation and sedimentation tank will be optimized as a high-efficiency sedimentation tank, and the D-shaped filter will be optimized as a deep-bed denitrification filter, to enable the sewage treatment plant in the north working area has a better denitrification and phosphorous removal effect and operate in a safer and more sTable manner.

After the airport is expanded, the wastewater to be generated will mainly be domestic sewage, oily wastewater from the catering center and oily wastewater from production. After being pretreated by the septic tank and oil separation tank, the sewage will enter the sewage treatment plant. Compared with the south working area, the north working area has the similar sewage sources, so the influent quality of the sewage treatment plant is also similar. Besides, the sewage treatment process and scale of the sewage treatment plant in the north working area are better than those in the south working area. Therefore, the effluent quality of the new sewage treatment plant to be constructed in the north working area can meet the standards for toilet flushing use and car wash use in the *Reuse of Urban Recycling Water - Water Quality Standard for Urban Miscellaneous Use*.

The reclaimed water in the airport is planned to be used for:

· Ground cleaning and toilet flushing: Reclaimed water pipe network can be conFigure d in the office area, terminal area, aircraft maintenance area and other production areas of each airport-stationed unit;

· Replenishing air conditioning water: The reclaimed water can be used for replenishing air conditioning water since a large number of air conditioning systems are provided in each office area and terminal area of the airport, and the reclaimed water can also be used as the circulating cooling water in the fuel tank area; and

· Greening and landscaping: Kunming Airport is an international hub airport, and the key points in its overall layout are the greening and landscaping. The greening index designed for the airport is more than 35%, and the reclaimed water will mainly be used for the large-scale greening and landscaping.

By the target year 2030, the production and domestic sewage generated, after being treated by the existing reclaimed water treatment plant in the south working area and the new sewage treatment plant to be constructed in the north working area, can be completely reused, and will have a small impact on the surface water environment.

An oily rainwater treatment system will be built in the maintenance apron area to reduce the impact of oily rainwater discharged from the airport on the surrounding environment. An independent rainwater collection pipe network will be built in the maintenance apron area to be expanded. The rainwater on the apron will be collected by the specific pipe network and then discharged to the oil separation equipment for treatment, and after meeting the requirements, will be discharged into the rainwater system in the site.

9 Environmental Impact Assessment of Soil and Groundwater and Mitigation Measures

9.1 Impact Assessment of Soil and Groundwater and Mitigation Measures During Construction Period

During the construction period, the soil and groundwater pollution sources are mainly domestic sewage, construction waste residue, construction wastewater, etc. The main pollutants are petroleum, COD, NH_3-N and SS.

(1) Domestic sewage

The domestic sewage generated in the will have a certain impact on the groundwater if it is discharged at will. Since all construction camps are temporary facilities and are distributed in a large area, it is difficult to collect the domestic sewage generated by them for unified treatment. Environment-friendly mobile toilets or anti-seepage septic tanks shall be provided on the construction site. The domestic sewage, after treatment, will be regularly cleaned and transported out by the environmental sanitation department.

(2) Construction waste residue, sludge, etc.

During the construction period, a large amount of waste residue will be generated from the excavation of the foundation pit, and a certain amount of waste sludge will be generated from the concrete lining inside the foundation pit. These waste residues and waste sludge, if stacked arbitrarily, will pollute the groundwater after being leached by rainwater. Therefore, retaining walls shall be built on the waste residue stacking site and the waste residues and waste sludge shall be collected for centralized treatment.

(3) Construction waste water

The production wastewater during the construction period is mainly the cleaning wastewater from the construction site, construction machinery and transport vehicles, mainly containing sediment, suspended particulates, etc. The direct discharge of production wastewater will have an adverse impact on the local environment. Temporary sedimentation tanks shall be constructed to properly treat the sediment-containing sewage, and the sewage, after sedimentation, can be used for dust suppression on the construction site, and will not need to be discharged.

9.2 Environmental Impact Assessment of Soil and Groundwater and Mitigation Measures During Operation Period

During the operation period, the link that affects the soil and groundwater environment is the leakage of sewage pipelines. Sewage pipeline: 2mm-thick waterproof roll shall be used for artificial anti-seepage along the sewage pipeline, and the permeability coefficient of the impermeable layer shall not exceed 1.0×10^{-7}cm/s. It is required to ensure the quality of the sewage pipeline and use pipes with good impermeability. High-density polyethylene pipes with good impermeability are used, with the length of pipe section increased and pipe joints reduced. The underground pipes and valves shall be equipped with the anti-seepage pipe ditch and observation cover to observe and handle the leakage problem, if any, as early as possible.

10 Environmental Impact of Solid Waste and Mitigation Measures

10.1 Environmental Impact of Solid Waste and Mitigation Measures During Construction Period

The solid wastes during construction period mainly include construction waste produced on the construction site and domestic waste generated by construction personnel.

(1) Construction waste

Construction waste primarily refers to the substantial amount of waste materials generated during ground excavation, demolition, road construction, pipeline laying, material transportation, foundation works, and housing construction. These materials include sand, gravel, lime, concrete, wood, and waste mud, among others. The site leveling of the east project area has been completed in 2020, and the amount of waste slag generated from the earthwork is small.

Special personnel shall be designated to be responsible for sorting construction waste and recycling any useful steel bars, timbers, cables, and other materials. Any construction waste or debris from demolished structures that cannot be reused shall be piled up at designated sites and regularly transported to the designated disposal location in the Airport New Town.

(2) Domestic waste

During the construction period of the Project, with construction personnel of all kinds concentrated, the amount of domestic waste to be generated during the construction period will be 1.5t/d according to the rate of 0.5kg/person·d. According to the environment impact assessment requirements, temporary waste containers shall be provided at the construction site, and domestic waste shall be sorted for management, and regularly cleaned and transported in accordance with the regulations of the local sanitation department.

10.2 Environmental Impact of Solid Waste and Mitigation Measures During Operation Period

The solid waste during the operation period is mainly aviation waste. According to the analysis on pollution sources, the aviation waste received by Kunming Changshui International Airport in 2030 will be about 10,630 t/a. Aviation waste from areas other than the quarantine area, after being sealed and disinfected, shall be transported and disposed of together with domestic waste by KSEC Environmental Protection Technology Co., Ltd. Aviation waste from the quarantine area shall, according to the requirements for medical waste management, be sealed and collected separately and disinfected in a centralized manner under the supervision of the Entry-Exit Inspection and Quarantine Department of the Airport, and then disposed of by Yunnan Zhengxiao Environmental Protection Investment Co., Ltd.

11 Acoustic Environmental Impact Assessment and Mitigation Measures

11.1 Acoustic Environmental Assessment Scope and Protection Targets

11.1.1 Assessment scope determination method

The noise assessment scope shall be determined according to the airport project assessment scope in the *Technical Guidelines for Noise Impact Assessment* (HJ2.4-2021) (Table 11-1).

Table 0-1 Determination Method for Airport Noise Assessment Scope

Airport category	Flight movements N (capacity of one runway)	Recommended assessment scope at both ends of runway	Recommended assessment scope on both sides of runway
Transport airport	N≥150,000 per year	More than 12 km at both ends	3 km on both sides
	100,000 per year ≤ N < 150,000 per year	10 km ~ 12 km at both ends	2 km on both sides
	50,000 per year ≤ N < 100,000 per year	8 km ~ 10 km at both ends	1.5 km on both sides
	30,000 per year ≤ N < 50,000 per year	6 km ~ 8 km at both ends	1 km on both sides
	10,000 per year ≤ N < 30,000 per year	3 km ~ 6 km at both ends	1 km on both sides
	N<10,000 per year	3 km at both ends	0.5 km on both sides
General airport	Without helicopter	3 km at both ends	0.5 km on both sides
	With helicopters	3 km at both ends	1 km on both sides

The scope of Yunnan Kunming Changshui Green Airport Development Project funded by AIIB is the east area, but the impact of aircraft noise is cumulative. Therefore, the prediction of aircraft noise around the airport shall include Runway E2 which is funded by AIIB, Runway W3 which is not included in Yunnan Kunming Changshui Green Airport Development Project, and the existing two runways.

The flight movements that each runway can undertake shall be determined according to the flight parameters of runways, and the results are 210,000 flight movements for Runway W3, 140,000 for Runway W1, 150,000 for Runway E1 and 130,000 for Runway E2. According to the method for determining the assessment scope of airport projects in the *Technical Guidelines for Noise Impact Assessment* (HJ2.4-2021), the aircraft noise assessment scope is 12.2km to the northeast end of runway, 13.6km to the southwest end of runway, 3.9km to the west of Runway W3, and 6.4km to the east of Runway E2, including the area with a WECPNL of 70dB.

11.1.2 Assessment period

Construction period: 6 years, from December 2022 to December 2028.

Operation period: According to the *Feasibility Study Report on Yunnan Kunming Changshui Green Airport Development Project*, the airport will have a 4-runway configuration after the expansion is completed by the target year 2030 and relevant parameter is the maximum load of the airport with 4 runways. In the short term, the data of 2035 is a 5-runway configuration.

11.1.3 Acoustic environment sensitive sites

The aircraft noise assessment range is 12.2km to the northeast end of runway, 13.6km to the southwest end of runway, 3.9km to the west of Runway W3, and 6.4km to the east of Runway E2.

There are 164 main sensitive targets within the assessment scope of the airport project, including 114 villages and residential communities (97 villages and 17 residential communities), 44 schools (20 kindergartens and 24 schools), 4 hospitals and 2 drug rehabilitation centers.

Among these acoustic environmental protection targets, 24 are located within the control scope of the previous EIA planning and were constructed after the approval of the previous EIA, including 6 residential communities, 13 schools (12 kindergartens and 1 school), 3 hospitals and 2 drug rehabilitation centers.

The population of all acoustic environment sensitive sites within this EIA scope is about 150,194 from 52,842 households, accounting for about 13.29% of the population in the whole Yunnan Dianzhong New Area;

Establishment of a coordinate system: To better express the location relationship between acoustic environmental protection targets and the airport, a coordinate system is established within this EIA scope. A rectangular coordinate system is established with the south endpoint of the new Runway E2 as the origin of coordinates, the runway direction as the X axis and the direction perpendicular to the runway direction as the Y axis. In the runway direction, X axis is positive in the north and negative in the south of the south endpoint of Runway E2. Y axis is positive in the west and negative in the east of the south endpoint of Runway E2. Zone I is located in the south of the origin, Zone II is located on the two sides of the runway, and Zone III is located in the north of the north end of Runway E1 (existing length: 4,500m). The coordinates of sensitive targets in Zones I, II and III are expressed as (|X|, Y), (X, Y) and ((X-4500m), Y) respectively. X and Y are the actual coordinates in the coordinate system. See Figure 11-1 for details of zoning. See Figure 11-2 for the distribution of acoustic environmental protection targets.

Table 0-2 Statistics of Acoustic Environmental Protection Targets

Category	Villages	Schools and hospitals	Total
This EIA	108	32	140
Within the control scope of the previous EIA planning and constructed after the approval of the previous EIA	6	18 (including 2 drug rehabilitation centers)	24
Subtotal	114	50	164

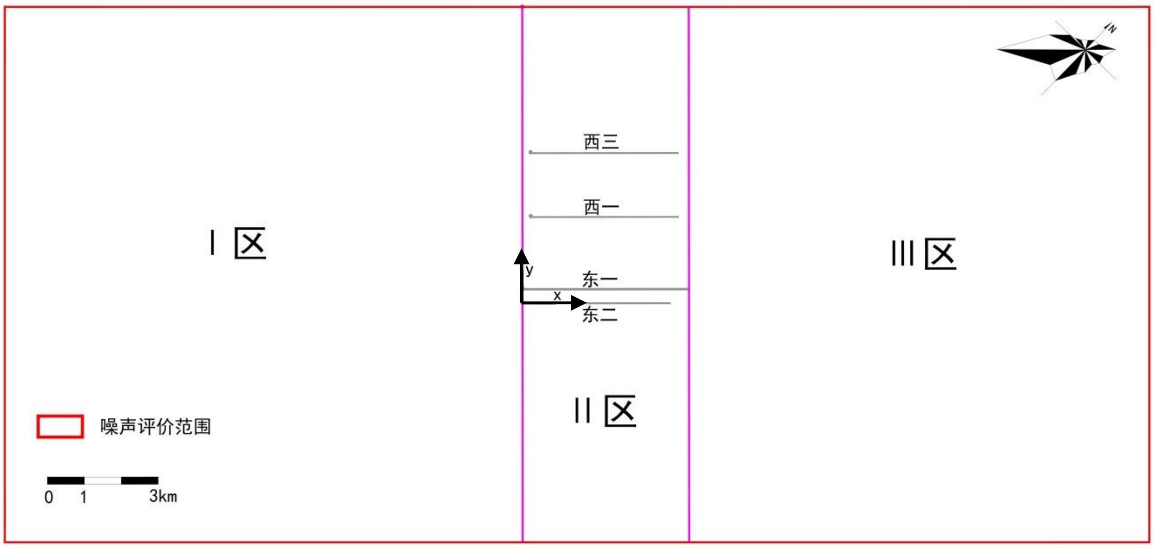


Figure 0-1 Schematic Diagram of Coordinate Zoning

Table 0-3 Acoustic Environmental Protection Targets (Villages)

S/N	Administrative division		Description	Coordinates		Scale	
	Town/ Township	Administrative village/community		X/m	Y/m	Number of households	Population
Zone I							
1	Dabanqiao Subdistrict, Guandu District	Liqi Community	Dacunzi	-3442	2481	343	959
2			Heibo Village	-4069	3870	176	487
3			Xialiqi	-6899	2454	92	198
4			Tanglipo	-7203	5768	147	559
5		Banqiao Community	Yijia	-6685	2360	499	1350
6			Erjia	-6842	1954	402	1040
7			Sanjia	-6738	1892	271	739
8			Sijia	-6706	1870	403	996
9			Wujia	-7098	1853	470	1199
10			Zhuangke Village	-5801	1692	203	518
11		Xichong Community	Xichongkou	-8355	1791	304	837
12			Shanjiao Village	-7802	1258	407	570
13			Liziyuan	-8702	1941	186	513
14			Wajiao Village	-8351	2651	243	728
15			Ayi Village	-7569	2158	124	325
16		Shagou Community	Bakou	-4231	-2433	94	325
17			Dadongchong	-5266	-1453	98	354
18			Xinfu Village	-7305	-2812	62	212
19			Adi Village	-5140	-246	169	548
20			Gaoshitou	-5848	-327	80	234
21			Hongshapo	-5666	135	108	286
22			Shagou Village	-6220	31	134	328
23			Caojiachong	-6646	-1814	28	111
24		Fuxing Community	Xiaokanglangxiao Village	-1806	4147	118	472
25			Xiaokanglangda Village	-888	4349	167	505

26			Fuxing Village	-2248	4399	165	505
27			Xinqiao Village	-2298	4067	54	216
28			Ganluochong	-2744	2914	39	127
29			Yangtianchong	-3713	5283	54	174
30			Erlongba	-423	5890	64	226
31		Xinfa Community	Xinfa Village	-1574	-2723	167	557
32			Yangtaoqing	-94	-2809	287	1001
33			Ganhaizi	-1856	224	125	500
34			Chahe New Village	-3651	-3665	46	161
35			Chahe Village	-2721	-4677	58	203
36			Yangbachong	-1629	-4572	18	68
37			Fanggangqing	-1950	-5239	30	102
38		Yiduoyun Community	Laohuqing	-8127	-5241	37	130
39			Wayao Village	-6364	-4203	41	144
40	Ala Subdistrict, Economic Development Zone	Haizi Community	Xiaobaitu Village	-9988	2640	114	245
41			Dabaitu Village	-10559	2743	144	299
42			Haizi Village	-11030	1986	295	625
43			Old village	-11762	977	136	277
44			New Village	-10631	3496	137	333
45		Gaopo Community	Xiaogaopo, Dagaopo, Xiaopulian	-11777	3115	2369	8291
46			Sanwa Village	-9594	2939	301	1085
47			Jinma Village	-11265	44	542	2389
48		Ala Community	Ala Village	-11819	2041	458	1081
49			Baishuitang	-12879	343	434	1010
50		Qingshui Community	Xiacun	-10818	-3023	336	929
51			Zhongshang Village	-10464	-2780	295	785
52	Qingyun Subdistrict, Panlong District	Qinglong Community	Liangmian Temple	-11600	5733	191	669
53			Yufeng Village	-9297	7686	65	228
54	Shuanglong Subdistrict, Panlong District	Wulong Community	Hangzishan	-3509	6333	51	179
55			Dabai	-2858	6754	42	147
56			Sanshimu	-710	7372	44	154
57	Dabanqiao Subdistrict, Guandu District	/	Ayi Jiayuan (under construction)	-8527	2418	Replacement housing for Ayi Village, under construction	
58		/	Dongyuan Qicheng (under construction)	-9171	2008	Under construction	
59		/	Resettlement Area in Xichong Area	-7250	1732	Under construction	
60	Luoya	Shilonghu	Country	-13608	-3147	608	2128

	ng Subdistrict, Economic Development Zone	Community	Garden · Dongyuan Community				
61		Guolin Community	Lingdong Zijun	-13555	-2509	200	712
62	Ala Subdistrict Office of Economic Development Zone	Changchun Community	198 Property Management Community	-12981	2921	64	224
63*	Dabanqiao Subdistrict, Guandu District	/	Yincheng Jiayuan*	-9102	333	1232	Public rental house
64*		/	Yunxiangyuan*	-4380	-787	6123	18369
65*		/	Xingyue Lanwan, Konggang Jiayuan*	-2145	-419	4725	11426
66*		/	Xianghuiyuan and other areas within Chance-Way Airport Town*	-177	-1164	10162	24574
II区							
67	Dabanqiao Subdistrict, Guandu District	Huaqing Community	Huaqing Village	2089	3740	162	505
68			Yanjiazhuang	3463	5130	130	384
69			Zhushaqing	3354	7150	60	172
70	Shuanglong Subdistrict, Panlong District	Wulong Community	Lizichong	1455	6902	19	67
71			Dapingdi	777	7380	626	2191
72	Dabanqiao Subdistrict, Guan	Fuxing Community	Shangmazhong	872	5899	3	13
73			Machong	1129	6442	6	21
74		Changshui Community	Zhangjiapo	3202	-1580	226	670
75		Adi	Shihuiyao	314	-5548	18	63

	du District	Community					
	Zone III						
76	Dabanqiao Subdistrict, Guandu District	Changshui Community	Changpo Village	775	-176	303	1000
77		Yunqiao Community	Yunqiao Village	4902	-1574	274	1096
78		Wuxi Community	Xichong Village	675	3805	198	664
79			Getenggou	2390	1926	32	90
80		Baihanchang Community	Baihanchang	3921	3686	500	1400
81			Yangguanzhuang	3402	-14	100	350
82			Baizhongqing	2801	4440	66	201
83		Tu'er Community	Xiangshui Village	3395	5770	112	224
84			Xinfangzi	5262	7165	130	319
85			Tu'erguan	3908	7374	285	938
86			Suomei'ao	3580	6607	141	493
87			Sanchahe	2032	6483	129	408
88		Zhongduilong Community	Zhongduilong	7902	5380	327	1175
89			Xiaduilong	9495	5903	177	568
90			Wushan	9206	7231	137	512
91		Yina Community	Zhangjiatun	11028	2550	105	385
92			Hamazui	10933	5223	107	425
93			Bajia Village	10862	429	125	497
94		Shajing Community	Shajing Village	2395	-4251	679	2367
95			Lengkou	2322	-6362	32	100
96			Zhangzigou	4626	-6017	37	128
97			Yemaochong Village	290	-1971	297	1094
98		Xiaoshao Community	Lingyuan Village	4887	5070	23	70
99		/	Yunrui Community	4285	-1715	543	2172
100		/	Yuntianyuan	4468	-2493	6338	19014
101	Songming County	/	Lingxiu Knowledge City, Phase I	12120	5734	1428	4998
102		/	Evergrande Cultural Tourism City in Kunming (under construction)	11834	7387	Under construction	
103	Dabanqiao Subdistrict, Guandu District	/	China Merchants Shekou Holdings · Evian International Community (under construction)	5846	6259	Under construction	
104*		/	Xiaoshao Community*	5108	-492	258	733
105	Songming County	Laoyutun Village	Xiaoshidong	8222	-4148	54	168
106			Nanchong	9442	-4476	310	1090
107			Laoyutun Village	10350	-4723	207	710
108			Mahuangjing	11608	-5429	60	185
109			Diantou	9216	-4265	380	1345
110			Wulongshan	9760	-6334	5	28

111		Dashuying Village	Dashuying Village	11280	-3621	866	2598
112			Xiaobaozi	9397	-434	186	651
113			Xinnong Village	9981	-895	213	746
114 *		/	Qiliwan Community*	9005	-46	847	2500

Note: Those marked * are located within the planed control range of the WECPNL70dB contour line in 2035 of the previous EIA of Kunming Airport, and will be constructed after the approval of the previous EIA.

Table 0-4Acoustic Environmental Protection Targets (Schools, Hospitals, etc.)

S/N	Town/Township	Description	Type	Coordinates		Scale		Remarks
				X/m	Y/m	Number of teachers and students	Number of beds	
Zone I								
1*	Dabanqiao Subdistrict, Guandu District	Kunming Yunqiao Village Hospital*	Hospital	-6113	1206	/	208	2012
2*		Liyun Hospital*		-8911	1396	/	106	2016
3*		Dabanqiao Subdistrict Community Health Service Center, Guandu District*		-6716	1584	/	100	2022
4		Xichong No.2 Kindergarten	Kindergarten	-8559	1635	129		
5*		Yijia Central Yizi Kindergarten		-7074	2199	273		2019
6*		Beibei Feixing Kindergarten*		-6673	1940	462		2013
7		Kunming Airport Economic Zone No.1 Kindergarten		-1	-1489	542		
8*		Dongfang Jinbaobei Kindergarten*		-6188	1313	92		2014
9*		Xingyuan Kindergarten*		-6218	1019	518		2013
10*		Hongsha Beibei Kindergarten*		-5841	794	293		2018
11*		Wutongyu Kindergarten*		-5676	935	325		2018
12*		Haitian Kindergarten*		-4834	1249	236		2017
13*		Yunnan Bohui Kindergarten*		-4902	592	120		2021
14*		Beibei Kindergarten*		-6749	2374	78		2020
15		Aibeier Kindergarten		-9605	3306	143		
16		Xiaozhaoyang Kindergarten		-7033	2342	424		
17		Morningstar Kindergarten		-6950	1702	436		
18		Xichong Kindergarten		-8337	1669	233		
19		Fuxing Primary School	Schools	-2019	4396	328		
20		Xinfa Primary School		-1510	-2755	363		
21		Lizhi Primary School		-7066	2376	384		
22		Xichong Primary School		-8113	1695	686		
23		Qinglong School		-8483	1446	155		
24		Xingjie Primary School		-7300	2155	681		
25		Mingzhu School		-7147	2080	655		
26		No.4 Primary School of Kunming Economic and Technological Development Zone		-11253	1861	1262		
27		Gaopo Branch		-11294	3505	192		

28		Airport Experimental School of Kunming No.3 Middle School		-9458	1476	1943		
29		Banqiao Middle School		-7225	2265	571		
30		Shagou Central School		-5159	-189	499		
31		Yunnan Kunming No. 17 Middle School		-246	-1537	1375		
32*		Yunnan Xixinan Technical School*		-6862	2367	1387		2017
33		Yunnan Vocational College of Judicial Police		-3844	1764	4141		
34*	Dabanqiao Subdistrict, Guandu District	Compulsory Isolation Drug Rehabilitation Center for Women in Yunnan Province*	Drug Rehabilitation Center	-3247	-397	/	/	Moved to the new area in 2018
35*		The Seventh Compulsory Isolation Drug Rehabilitation Center in Yunnan Province*		-2827	758	/	/	2017
Zone II								
36	Dabanqiao Subdistrict, Guandu District	Airport Economic Zone No.2 Kindergarten	Kindergarten	1259	-1460	435		
37		Kunming Airport No.1 Primary School	Schools	49	-1657	685		
Zone III								
38	Dabanqiao Subdistrict, Guandu District	Dabanqiao Xiaoshao Community Health Service Station, Guandu District	Hospital	5358	3796	/	30	
39*		Kangle Kindergarten*	Kindergarten	1480	-229	104		2016
40*		Baihanchang Central Kindergarten*		4432	3296	60		2013
41*		Xiaoshao Borui Kindergarten*		5325	-634	114		2016
42		Changshui Chenxing Kindergarten		4391	-1805	127		
43		Baihanchang Central School	Schools	4169	3387	488		
44		Kunming Guanghua School		5694	314	3000		
45		Changshui Central School		4434	-1791	770		
46		Xiaoshao Middle School, Guandu District		5217	3439	549		
47		Jinqiao College of Kunming University of Science and Technology		2932	-2249	4300		
48		Yunnan Vocational College of Agriculture		5154	2279	4820		
49		Zhongduilong Central		8485	6906	885		

		School, Guandu District, Kunming						
50		Kunming Preschool Teachers College		11183	6613	5517		

Note: Those marked * are located within the planed control range of the WECPNL70dB contour line in 2035 of the previous EIA of Kunming Airport, and will be constructed after the approval of the previous EIA.

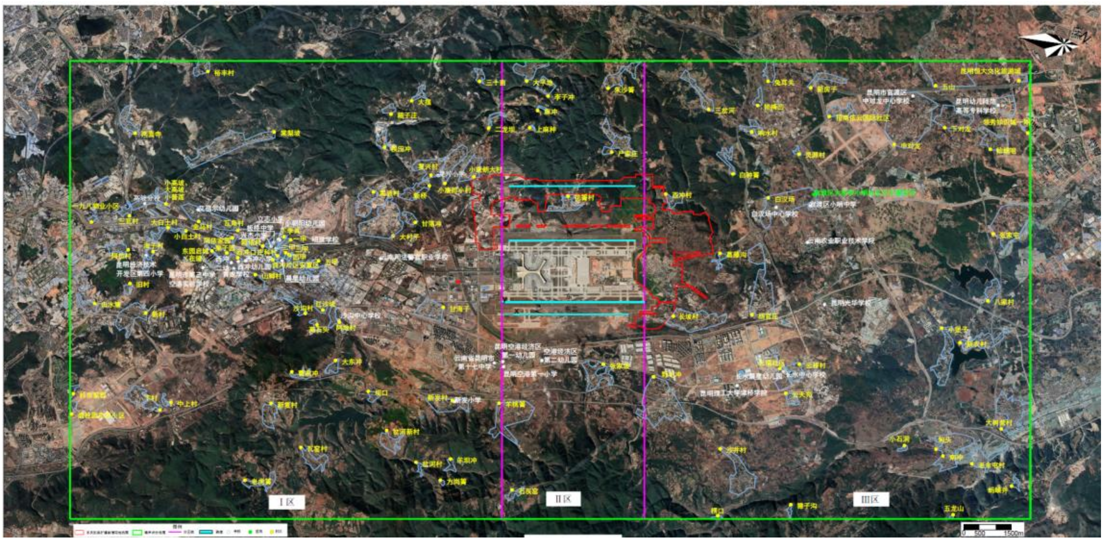


Figure 0-2 Distribution of Acoustic Environment Sensitive Sites

11.2Noise Prediction Method During Operation Period

11.2.1 Noise prediction model

INM 7.0d (Integrated Noise Model) developed by the Office of Environment and Energy, Noise Division (AEE-100) of FAA is selected for this noise assessment. The INM core calculation model, based on the standards of SAE Aviation Noise Committee (A-21), is compatible with multiple international standards, such as ECAC Document 29 and ICAO Circular 205. It is widely used in noise impact assessment of civil aviation airports.

INM can be used to calculate multiple aircraft noise assessment indicators, such as Ldn, Lden (CNEL), LAmax, Lwecpn, Ld (15-hour) and Ln (9-hour), and assess the impact of airport noise from multiple perspectives, such as short-term and long-term average.

11.2.2 Aircraft noise prediction procedure

According to *Technical Guidelines for Environmental Impact Assessment Constructional Project of Civil Airport* (HJ/T 87-2002), the aircraft noise prediction procedure of Yunnan Kunming Changshui International Airport is shown in the Figure below.

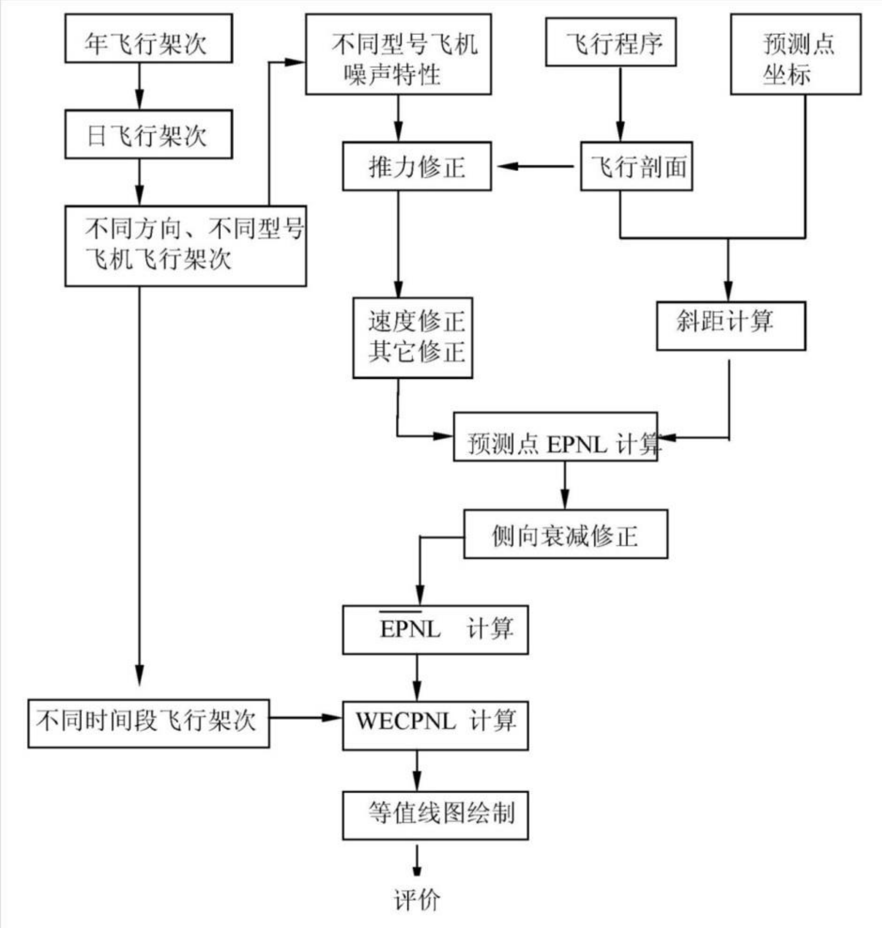


Figure 0-3 Noise Prediction Procedure of Yunnan Kunming Changshui International Airport

In the above prediction procedures, the key roles are:

(1) Noise-distance characteristic curve or noise-distance-power data of a single aircraft: The data in INM7.0d are used in this assessment, not involving the customized aircraft types or take-off and landing profiles.

(2) Take-off and landing track of aircraft: The assessment is assisted by relevant departments of Yunnan Kunming Changshui International Airport, and they provide basic information on the flight path for noise prediction of aircraft at Yunnan Kunming Changshui International Airport;

(3) Aircraft types and flight movement prediction of the airport: In this assessment, the aircraft types used in the prediction and the number of flight movements in different directions are given on the basis of the aircraft types and predicted number of flight movements provided in the feasibility study report of Yunnan Kunming Changshui International Airport;

(4) Flight procedure: This assessment is based on the flight procedure and approach and departure procedures of the expansion project in the target year provided by Yunnan Kunming Changshui International Airport.

11.2.3 Main parameters

The parameters selected for aircraft noise impact assessment of the expansion project of Kunming Changshui International Airport in this phase are listed as follows.

11.2.4 Prediction period

The target year of Yunnan Kunming Changshui Green Airport Development Project in this phase is 2030, and the prediction period shall be consistent with that in the feasibility study report.

11.2.5 Air traffic volume

According to the feasibility study report of the expansion project of Kunming Changshui International Airport in this phase, the designed target year is 2030. By then, the annual passenger throughput of Kunming Changshui International Airport will be 95 million, the annual cargo throughput will be 1 million tons, and the annual take-off and landing flights will be 632,875, including 622,000 domestic flights and 10,875 international flights.

11.2.6 Fleet composition and takeoff/landing proportion in daytime and at night

11.2.6.1 Composition of passenger aircraft fleet

In 2019, a total of 360,000 aircraft of different types took off from and landed at Kunming Changshui International Airport, among which Class C aircraft accounted for 95.77% of the annual take-off and landing aircraft, where B737, B738 and A320 were the main types, accounting for 83.19% in the fleet. The main types of aircraft taking off from and landing at Kunming Changshui International Airport in 2019 are listed in the following Table :

Table 0-5 Main Types and Proportions of Aircraft Taking off from and Landing at Kunming Changshui International Airport in 2019

Aircraft type	Flight movement	Proportion
B738	126007	35.00%
A320	88721	24.64%
B737	84780	23.55%
A321	14926	4.15%
A319	14725	4.09%
A330	5132	1.43%
Others	25746	7.15%
Total	360037	100%

The aircraft types of Yunnan Kunming Changshui Green Airport Development Project in this phase is provided by reference to the feasibility study report, and is appropriately adjusted by reference to the actual types of aircraft taking-off from and landing at Kunming Changshui International Airport in 2019.

11.2.6.2 Determination of composition of cargo aircraft fleet

Since the information on the types and proportions of cargo aircraft taking-off from and landing at Kunming Changshui International Airport are not available currently, the composition of the cargo aircraft fleet in this phase will be estimated by the analogy method. Currently, there are mainly five types of mainstream all-cargo aircraft in China:

(1) Boeing B777-200F

B777-200 F freighter has a total fuselage length of 62.94m, a wingspan of 64.80m, a height of 18.76m, a main cabin floor height of 5.09m, a lower cargo compartment floor height of 3.11m, a maximum cargo capacity of 105.9t, a maximum cargo volume of 650m^3, and a maximum range of about 9630km under full load.

In 2005, Boeing developed this B777-200F freighter on the basis of the long-range B777-200LR to replace the old B747-400F and the discontinued MD-11F. As an aircraft with the longest flight range, the largest loading capacity and the lowest range cost among twin-engine freighters, B777-200F freighter has great advantages in long-range operation.

In 2008, the first B777-200F freighter was delivered to Air France-KLM. On December 3, 2009, China Southern Airlines received the delivery of its order for two B777-200F freighters and became the first airline introducing this aircraft type into China.

(2) Boeing B777-400F

B747-400F freighter has a total fuselage length of 70.66m, a wingspan of 64.44m, a height of 19.41m, a main cabin floor height of 5.1m, a lower cargo compartment floor height of 3m, a maximum cargo capacity (theoretical structure) of 117.69 tons, a maximum cargo volume of 725m^3, and a maximum range of about 7223km under full load.

B747-400F freighter is a four-engine long-range wide-fuselage transport aircraft produced by Boeing Company. The biggest characteristics are its nose cargo door and a large side compartment door. They ensure that both conventional cargo and oversize and overweight cargo can be quickly loaded and unloaded. Compared with the double-engine freighter, it has a larger load capacity and lower operating cost.

B747-400F freighter was first introduced and operated by Cargolux Airlines International in November 1993. China Southern Airlines introduced two freighters of this type in 2002, and began to operate them independently.

(3) Boeing B747-8F

The cargo version of Boeing 747-8 is 747-8F, a derivative of 747-400ERF, with a total load capacity of 154 tons. The load capacity of 747-8 freighter is 16% higher than that of 747-400F.

Compared with 747-400 freighter, 747-8 freighter has an extra cargo space of 16% and a longer range. With the same front nose cargo loading capacity, after loading industry-standard 3m (10ft) pallets, it has a space of 117m^3 left which can load 4 main and 3 lower hold pallets.

It can load 7 extra pallets, and in terms of standard containers, it can also load 7 extra standard containers. Besides, its actual cargo density capacity during operation can be up to 157 kg/m^3. The 747-8F freighter has a range of 8,275 km.

For 747-8 freighter, it is possible to choose carrying more load, an extra load of 23 tons, or increasing a range of 1,400 nautical miles provided that the cargo density requirement is low. In fact, 747-8 freighter has a lower cost per ton per mile than that of any other freighters. The bare weight of Boeing 747-8 is 95 tons lighter than that of the A380 freighter. The first 747-8 freighter was put into service in 2009.

(4) Airbus A330-200F

The A330-200F freighter is a version with shorter fuselage among the A330 twin-engine wide-body series of Airbus. It can fly all ranges from short to long range and is also suiTable for point-to-point operation. It is the only new medium-sized cargo aircraft launched currently, with a maximum load capacity of 64 tons of cargo and a maximum range of 7,400 km.

The first A330-200F was delivered to its user Etihad Crystal Cargo from United Arab Emirates in 2010.

(5) Antonov AN-255

The AN-225 is an ultra-large civilian cargo aircraft with a take-off weight of more than 600 tons, the transport aircraft with the highest load capacity in the world so far, owned and commercially operated by Antonov Airlines in Ukraine. It is the world's largest six-engine turbofan heavy transport aircraft developed by the former Soviet Union in 1984-1988, and can carry more than 250 tons of cargo.

Ordinary civilian passenger aircraft have to face the aging problem after 15 to 20 years of service, and alternative types with better competitiveness will appear in the market. However, these passenger aircraft can continue to serve for 15 to 25 years after removal of seats, luggage compartments and other unnecessary facilities and being converted into cargo aircraft. At present, the mainstream B737-300/400F freighter is made by modifying the previous B737-300/400 passenger aircraft.

Another reason for the new generation of 737 cargo aircraft modified from passenger aircraft is that the current air freight market is growing slowly, and the cost and price of converting passenger aircraft into cargo aircraft are significantly lower than manufacturing new cargo aircraft. It can be seen that the B737 series cargo aircraft will still be the main type in the next 10 to 20 years.

According to the statistical data of CAAC News, by the end of 2013, there were 101 cargo aircraft of different types in the domestic civil aviation market. The number of B737-300F is the most, being 38, followed by B747F and B777-200F, being 20 and 15, respectively, and then B757F and B737-400F, both being 12.

Table 0-6 Number and Proportion of Main Cargo Aircraft Types in China in 2013

Aircraft class	Aircraft type	Quantity	Proportion
Class C	B737-300F	38	37.62%
	B737-400F	12	11.88%
Class D	B757F	12	11.88%
Class E	B747-100F	20	19.80%
	B747-200F	3	2.97%
	B777-200F	15	14.85%
	A330-200F	1	0.99%
Total		101	100%

B737-800 has existed for 18 years, and the first batch delivered need to be replaced now. Since more and more B737-800 passenger aircraft retire and are converted into and cargo aircraft, it can be predicted that B737 aircraft will still be the main type in the aviation logistics industry in China.

According to the feasibility study report of the project in this phase, the cargo throughput of Kunming Changshui International Airport in 2030 will be about 1,000,000t, including 650,000t of domestic cargo (loading capacity of all-cargo aircraft: 130,000t), with an average loading capacity of each cargo aircraft being 20t, and 320,000t of international cargo (loading capacity of all-cargo aircraft: 140,000t), with an average loading capacity of each cargo aircraft being 32t.

According to the above analysis, the proportion of freight aircraft types in the prediction is shown in Table 117.

Table 0-7 Proportion of Freight Aircraft Types to be Selected in the Prediction

Aircraft class	Aircraft type	Maximum payload (t)	Proportion	Sorties /a	Remarks
Class C	B737-400F	20	66.60%	7242.75	
Class E	A330-200F	36	33.40%	3632.25	
Total			100%	10875	

11.2.6.3 Distribution of proportions of aircraft types suiTable for Yunnan Kunming Changshui Green Airport Development Project in this phase

According to the actual types of aircraft taking off from and landing at Kunming Changshui International Airport in 2019 and the suiTable aircraft types provided in the feasibility study report of this phase, the composition of the aircraft fleet with noise impact in the expansion project in this phase is determined as shown in the following Table .

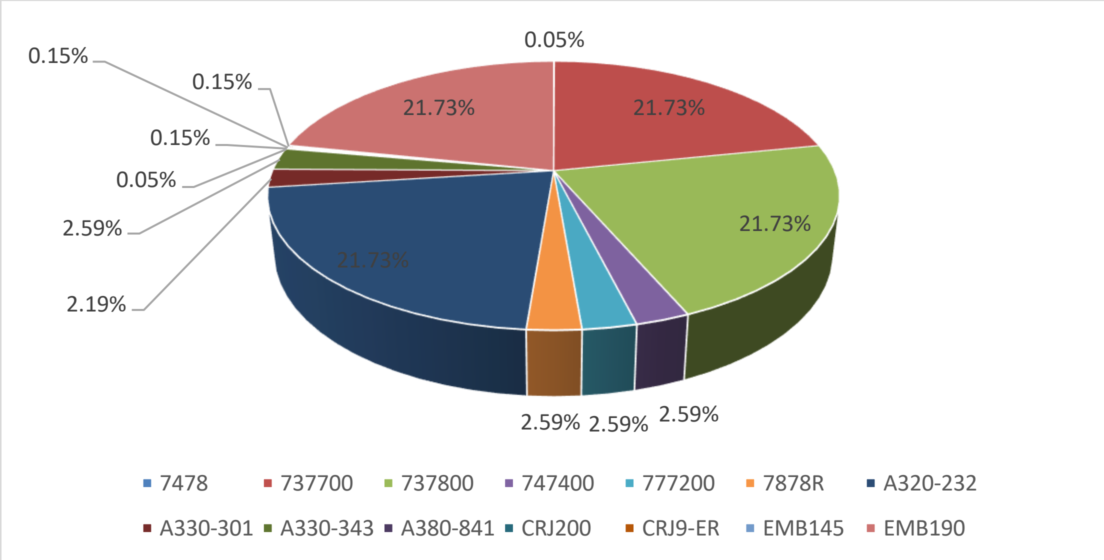


Figure 0-4 Composition of Aircraft Fleet Selected for Noise Assessment of Yunnan Kunming Changshui Green Airport Development Project in This Phase

11.2.6.4 Flight movements in different periods

The estimated flight movements in different periods of Kunming Changshui International Airport in 2030 are listed in the following Table .

Table 0-8 Prediction of Take-off and Landing Proportions of Kunming Changshui International Airport in Different Periods in 2030

Take-off and landing period	07:00-19:00	19:00-22:00	22:00-07:00
Take-off proportion	71.7%	14.0%	14.3%
Landing proportion	64.8%	15.9%	19.3%

11.2.7 Take-off and landing proportions on different runways

In this phase of Yunnan Kunming Changshui Green Airport Development Project, 2 new runways will be added. After the implementation of the Project, 4 runways will be operated at the same time. According to the functions and orientations of different runways, the take-off and landing proportions of each runway are shown in the following Table .

Table 0-9 Prediction of Take-off and Landing Proportions on Different Runways of Kunming Changshui International Airport in 2030

Take-off/landing direction	Proportion	Runway	Flight status	Use ratio	Heading	Relative ratio
Northeast-Southwest	65%	21L	起飞	34.70%	LXI	0.00%
					NODIB	4.94%
					DADOL	52.57
					NIXAS	0.00%
					P73	17.19%
					GULOT	0.00%

					Point A	25.30%
			Landing	10.48%	MP2	3.40%
					PP920	23.25%
					PP940	73.35
		21R	Take-off	17.30%	LXI	0.00%
					NODIB	0.00%
					DADOL	36.56%
					NIXAS	0.00%
					P73	5.38%
					GULOT	0.00%
					Point A	58.06%
			Landing	47.80%	MP2	7.54%
					PP920	40.23%
					PP940	52.23%
		22R	Take-off	48.00%	LXI	41.50%
					NODIB	54.23%
					DADOL	4.25%
					NIXAS	0.00%
					P73	0.00%
					GULOT	0.00%
					Point A	0.00%
			Landing	0.00%	MP2	/
					PP920	/
					PP940	/
		22L	Take-off	0.00%	DADOL	/
					P297	/
					P73	/
					S	/
					A	/
					NODIB	/
					N	/
			Landing	41.72%	MP2	8.12%
					PP920	28.96%
					PP940	62.92
Southwest-Northeast	35%	03R	Take-off	35.08%	LXI	0.00%
					NODIB	1.10%
					DADOL	52.23%
					NIXAS	0.00
					P73	16.72%
					GULOT	8.18%
					Point A	21.77%
			Landing	6.88%	MP3	14.58%
					MP4	85.42%
		03L	Take-off	16.42%	LXI	0.00%
					NODIB	10.93%
					DADOL	43.94%
					NIXAS	0.00%
					P73	6.65%
					GULOT	2.14%
					Point A	36.34%
			Landing	54.62%	MP3	60.34%
					MP4	39.26%
		04L	Take-off	48.50%	LXI	41.27%

					NODIB	54.87%
					DADOL	3.86%
					NIXAS	0.00%
					P73	0.00%
					GULOT	0.00%
					Point A	0.00%
			Landing	0.00%	MP3	/
					MP4	/
		04R	Take-off	0.00%	DADOL	/
					P297	/
					P73	/
					S	/
					A	/
					NODIB	/
					N	/
			Landing	38.50%	MP3	32.00%
					MP4	68.00%

11.2.7.1 Flight procedures

The flight procedures for aircraft noise impact prediction are mainly based on the flight procedure design report provided for Yunnan Kunming Changshui Green Airport Development Project. According to the data provided by the airport, the flight procedures of Kunming Changshui International Airport are divided into traditional standard instrument take-off and landing procedures and PBN take-off and landing procedures. The latter is the main and priority take-off and landing procedure. The noise assessment in this phase will also based on the flight path of PBN take-off and landing procedure.

11.2.7.2 Other parameters

Annual average temperature of the airport: 14.8

Annual average atmospheric pressure of the airport: 765.56mmhg

Annual average humidity of the airport: 71.4%

Annual average wind velocity of the airport: 4.1m/s

11.3 Assessment of the Current Status of Acoustic Environment Quality

11.3.1 Verification of noise prediction model

The method to verify the reliability of the model is: selecting some points around the airport to monitor the current status of aircraft noise impact of Kunming Changshui International Airport, carrying out simulation calculation according to the aircraft noise monitoring results and the aircraft take-off and landing data recorded during the monitoring period, comparing the results and calculating their difference.

According to the Technical Guidelines for Noise Impact Assessment (HJ2.4-2021), in terms of airport reconstruction and expansion projects, for an airport with two existing runways, 9 ~ 14 noise monitoring points can be set.

Currently, Kunming Changshui International Airport has two runways in the east and west respectively. A total of 20 monitoring points are set this time, especially at the positions 3km-5km to both ends of the runway and within 2km on both sides. The priority shall be given to the acoustic environmental protection targets below the flight path, and these monitoring points shall be arranged on the side where the sensitive site is close to the main route and the airport runway, in order to obtain the maximum value of WECPNL at the sensitive site affected by aircraft noise.

11.3.2 Monitoring scheme for aircraft noise impact

(1)Monitoring point

A total of 17 monitoring points are set at both ends of the runways, and a total of 3 monitoring points are set within 2km from the runway side, including 7 schools and 13 villages. The position information of each monitoring point is listed in the following Table .

Table 0-10 Current Situation of Aircraft Noise at Kunming Changshui International Airport

S/N	Name of the monitoring point	Latitude and longitude	Monitoring contents
N1	Ganhaizi	102.92138100，25.07246102	LAmax、EPNL、Td
N2	Ganluochong	102.89348602，25.08087642	LAmax、EPNL、Td
N3	Heibo Village	102.87891623，25.07343774	LAmax、EPNL、Td
N4	Dacunzi	102.88882181，25.06930916	LAmax、EPNL、Td
N5	Fuxing Primary School	102.88814130，25.09491074	LAmax、EPNL、Td
N6	Huaqing Village	102.92218849，25.11675058	LAmax、EPNL、Td
N7	Xichong Village	102.94177751，25.14117672	LAmax、EPNL、Td
N8	Baihanchang Central School	102.96263337，25.16473639	LAmax、EPNL、Td
N9	Getenggou	102.96297063，25.14409085	LAmax、EPNL、Td
N10	Wuxi Village	102.94950111，25.12591166	LAmax、EPNL、Td
N11	Changpo Village	102.96701773，25.11929237	LAmax、EPNL、Td
N12	Kunming Guanghua School	102.99723387，25.15938576	LAmax、EPNL、Td
N13	Xiaoshao Village	102.99848273，25.14997407	LAmax、EPNL、Td
N14	Chance-Way Airport Town Community	102.92507252，25.06723552	LAmax、EPNL、Td
N15	Shagou Central School	102.90463539，25.04664276	LAmax、EPNL、Td
N16	Yunnan Vocational College of Judicial Police	102.8973311，25.06722077	LAmax、EPNL、Td

N17	Qinglong School	102.87136905, 25.03251304	LAmax、EPNL、Td
N18	Xingyuan School	102.98526569， 25.13443325	LAmax、EPNL、Td
N19	Yunqiao Village	103.00474942， 25.14052559	LAmax、EPNL、Td
N20	Yunnan Vocational College of Agriculture	102.97834151， 25.16491904	LAmax、EPNL、Td

The distribution of monitoring points is shown in the following Figure :

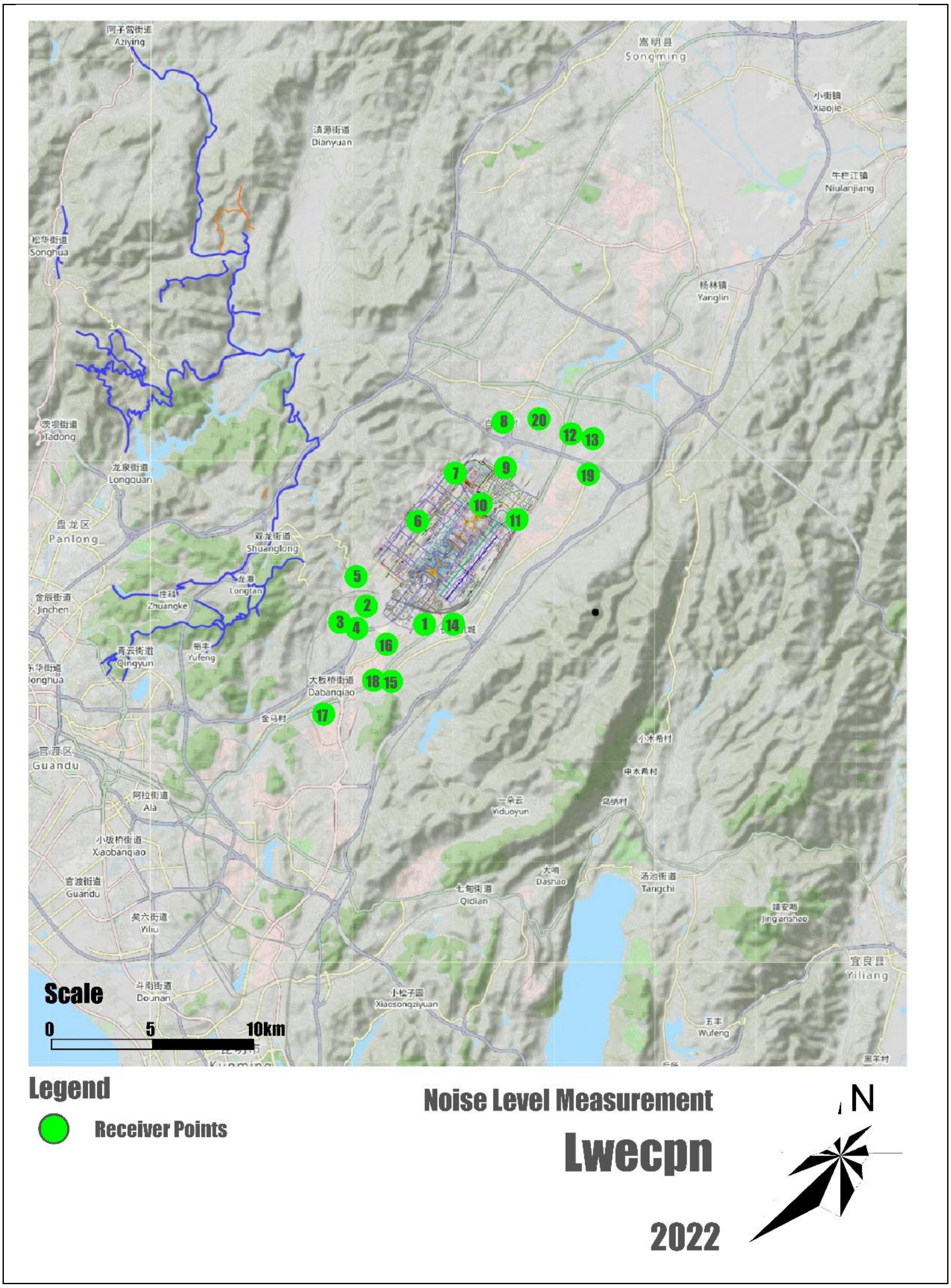


Figure 0-5 Distribution of Monitoring Points for Aircraft Noise at Kunming Changshui International Airport

(2) Monitoring period and frequency

The monitoring period is January 4-20, 2022, for continuously monitoring one flight cycle (one week), and the monitoring at each point is synchronous and continuous for 7 days and nights.

(3) Monitoring items

According to the Standard of Aircraft Noise for Environment Around Airport (GB9660-88), the aircraft noise shall be monitored for LAmax, Td and EPNL when the aircraft flies over the monitoring points, and the weather, aircraft take-off/landing and other relevant information shall be recorded.

(4) Monitoring methods and instruments

Aircraft noise shall be monitored according to the methods specified in the *Measurement of Aircraft Noise Around Airport* (GB9661-88). The monitoring instruments shall be multi-functional sound level meter AWA6228, etc.

11.3.3 Aircraft noise monitoring results

(1) Aircraft types and flight movements during monitoring

During the monitoring period from January 4 to 20, 2022, the flight movements are 8,499, with an average of 607 flight movements per day. The number of A320, B737, B738 and their series types accounts for more than 80%. The main aircraft types and proportions are listed in the following Table .

Table 0-11 Main Types of Aircraft Taking off from and Landing at Kunming Changshui International Airport during the Monitoring Period

Aircraft classification	Main types	Proportion (%)
C	B737/738、A319/320、A321、A32N	97.63%
D	B752、B757	1.71%
E	A330、A332、A333、A339、B773、B789	0.66%
F	N/A	/
Total		100%

(2) Proportion of flight movements in different time periods

The take-off and landing proportions in daytime and at night during the aircraft noise monitoring period are listed in the following Table ;

Table 0-12 Statistics of Flights in Different Periods during Monitoring

Period	Daytime	Evening	Nighttime
	07:00~19:00	19:00~22:00	22:00~7:00
Take-off	77.32%	13.36%	9.32%
Landing	64.28%	15.62%	20.10%

(3) Runway operating parameters during monitoring

The take-off and landing proportions of different runways during the current aircraft noise monitoring are listed in the following Table ;

Table 0-13 Operation Parameters of Airport Runways

Take-	Direction	Runway	Flight status	Proportion

off/landing direction	proportion %			(%)
Northeast-southwest	72.28%	21 (West Runway)	Take-off	48.83%
			Landing	48.67%
		22 (East Runway)	Take-off	51.17%
			Landing	51.33%
Southwest-northeast	27.72%	03 (West Runway)	Take-off	50.79%
			Landing	49.39%
		04 (East Runway)	Take-off	49.21%
			Landing	50.61%

(4) Lwecpn Calculation method

According to the *Measurement of Aircraft Noise Around Airport* (GB9661-88), the energy of aircraft noise continuously monitored at each monitoring point for one week is averaged to obtain the average WECPNL of one day and night, as the assessment indicator of aircraft noise.

The specific formula is as follows:

$$\text{WECPNL}=\overline{L'_{Amax}}+10\times\log\left[\frac{\left(\sum_{i=1}^{7}(N_{1i}+3N_{2i}+10N_{3i})\right)}{7}\right]-27$$

$$\overline{L'_{Amax}}=10\times\log\left[\frac{\left(\sum_{i=1}^{N}\left(10^{L'_{Amax}i/10}\right)\right)}{N}\right]$$

$$L'_{Amax}=L_{Amax}+10\log（T_d/20）$$

where: $\overline{L'_{Amax}}$——L'_{Amax} average energy value of all flights in a week;

L'_{Amaxi}——L'_{Amax} of one flight;

Td——actual duration, s;

N_{1i}、N_{2i}、N_{3i}——number of flights per day in three different periods from Monday to Sunday.

N1: number of flight movements during daytime (7:00-19:00);

N2: Number of flight movements in the evening (19:00-22:00);

N3: Number of flight movements at night (22:00-7:00).

(5) Statistics of monitoring results

The monitoring results of each monitoring point are listed in the following Table . The monitoring results show that the values monitored at N1 Ganhaizi Village, N12 Kunming Guanghua School, N18 Xingyuan School and N20 Yunnan Vocational College of Agriculture exceed the standard limit specified in the *Standard of Aircraft Noise for Environment Around Airport* (GB9660-88), but the LWECPN values at other points meet the standards for Class I and Class II areas in the *Standard of Aircraft Noise for Environment Around Airport* (GB9660-88).

Table 0-14 List of Aircraft Noise Monitoring Results of Kunming Changshui International Airport

Name of the monitoring point	L_{Amax}	LEPN	T_d(s)	Effective flight movements	Take-off and landing		$\overline{L}_{EPN}$ (dB)	LWECPN	Standard value	Compliance
				(Daytime, evening, nighttime)	Take-off	Landing				
N1 Ganhaizi	60.0-92.5	67.2-106.9	3.5-67.0	1920（1356、257、307）	1003	917	88.1	76.8	75	Exceed the standard
N2 Ganluochong	60.0-92.5	66.3-98.5	3.50-67	1773（1255、244、274）	1217	556	86.0	74.3	75	Yes
N3 Heibo Village	60.0-93.5	66.3-101.3	3.5-64.0	1674（1227、228、219）	1043	631	84.5	72.3	75	Yes
N4 Dacunzi	60.0-79.1	66.0-91.9	3.5-65.0	1788（1159、320、309）	1267	521	82.7	71.6	75	Yes
N5 Fuxing Primary School	59.3-80.4	66.4-89.2	3.5-63.5	1189（865、171、153）	830	359	81.2	67.4	70	Yes
N6 Huaqing Village	52.1-76.3	64.3-87.4	3.5-58.0	1135（916、145、74）	881	254	79.6	64.3	75	Yes
N7 Xichong Village	59.9-89.8	66.0-96.7	3.5-73.0	1264（919、185、160）	495	769	81.7	68.2	75	Yes
N8 Baihanchang Central School	60.0-78.7	66.1-91.1	3.5-93	1209（924、173、112）	370	839	83.5	69	70	Yes
N9 Getenggou	60.0-96.2	66.3-104.9	3.5-97	1686（1246、224、216）	478	1208	84.7	72.3	75	Yes
N10 Wuxi Village	60.0-91.8	65.6-106.9	3.5-84.5	1793（1248、272、273）	628	1165	84.3	72.9	75	Yes
N11 Changpo Village	60.0-91.5	66.2-96.9	3.5-40.0	1378（927、214、237）	509	869	86.0	73.6	75	Yes
N12 Kunming Guanghua School	60.0-	66.2-	3.5-	1200（803、167、	279	921	84.	71.6	70	Exceed the

	89.1	97.5	71.0	230）			5			standard
N13 Xiaoshao Village	59.5-91.5	66.0-96.9	3.5-71.0	1133（845、150、138）	290	843	83.2	69	75	Yes
N14 Xingyue Lanwan	60.0-86.6	66.0-96.8	3.5-50.5	1486（1201、167、118）	1071	415	85.4	71.6	75	Yes
N15 Shagou Central School	60.0-89.6	66.6-95	3.5-47.5	1242（998、146、98）	827	415	83.4	69.2	70	Yes
N16 Yunnan Vocational College of Judicial Police	60.0-78.5	65.8-90.2	3.5-80.0	1794（1345、228、221）	1330	464	80.9	68.8	70	Yes
N17 Qinglong School	60.0-91.8	66.0-97.8	3.5-94.5	1215（993、135、87）	912	303	80.9	66.2	70	Yes
N18 Xingyuan School	55.6-82.6	66-91.1	3.5-78.5	1431（1163、154、114）	917	514	84.7	71.1	70	Exceed the standard
N19 Yunqiao Village	60.0-89.4	66.2-94.8	3.5-84.5	1105（896、140、69）	376	729	81.1	65.7	75	Yes
N20 Yunnan Vocational College of Agriculture	60.0-92.2	66.4-104.8	3.5-67.0	1562（1100、213、249）	327	1235	85.1	73	70	Exceed the standard

(4) Comparison between predicted and measured results

According to the actual flight conditions of aircraft during the actual aircraft noise measurement period, the WECPNL at each monitoring point is calculated with INM7.0d. The comparison between the calculated values and the measured values are shown in Table 11-15 below. According to comparison results, the difference between the calculated results and measured results at each monitoring point are within the range of 0.6dB - 3dB. The difference within 3dB is generally considered as relatively ideal. Therefore, the INM model is basically well fitted with the monitoring results, and predicting aircraft noise impact with the INM model is reliable.

Table 0-15 Comparison Between INM Predicted Results and Measured Results

S/N	Description	INM predicted WECPNL	Measured WECPNL	Measured value-predicted value
N1	Ganhaizi	79.8	76.8	3
N2	Ganluochong	76.8	74.3	2.5
N3	Heibo Village	74.6	72.3	2.3
N4	Dacunzi	73	71.6	1.4
N5	Fuxing Primary School	68.2	67.4	0.8
N6	Huaqing Village	64.9	64.3	0.6
N7	Xichong Village	69.3	68.2	1.1
N8	Baihanchang Central School	71.6	69	2.6
N9	Getenggou	70.8	72.3	-1.5
N10	Wuxi Village	74.2	72.9	1.3
N11	Changpo Village	76.4	73.6	2.8
N12	Kunming Guanghua School	72.6	71.6	1
N13	Xiaoshao Village	68.3	69	-0.7
N14	Chance-Way Airport Town Community	73.2	71.6	1.6
N15	Shagou Central School	72.2	69.2	3
N16	Yunnan Vocational College of Judicial Police	70.7	68.8	1.9
N17	Qinglong School	66.4	66.2	0.2
N18	Xingyuan School	73.2	71.1	2.1
N19	Yunqiao Village	67	65.7	1.3
N20	Yunnan Vocational College of Agriculture	70.9	73	-2.1

11.4 Current Aircraft Noise Impact of Kunming Changshui International Airport

Affected by the COVID-19 pandemic in 2020-2022, the air traffic volume of major airports in China dropped sharply. In this phase, 2019 is selected as the base year for the assessment of the current aircraft noise impact of Kunming Changshui International Airport. On the basis of the annual and daily average flight movements, the INM model is used for simulation calculation.

(1) Impact range of different WECPNLs of Kunming Changshui International Airport in

2019

According to the simulation calculation results, the coverage of different aircraft noise levels Lwecpn of Kunming Changshui International Airport in 2019 is shown in the following Table ;

Table 0-16 Impact Range of Different WECPNLs of Kunming Changshui International Airport in 2019

S/N	WECPNL (dB)	Coverage (km^2)
1.	≥70	110.441
2.	≥75	51.718
3.	≥80	19.047
4.	≥85	7.074
5.	≥90	3.229

The distribution of Lwecpn contour lines of Kunming Airport in 2019 is as follows;

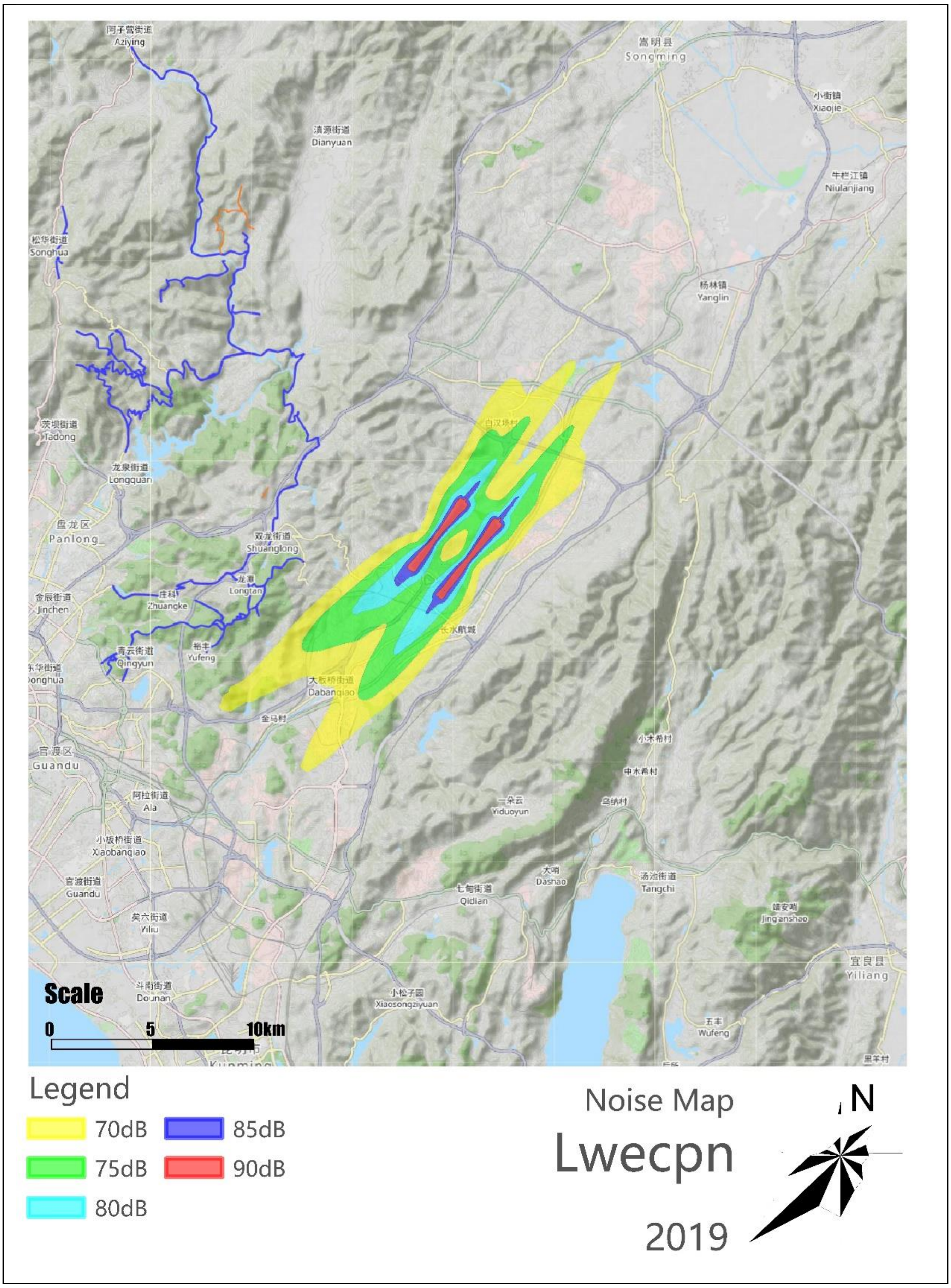


Figure 0-6 Distribution of WECPNL Contour Lines of Kunming Changshui International Airport in 2019

The Lwecpn values of main sensitive sites (receptors and receiving sites) around the airport are shown in the following Table .

Table 0-17 WECPNL Impact of Aircraft Noise of Kunming Changshui International Airport on Surrounding Villages and Residential Areas in 2019

Unit: dB

S/N	Environmental Protection Targets	LWECPN in 2019	Exceedance	Remarks
1	Dacunzi	76.1	1.1	Exceed the standard
2	Heibo Village	78.2	3.2	Exceed the standard
3	Xialiqi	70		
4	Tanglipo	69.6		
5	Yijia	70.5		
6	Erjia	70		
7	Sanjia	70.1		
8	Sijia	70.2		
9	Wujia	71.7		
10	Zhuangke Village	69.6		
11	Xichongkou	68.6		
12	Shanjiao Village	70.6		
13	Liziyuan	68.1		
14	Wajiao Village	67.3		
15	Ayi Village	68.8		
16	Dadongchong	65.5		
17	Adi Village	75.7	0.7	Exceed the standard
18	Gaoshitou	74.3		
19	Hongshapo	76.2	1.2	Exceed the standard
20	Shagou Village	75		
21	Caojiachong	62.9		
22	Xiaokanglangxiao Village	66.8		
23	Xiaokanglangda Village	67.1		
24	Fuxing Village	70.9		
25	Xinqiao Village	75.6	0.6	Exceed the standard
26	Ganluochong	80.4	5.4	Exceed the standard
27	Yangtianchong	68.9		
28	Erlongba	60		
29	Ganhaizi	82.7	7.7	Exceed the standard
30	Yincheng Jiayuan*	71.5		
31	Yunxiangyuan*	71.5		
32	Xingyue Lanwan, Konggang Jiayuan*	75.7	0.7	Exceed the

				standard
33	Yunshanyuan and other areas of Chance-Way Airport Town*	70.3		
34	Xiaobaitu Village	66.6		
35	Dabaitu Village	65.7		
36	Haizi Village	66.6		
37	New Village	69.6		
38	Xiaogaopo, Dagaopo, Xiaopulian	65.7		
39	Jinma Village	66.3		
40	Xiaoshao Community*	70.7		
41	Qiliwan Community*	69.4		
42	Ayi Jiayuan (under construction)	68.7		
43	Dongyuan Qicheng (under construction)	68.2		
44	Resettlement Area in Xichong Area	69.1		
45	Huaqing Village	70.1		
46	Yanjiazhuang	60.4		
47	Shangmazhong	58.2		
48	Zhangjiapo	63.7		
49	Changpo Village	78.8	3.8	Exceed the standard
50	Yunqiao Village	69.1		
51	Xichong Village	72.1		
52	Getenggou	73.1		
53	Baihanchang	74.4		
54	Yangguanzhuang	69.6		
55	Baizhongqing	63.3		
56	Xiangshui Village	59.8		
57	Zhongduilong	64.8		
58	Xiaduilong	63.5		
59	Lingyuan Village	65		
60	Yunrui Community	69.4		
61	Xiaobaozi	65.8		
62	Xinnong Village	63		

Note: (1) The standard is based on the 75dB limit for WECPNL of Class II area in the *Standard of Aircraft Noise for Environment Around Airport* (GB9660-88);

(2) Sites with the symbol * are new buildings within the control scope of the previous EIA planning.

The measurement in 2019 show the WECPNL values of 62 villages among the acoustic environmental protection targets are within the range of 55.6dB - 82.7dB, and those of 9 targets exceed the standard limit for Class II area (LWECPN≤75dB) in the *Standard of Aircraft Noise for Environment Around Airport* (GB9660-88). Among them, the WECPNL values of 7 targets (Dacunzi, Heibo Village, Adi Village, Hongshapo, Xinqiao Village, Changpo Village and Xingyue Lanwan) are within the range of 75dB - 80dB. The WECPNL value of Changpo Village is the maximum, being 78.8 dB, and those of two targets (Ganluochong and Ganhaizi) are within the range of 80dB - 85dB, being 80.4dB and 82.7dB respectively.

With 3dB as the interval, the number distribution of sensitive sites in different WECPNL ranges is shown in the following Figure .

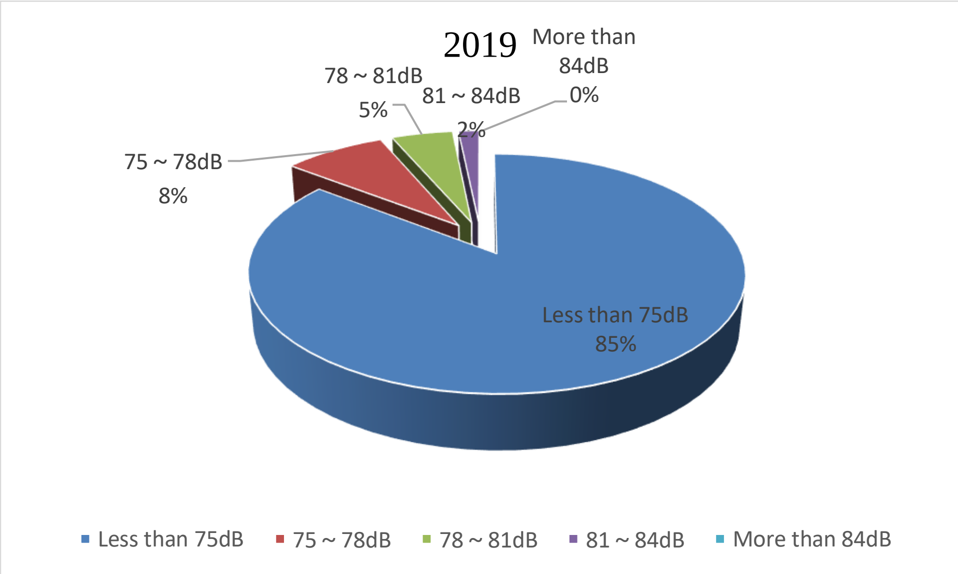


Figure 0-7 Number Distribution of Sensitive Sites in Different WECPNL Ranges of Kunming Changshui International Airport in 2019 (Class II Area)

The above Figure shows that the WECPNL impact of 84% of Class II sensitive sites (receptors) is less than 75dB (compliance rate: 84%) in 2019. The WECPNL impact of 2% of Class II sensitive sites (receptors) is greater than 81dB.

Table 0-18 ARABIC \s 1 18 WECPNL Impact of Aircraft Noise on Surrounding Schools and Hospitals of Kunming Changshui International Airport in 2019

Unit: dB

S/N	Class I acoustic environmental protection targets	LWECPN in 2019	Exceedance	Remarks
1	Kunming Yunqiao Village Hospital*	73	3	Exceed the standard
2	Liyun Hospital*	69		
3	Dabanqiao Central Hospital, Guandu District*	70.1	0.1	Exceed the standard
4	Xichong No.2 Kindergarten	68.4		
5	Yijia Central Yizi Kindergarten	70		
6	Beibei Feixing Kindergarten*	70.4	0.4	Exceed the standard
7	Kunming Airport Economic Zone No.1 Kindergarten	67.2		
8	Dongfang Jinbaobei Kindergarten*	72.5	2.5	Exceed the standard
9	Xingyuan Kindergarten*	73.6	3.6	Exceed the standard
10	Hongsha Beibei Kindergarten*	75.3	5.3	Exceed the standard
11	Wutongyu Kindergarten*	74.9	4.9	Exceed the standard
12	Haitian Kindergarten*	74.5	4.5	Exceed the standard
13	Yunnan Bohui Kindergarten*	77.6	7.6	Exceed the standard
14	Beibei Kindergarten*	70.7	0.7	Exceed the standard
15	Aibeier Kindergarten	66.6		

16	Xiaozhaoyang Kindergarten	70.2	0.2	Exceed the standard
17	Morningstar Kindergarten	69.9		
18	Xichong Kindergarten	68.6		
19	Fuxing Primary School	71.5	1.5	Exceed the standard
20	Xinfa Primary School	59.6		
21	Lizhi Primary School	70.1	0.1	Exceed the standard
22	Xichong Primary School	68.6		
23	Qinglong School	69		
24	Xingjie Primary School	69.7		
25	Mingzhu School	69.8		
26	No.4 Primary School of Kunming Economic and Technological Development Zone	66.7		
27	Airport Experimental School of Kunming No.3 Middle School	68.3		
28	Banqiao Middle School	69.7		
29	Shagou Central School	75.4	5.4	Exceed the standard
30	Yunnan Kunming No. 17 Middle School	67		
31	Yunnan Xixinan Technical School*	70.1	0.1	Exceed the standard
32	Yunnan Vocational College of Judicial Police	73.6	3.6	Exceed the standard
33	Compulsory Isolation Drug Rehabilitation Center for Women in Yunnan Province*	75.9	5.9	Exceed the standard
34	The Seventh Compulsory Isolation Drug Rehabilitation Center in Yunnan Province*	79.1	9.1	Exceed the standard
35	Airport Economic Zone No.2 Kindergarten	65.1		
36	Kunming Airport No.1 Primary School	66.7		
37	Dabanqiao Xiaoshao Community Health Service Station, Guandu District	71.8	1.8	Exceed the standard
38	Kangle Kindergarten*	77.1	7.1	Exceed the standard
39	Baihanchang Central Kindergarten*	73.7	3.7	Exceed the standard
40	Xiaoshao Borui Kindergarten*	70.2	0.2	Exceed the standard
41	Baihanchang Central School	74.3	4.3	Exceed the standard
42	Changshui Central School	69.4		
43	Kunming Guanghua School	75.2	5.2	Exceed the standard
44	Xiaoshao Middle School, Guandu District	72	2	Exceed the standard
45	Yunnan Vocational College of Agriculture	73.2	3.2	Exceed the standard

Note: (1) The standard is based on the 70dB limit for WECPNL of Class I area in the *Standard of Aircraft Noise for Environment Around Airport* (GB9660-88);

(2) Sites with the symbol * are new buildings within the control scope of the previous EIA planning.

The measurement in 2019 show the WECPNL values of 45 schools and hospitals among the acoustic environmental protection targets are within the range of 57.1dB - 79.1dB, and those of 19 targets exceed the standard limit for Class I area (LWECPN≤70dB) in the *Standard of Aircraft Noise for Environment Around Airport* (GB9660-88). Among the other 26 targets with out-of-limit WECPNL values, the WECPNL values of 12 targets are within the range of 70dB - 73dB, 11 targets 73dB - 76dB, and 2 targets 76dB - 79dB. Only one Class I sensitive site, the Seventh Compulsory Isolation Drug Rehabilitation Center in Yunnan Province, has a WECPNL value of more than 79dB, being 79.1dB.

With 3dB as the interval, the proportion of sensitive sites in different WECPNL ranges is shown in the following Figure .

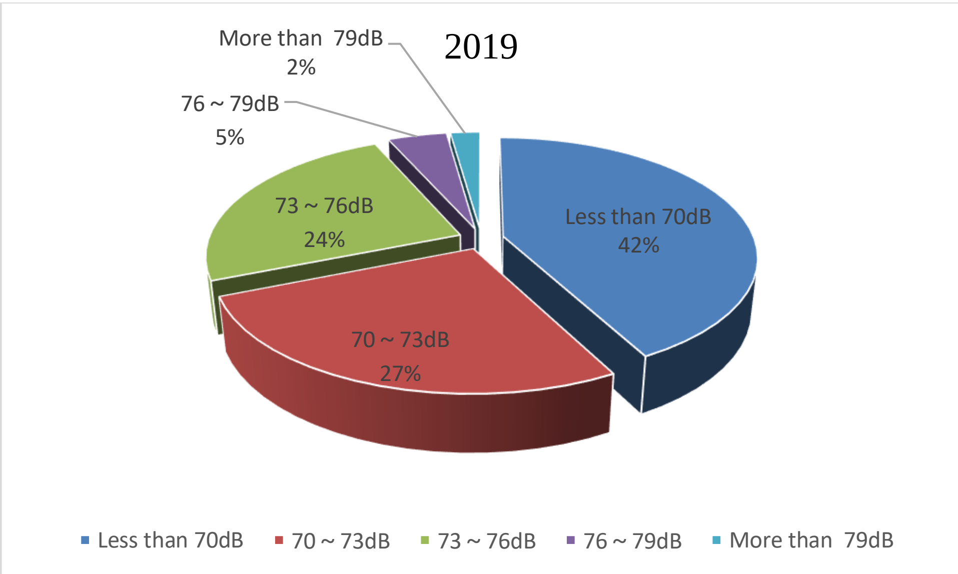


Figure 0-8 Number Distribution of Sensitive Sites in Different WECPNL Ranges of Kunming Changshui International Airport in 2019 (Class I Area)

The above Figure shows that 42% of Class I sensitive sites (receptors) within the assessment scope of this phase in 2019 are in the impact areas with WECPNL values lower than 70dB.

11.5Noise Impact Assessment and Mitigation Measures During Construction Period

The construction noise mainly comes from the noise generated by construction machinery and transport vehicles. The types of construction noise can be specifically divided into the following three categories: mechanical noise from earthwork excavation and filling and site leveling; mechanical noise from pavement and building construction sites; and traffic noise from vehicle transport. Excavators, bulldozers, loaders, etc. are required for excavation and filling of earthwork and gravel materials, and the noise generated by them will affect the surrounding environment. Mechanical equipment that can generate high level of noise during construction include bulldozer, grader, road roller, drilling rig, vibrator, and pile driver, and that has the greatest impact on the surrounding environment is the concrete mixer, generally with a noise level of 76~91dB (A) (The measuring point is 5m away from the driving line). The noise of main construction machinery is shown in Table 11-19.

Table 0-19 Statistics of Noise Source Intensities of Construction Machinery (Distance: 5m)

S/N	Equipment	A sound level dB(A)
1	Impact well drill	84
2	Concrete mixer	91
3	Concrete pump	85
4	Concrete vibrator	84
5	Static pressure pile driver	90
6	Hydraulic wheel excavator	84
7	Bulldozer	86
8	Grader	90
9	Wheel loader	90
10	Vibratory roller	86
11	Tandem vibratory road roller	87
12	Three-wheel roller	81
13	Pneumatic tyred roller	76

2) Noise from transport vehicles

During the construction process, large freight trucks and concrete trucks are generally used, and the noise generated by them can reach 87dB(A) (the measuring point is 7.5m away from the vehicle driving line). Dump trucks can generate noise of more than 90 dB(A) during loading or unloading of stones or other building materials.

Among the construction machinery, the concrete mixer has the highest noise source intensity, which can be up to 91dB (A) at a position 5m away from the sound source. The sound level of most other construction machinery is between 76~90dB (A).

The noise pressure level at a distance r from the noise source is:

$$L_P(r) = L_P(r_0) - 20lg\frac{r}{r_0}$$

Where:

$L_p(r)$ - sound pressure level of the noise source at the prediction point, dB(A);

$L_p(r_0)$ – sound pressure level at the reference location, dB(A);

r_0 - distance from the reference location to the center of the noise source, m;

r - distance from the center of the noise source to the prediction point, m;

According to the formula, the impact range of equivalent sound level of construction machinery is shown in Table 11-20.

Table 0-20 Impact Range of Noise from Various Construction Machinery at the Airport

Unit: dB (A)

S/N	Equipment	Distance from prediction point (m)							Standard distance	
		5	10	20	40	80	160	320	Daytime	Nighttime
1	Impact well drill	84	78	72	66	60	54	/	25	142
2	Concrete mixer	91	85	79	73	67	61	55	56	317
3	Concrete pump	85	79	73	67	61	55	/	28	158
4	Concrete vibrator	84	78	72	66	60	54	/	25	142
5	Static pressure pile driver	90	84	78	72	66	60	54	50	283
6	Hydraulic wheel excavator	84	78	72	66	60	54	/	25	142
7	Bulldozer	86	80	74	68	62	56	50	32	177
8	Grader	90	84	78	72	66	60	54	50	283
9	Wheel loader	90	84	78	72	66	60	54	50	283
10	Vibratory roller	86	80	74	68	62	56	50	32	177
11	Tandem vibratory road roller	87	81	75	69	63	57	51	35	199
12	Three-wheel roller	81	75	69	63	57	51	/	18	100
13	Pneumatic tyred roller	76	70	64	58	52	/	/	10	56

The prediction results in Table 11-20 show that: During the construction of mixers, vibrators, and pile drivers, the standard limit requirements can be met if the distance is 56m away from the construction machinery in the daytime and 317m at night. During earthwork construction, the standard limit requirements can be met if the distance is 50m from the construction machinery in the daytime and 283m at night.

During the construction period, the standard distance shall be 25 ~ 56m in the daytime and 142 ~ 317m at night for structural construction, and 10 ~ 50m in the daytime and 56 ~ 283m at night for earthwork construction.

During construction, the greatest noise comes from concrete mixers, and the standard limit requirements can be met if the distance is 56m from the concrete mixers in the daytime and 317m at night. The Project mainly includes T2 terminal, works in the airfield area and supporting facilities works. Several residential areas, including Xichong Village, Changpo Village, Chance-Way Airport Town and Xiaokanglangda Village, are distributed within the area affected by the airport construction. On the premise of no use of high-noise machinery at night, the noise impact of construction machinery used for earthwork operation and structural engineering operation on the protection targets in daytime is accepTable .

During the construction period, the noise impact can be reduced by taking the following measures:

(1) Reasonably arrange the construction hours, and avoid construction at night as far as possible except for the conditions of non-stop construction scheme. It is strictly prohibited to

carry out construction activities around the acoustic environmental protection targets at night. If construction at night is necessary due to special requirements, the surrounding people shall be informed in time and necessary noise reduction and impact mitigation measures shall be taken;

(2) Reasonably plan construction passages, arrange transportation in an organized way, make sure the construction transportation routes bypass the acoustic environmental protection targets;

(3) Reasonably arrange the use of construction machinery during construction process, select and use low-noise construction machinery, equipment and technologies as far as possible, minimize the service hours of high-noise equipment, strengthen the maintenance of construction machinery, reduce the noise emission of construction machinery as far as possible, and strictly restrict the use of high-noise machinery at night;

(4) Set up construction fences at the boundaries of the construction site;

(5) Strengthen the noise monitoring for acoustic environmental protection targets at night, and limit the speed and loading capacity of transport vehicles at night to reduce the noise impact on villages at night.

11.6Noise Impact Assessment and Mitigation Measures During Operation Period

11.6.1 LWECPN prediction results

According to the predicted business volume in the feasibility study report of the expansion project in this phase, the areas with LWECPN greater than 90dB, 85dB, 80dB, 75dB and 70dB in 2030 are 8.748km^2, 20.617 km^2, 56.006 km^2, 106.652km^2 and 208.259km^2.

The coverage of different sound levels of aircraft noise WECPNL of Kunming Changshui International Airport in 2030 is listed in the following Table .

Table 021 Impact Range of Different Sound Levels L_{WECPN} of Kunming Changshui International Airport in 2030

Envelope area of sound level /dB/	≥70	≥75	≥80	≥85	≥90
2019	110.441	51.718	19.047	7.074	3.229
2030	208.259	106.652	56.006	20.617	8.748
Increase	88.57%	106.22%	194.04%	191.45%	170.92%
Range area of sound level /dB/	70~75	75~80	80~85	85~90	>90
2019	58.723	32.671	11.973	3.845	3.229
2030	101.607	50.646	35.389	11.869	8.748
Increase	73.03%	55.02%	195.57%	208.69%	170.92%

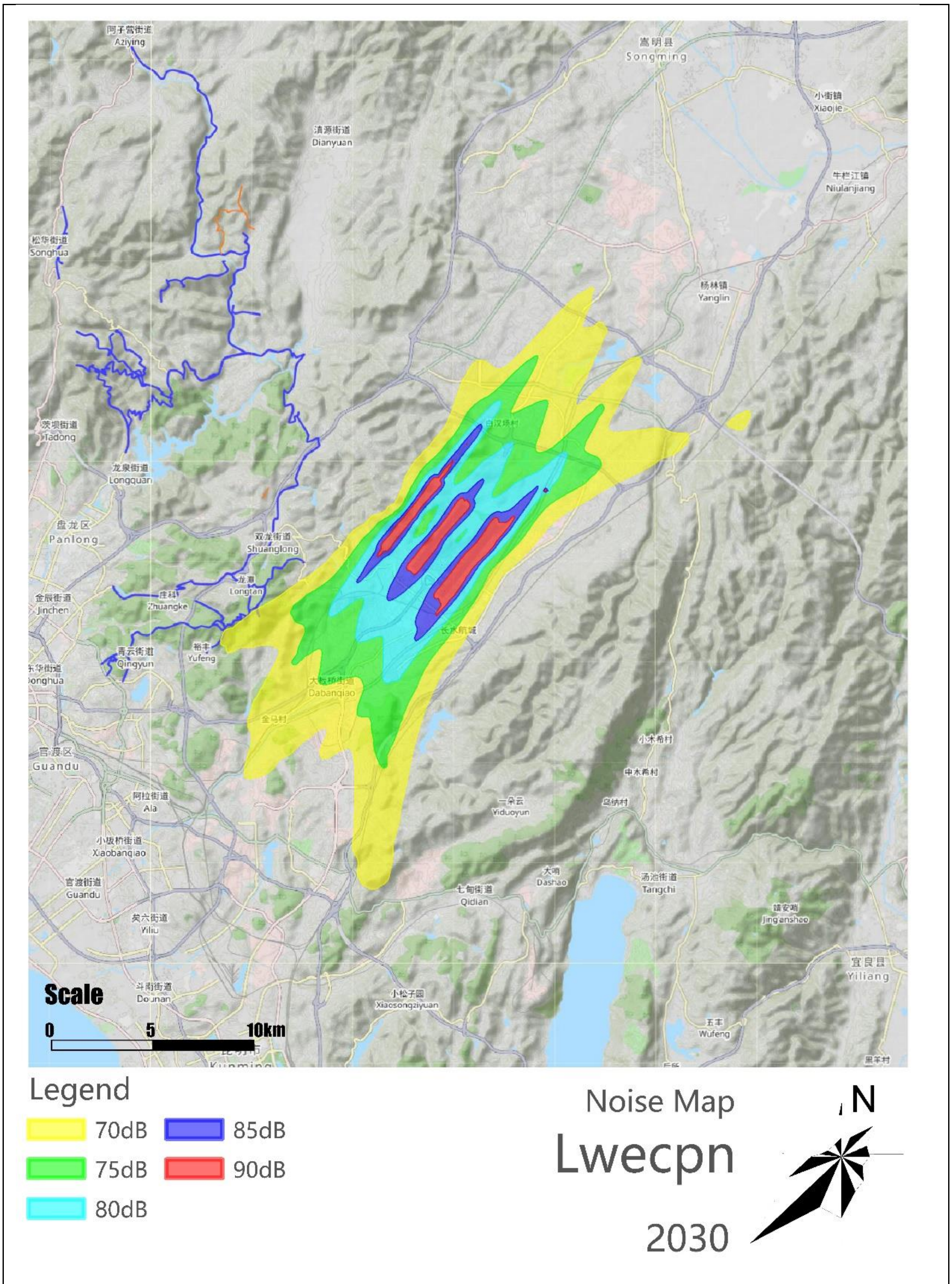


Figure 0-9 Distribution of Aircraft Noise L_{WECPN} Contour Lines of Kunming Changshui International Airport in 2030

11.6.2 Prediction Results of Aircraft Noise at Acoustic Environment Sensitive Sites

In 2030, the main villages and residential areas around Kunming Changshui International Airport that will be affected by aircraft noise L_{WECPN} are shown in the following Table .

Table 0-22 Impact of Aircraft Noise L_{WECPN} of Kunming Changshui International Airport on Surrounding Villages and Residential Areas in 2030

Unit: dB

S/N	Environmental Protection Targets	2019	2030		
		L_{WECPN}	L_{WECPN}	Noise increment	Exceedance
1	Dacunzi	76.1	81.1	5	6.1
2	Heibo Village	78.2	79.6	1.4	4.6
3	Xialiqi	70	75.2	5.2	0.2
4	Tanglipo	69.6	70.5	0.9	
5	Yijia	70.5	75.5	5	0.5
6	Erjia	70	74.9	4.9	
7	Sanjia	70.1	74.9	4.8	
8	Sijia	70.2	74.9	4.7	
9	Wujia	71.7	76	4.3	1
10	Zhuangke Village	69.6	74.3	4.7	
11	Xichongkou	68.6	72.9	4.3	
12	Shanjiao Village	70.6	71.7	1.1	
13	Liziyuan	68.1	73	4.9	
14	Wajiao Village	67.3	73.3	6	
15	Ayi Village	68.8	74.3	5.5	
16	Bakou	/	69.3	/	
17	Dadongchong	65.5	75.9	10.4	0.9
18	Xinfu Village	/	73.2	/	
19	Adi Village	75.7	79.8	4.1	4.8
20	Gaoshitou	74.3	77.9	3.6	2.9
21	Hongshapo	76.2	77.9	1.7	2.9
22	Shagou Village	75	77	2	2
23	Caojiachong	62.9	75.8	12.9	0.8
24	Xiaokanglangxiao Village	66.8	84.9	18.1	9.9
25	Xiaokanglangda Village	67.1	83.8	16.7	8.8
26	Fuxing Village	70.9	81.2	10.3	6.2
27	Xinqiao Village	75.6	84.3	8.7	9.3
28	Ganluochong	80.4	80.8	0.4	5.8
29	Yangtianchong	68.9	76.8	7.9	1.8
30	Erlongba	60	69.5	9.5	
31	Xinfa Village	/	65.3	/	
32	Yangtaoqing	/	64	/	
33	Ganhaizi	82.7	85.6	2.9	10.6
34	Chahe New Village	/	62.8	/	
35	Chahe Village	/	58.1	/	
36	Yangbachong	/	58.1	/	
37	Fanggangqing	/	55.8	/	
38	Laohuqing	/	63.5	/	
39	Wayao Village	/	64.5	/	
40	Xiaobaitu Village	66.6	72.3	5.7	
41	Dabaitu Village	65.7	71.5	5.8	
42	Haizi Village	66.6	71	4.4	
43	Old village	/	68.1	/	
44	New Village	69.6	68.2	-1.4	

45	Xiaogaopo, Dagaopo, Xiaopulian	65.7	70.3	4.6	
46	Sanwa Village	/	70	/	
47	Jinma Village	66.3	71.8	5.5	
48	Ala Village	/	70.8	/	
49	Baishuitang	/	66.8	/	
50	Xiacun	/	70.9	/	
51	Zhongshang Village	/	71	/	
52	Liangmian Temple	/	61.6	/	
53	Yufeng Village	/	69.6	/	
54	Hangzishan	/	69.2	/	
55	Dabai	/	65.9	/	
56	Sanshimu	/	61.1	/	
57	Ayi Jiayuan (under construction)	68.7	73.4	4.7	
58	Dongyuan Qicheng (under construction)	68.2	72.9	4.7	
59	Resettlement Area in Xichong Area	69.1	73.8	4.7	
60	Country Garden · Dongyuan Community	/	63.6	/	
61	Lingdong Zijun	/	62	/	
62	198 Property Management Community	/	69.6	/	
63	Yincheng Jiayuan*	71.5	70.5	-1	
64	Yunxiangyuan*	71.5	79.1	7.6	4.1
65	Xingyue Lanwan, Konggang Jiayuan*	75.7	81	5.3	6
66	Xianghuiyuan and other areas within Chance-Way Airport Town*	70.3	78.8	8.5	3.8
67	Huaqing Village	70.1	85.6	15.5	10.6
68	Yanjiazhuang	60.4	72.5	12.1	
69	Zhushaqing	/	60	/	
70	Lizichong	/	62.1	/	
71	Dapingdi	/	60.4	/	
72	Shangmazhong	58.2	67.1	8.9	
73	Machong	/	63.3	/	
74	Zhangjiapo	63.7	69	5.3	
75	Shihuiyao	/	53.1	/	
76	Changpo Village	78.8	89.8	11	14.8
77	Yunqiao Village	69.1	75.7	6.6	0.7
78	Xichong Village	72.1	83.4	11.3	8.4
79	Getenggou	73.1	80.1	7	5.1
80	Baihanchang	74.4	78.1	3.7	3.1
81	Yangguanzhuang	69.6	83.7	14.1	8.7
82	Baizhongqing	63.3	79.9	16.6	4.9
83	Xiangshui Village	59.8	70.2	10.4	
84	Xinfangzi	/	65.8	/	
85	Tu'erguan	/	62.3	/	
86	Suomei'ao	/	65.8	/	
87	Sanchahe	/	63.8	/	
88	Zhongduilong	64.8	65.5	0.7	
89	Xiaduilong	63.5	61.7	-1.8	
90	Wushan	/	64.4	/	
91	Zhangjiatun	/	70	/	
92	Hamazui	/	63.8	/	
93	Bajia Village	/	69.1	/	
94	Shajing Village	/	58.5	/	
95	Lengkou	/	52.4	/	
96	Zhangzigou	/	54.8	/	

97	Yemaochong Village	/	67.7	/	
98	Lingyuan Village	65	73.2	8.2	
99	Yunrui Community	69.4	75	5.6	0
100	Yuntianyuan	/	70.6	/	
101	Lingxiu Knowledge City, Phase I	/	60	/	
102	Evergrande Cultural Tourism City in Kunming	/	58	/	
103	China Merchants Shekou Holdings · Evian International Community	/	69.8	/	
104	Xiaoshao Community*	70.7	77.1	6.4	2.1
105	Xiaoshidong	/	70.4	/	
106	Nanchong	/	69.6	/	
107	Laoyutun Village	/	69.4	/	
108	Mahuangjing	/	69.7	/	
109	Diantou	/	70.1	/	
110	Wulongshan	/	65.7	/	
111	Dashuying Village	/	64.3	/	
112	Xiaobaozi	65.8	70	4.2	
113	Xinnong Village	63	65.7	2.7	
114	Qiliwan Community*	69.4	72.4	3	

Note: (1) The standard is based on the 75dB limit for WECPNL of Class II area in the *Standard of Aircraft Noise for Environment Around Airport* (GB9660-88);

(2) Sites with the symbol * are new buildings within the control scope of the previous EIA planning.

According to the prediction results, among the total 114 general residential areas within the aircraft noise impact assessment scope of Kunming Changshui International Airport in 2030, the number distribution of sensitive sites in different sound level ranges is shown in the following Table .

Table 0-23 Number Distribution of Sensitive Sites in Different Sound Level Ranges of Aircraft Noise WECPNL of Kunming Changshui International Airport in 2030

Unit: Nr.

Sound level interval / Year	Less than 75dB	75~78dB	78~81dB	81~84dB	More than 84dB	Total
2019	53	5	3	1	0	62
2030	84	12	8	5	5	114
Variation trend	31	7	5	4	5	52

As a result of the impact of the assessment scope and other factors, the number of Class II sensitive sites within the assessment scope in this phase is increased by 52 compared with that in 2019, and the total number is 114. With 3dB as the interval, the number of sensitive sites less than 75dB is increased by 31, the number of sensitive sites within the range of 75~78dB is increased by 7, the number of sensitive sites within the range of 78~81dB is increased by 5, the number of sensitive sites within the range of 81~84dB is increased by 4, and the number of sensitive site greater than 84dB is increased by 5 compared with those in 2019. The overall over-limit ratio is up to 26%.

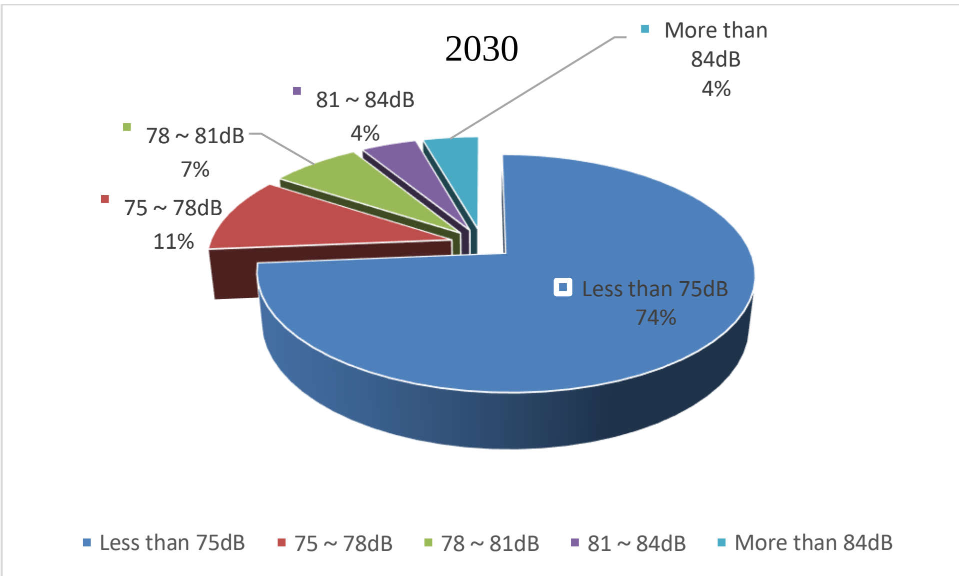


Figure 0-10 Number Distribution of Sensitive Sites in Different Sound Level Sections after the Implementation of the Project in this Phase

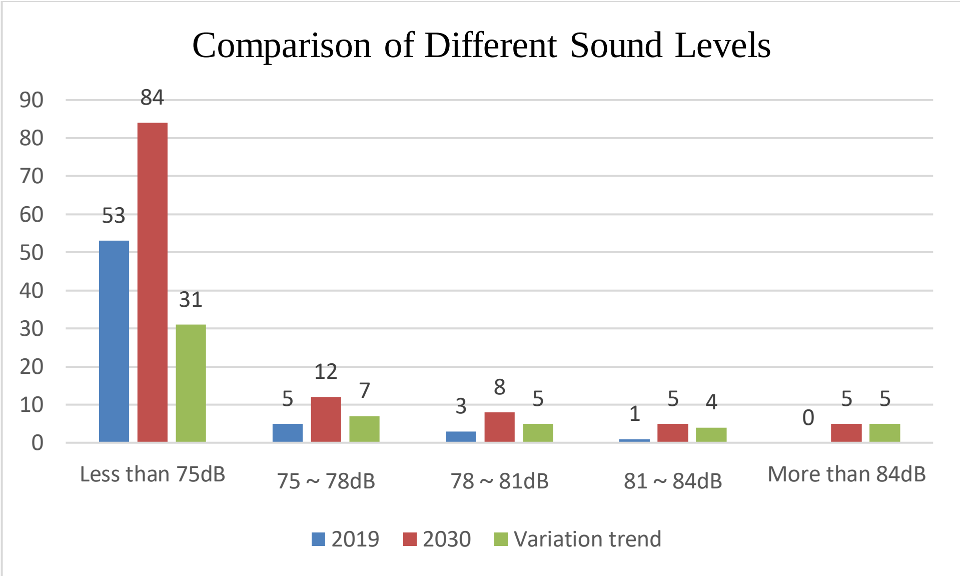


Figure 0-11 Number Distribution of Sensitive Sites in Different Sound Level Ranges Compared with Those in 2019 (Class II Sensitive Sites)

Schools, hospitals and other environmental sensitive sites around Kunming Changshui International Airport that will be affected by aircraft noise WECPNL in 2030 are shown in the following Table :

Table 0-24 Impact of Aircraft Noise WECPNL of Kunming Changshui International Airport on Surrounding Schools and Hospitals in 2030

Unit: dB

S/N	Environmental Protection Targets	2019	2030		
		LWECPN	LWECPN	Noise increment	Exceedance
1	Kunming Yunqiao Hospital*	73	74.1	1.1	4.1
2	Liyun Hospital*	69	71.2	2.2	1.2
3	Dabanqiao Subdistrict Community Health Service Center, Guandu District*	70.1	74	3.9	4.0
4	Xichong No.2 Kindergarten	68.4	72.2	3.8	2.2
5	Yijia Central Yizi Kindergarten	70	74.9	4.9	4.9
6	Beibei Feixing Kindergarten*	70.4	75.1	4.7	5.1
7	Kunming Airport Economic Zone No.1 Kindergarten	67.2	72.1	4.9	2.1
8	Dongfang Jinbaobei Kindergarten*	72.5	74.2	1.7	4.2
9	Xingyuan Kindergarten*	73.6	73.6	0	3.6
10	Hongsha Beibei Kindergarten*	75.3	74.7	-0.6	4.7
11	Wutongyu Kindergarten*	74.9	75	0.1	5.0
12	Haitian Kindergarten*	74.5	77.1	2.6	7.1
13	Yunnan Bohui Kindergarten*	77.6	78.1	0.5	8.1
14	Beibei Kindergarten*	70.7	75.4	4.7	5.4
15	Aibeier Kindergarten	66.6	71.1	4.5	1.1
16	Xiaozhaoyang Kindergarten	70.2	75.1	4.9	5.1
17	Morningstar Kindergarten	69.9	74.1	4.2	4.1

18	Xichong Kindergarten	68.6	72.5	3.9	2.5
19	Fuxing Primary School	71.5	81.5	10	11.5
20	Xinfa Primary School	59.6	65.1	/	
21	Lizhi Primary School	70.1	75	4.9	5.0
22	Xichong Primary School	68.6	72.8	4.2	2.8
23	Qinglong School	69	71.7	2.7	1.7
24	Xingjie Primary School	69.7	74.6	4.9	4.6
25	Mingzhu School	69.8	74.7	4.9	4.7
26	No.4 Primary School of Kunming Economic and Technological Development Zone	66.7	70.7	4	0.7
27	Gaopo Branch	/	69.9	/	
28	Airport Experimental School of Kunming No.3 Middle School	68.3	71.2	2.9	1.2
29	Banqiao Middle School	69.7	74.8	5.1	4.8
30	Shagou Central School	75.4	79.8	4.4	9.8
31	Yunnan Kunming No. 17 Middle School	67	71.8	4.8	1.8
32	Yunnan Xixinan Technical School*	70.1	75.3	5.2	5.3
33	Yunnan Vocational College of Judicial Police	73.6	79.9	6.3	9.9
34	Compulsory Isolation Drug Rehabilitation Center for Women in Yunnan Province*	75.9	80.7	4.8	10.7
35	The Seventh Compulsory Isolation Drug Rehabilitation Center in Yunnan Province*	79.1	82.6	3.5	12.6
36	Airport Economic Zone No.2 Kindergarten	65.1	71	5.9	1.0
37	Kunming Airport No.1 Primary School	66.7	70.8	4.1	0.8
38	Dabanqiao Xiaoshao Community Health Service Station, Guandu District	71.8	77.7	5.9	7.7
39	Kangle Kindergarten*	77.1	83.5	6.4	13.5
40	Baihanchang Central Kindergarten*	73.7	75.3	1.6	5.3
41	Xiaoshao Borui Kindergarten*	70.2	75.8	5.6	5.8
42	Changshui Chenxing Kindergarten	/	74.6	/	4.6
43	Baihanchang Central School	74.3	75.7	1.4	5.7
44	Changshui Central School	69.4	74.7	/	4.7
45	Kunming Guanghua School	75.2	76.5	1.3	6.5
46	Xiaoshao Middle School, Guandu District	72	74.8	2.8	4.8
47	Jinqiao College of Kunming University of Science and Technology	63.3	68.7	/	
48	Yunnan Vocational College of Agriculture	73.2	77.1	3.9	7.1
49	Zhongduilong Central School, Guandu District, Kunming	/	65.7	/	
50	Kunming Preschool Teachers College	/	58.5	/	

Note: (1) The standard is based on the 70dB limit for WECPNL of Class I area in the *Standard of Aircraft Noise for Environment Around Airport* (GB9660-88);

(2) Sites with the symbol * are new buildings within the control scope of the previous EIA planning.

Affected by the assessment scope and other factors, a total of 5 acoustic environment sensitive sites (receptors), including schools and hospitals, within the assessment scope of this phase are added compared with those before the expansion project of this phase, and the number distribution within different sound level ranges is listed in the Table below.

Table 0-25 Number Distribution of Sensitive Sites in Different Sound Level Ranges before and after the Expansion Project in This Phase (Schools and Hospitals)

Sound Level Range / Year	Less than 70dB	70~73dB	73~76dB	76~79dB	More than 79dB	Total
2019	19	12	11	2	1	45
2030	5	12	22	5	6	50
Variation trend	-14	0	11	3	5	5

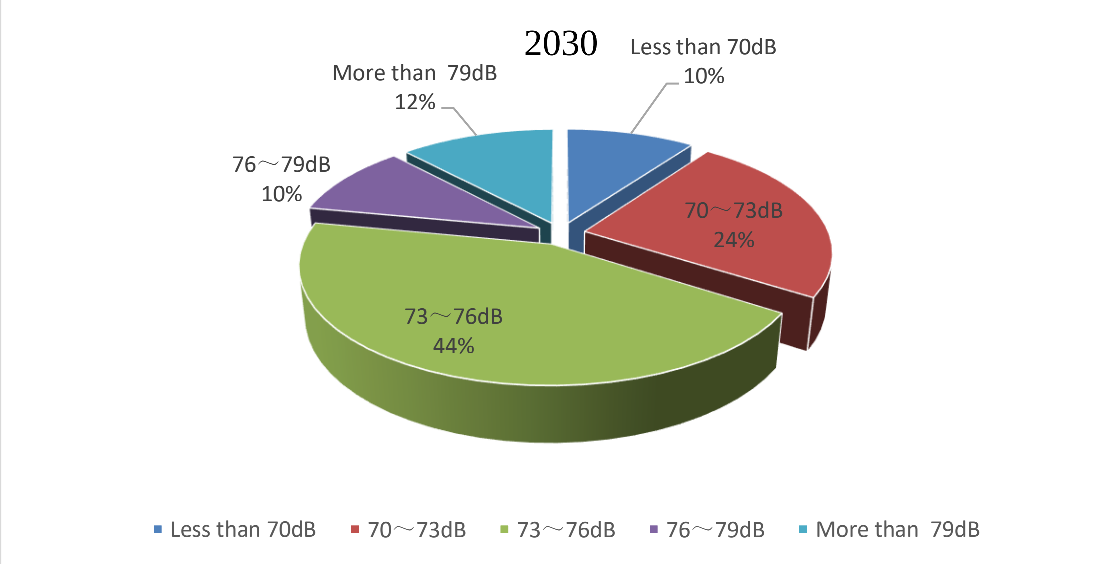


Figure 0-12 Number Distribution of Sensitive Sites in Different Sound Level Sections after the Implementation of the Project in this Phase

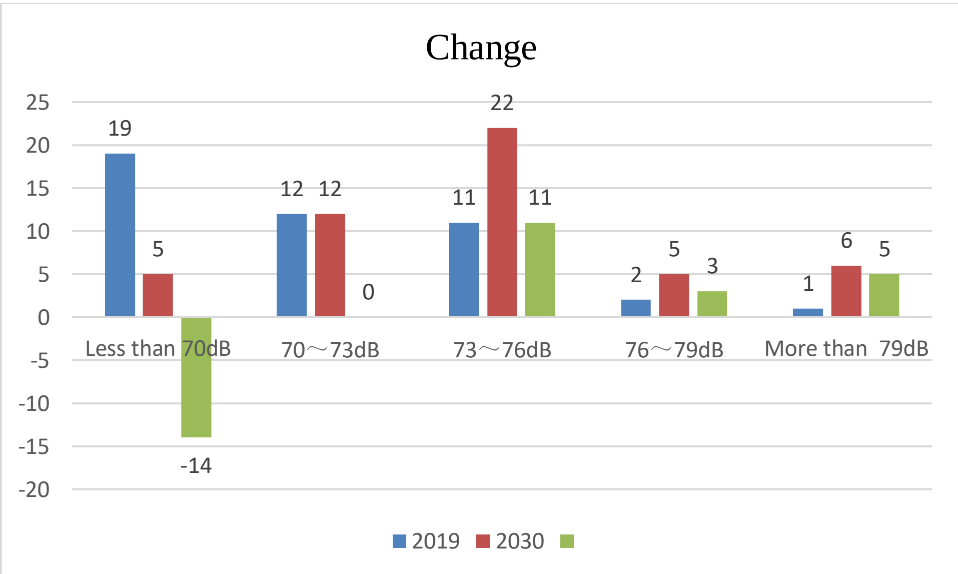


Figure 0-13 Changes in Number Distribution of Sensitive Sites in Different Sound Level Ranges before and after the Implementation of the Project in this Phase

After the implementation of Yunnan Kunming Changshui Green Airport Development Project in this phase, only 5 Class I sensitive sites (receptors) can meet the standard limit of

70dB, i.e. 14 less than that in 2019. The remaining 45 Class I sensitive sites (receptors) exceed the standard limit to different degrees, with an over-limit ratio of 90%. Among them, the number of Class I sensitive sites (receptors) within the range of 73dB~76dB is relatively large, being 22 in total. The number of Class I sensitive sites (receptors) with WECPNL values of more than 79dB is increased by 5 compared with that in 2019, making it 6.

11.6.3 Ldn prediction results

The Ldn impact assessment is mainly based on the standard limits for corresponding areas in the *Environmental Quality Standards for Aircraft Noise in the Surrounding Area of the Airport* (Second Draft for Comments).

Four classes of areas are divided in the *Environmental Quality Standards for Aircraft Noise in the Surrounding Area of the Airpor*t (Draft for Comments), and Class I and Class II areas correspond to those in the current *Standard of Aircraft Noise for Environment Around Airport* (GB9660-88). The functional comparison of different areas is shown in the Table below.

Table 0-26 Comparison between Draft for Comments and Current Standard in Aircraft Noise Standard for Areas Around Airport

Area division	Current standard		Draft for Comment	
	Standard limit (Lwecpn: dB)	Area type	Standard limit (Yldn: dBA)	Area type
Class I area	≤70	Residential, cultural and educational areas	≤57	Residential buildings, hospitals, schools
Class II area	≤75	Living quarter	≤62	Administrative office, culture and business areas
Class III area	/	/	≤67	Industrial, warehousing, entertainment areas
Class IV area	/	/	/	Agricultural, mining, transportation areas

Residential, cultural and educational areas are considered as Class I areas according to the *Standard of Aircraft Noise for Environment Around Airport* (GB9660-88), but in the actual implementation process, nonconcentrated residential areas and villages are assessed according to the standard limits for Class II areas. Considering the compatibility of this assessment standard with the recommended standards from the World Bank's EHS Guidelines and WHO's *Environmental Noise Guidelines for the European Region* (2018), in this assessment, the land for residence, education and research development, medical and health care, and other similar lands are assessed as Class I areas, i.e. YLdn≤57dBA by reference to the *Environmental Quality Standards for Aircraft Noise in the Surrounding Area of the Airport* (Draft for Comments). *Villages, general residential areas, hospitals, schools and other similar facilities are not separately distinguished.*

According to the air traffic volume prediction results of Kunming Changshui International Airport in 2030 given in the feasibility study report, the coverage of different sound levels YLdn of Kunming Changshui International Airport in 2030 is listed in the following Table .

Table 0-27 Impact Range of Aircraft Noise at Different Sound Levels YLdn of Kunming Changshui International Airport in This Phase (2030)

S/N	Ldn (dBA)	Coverage (km^2)
1.	≥57	247.896
2.	≥62	116.952
3.	≥67	59.591
4.	≥72	20.632
5.	≥77	8.527

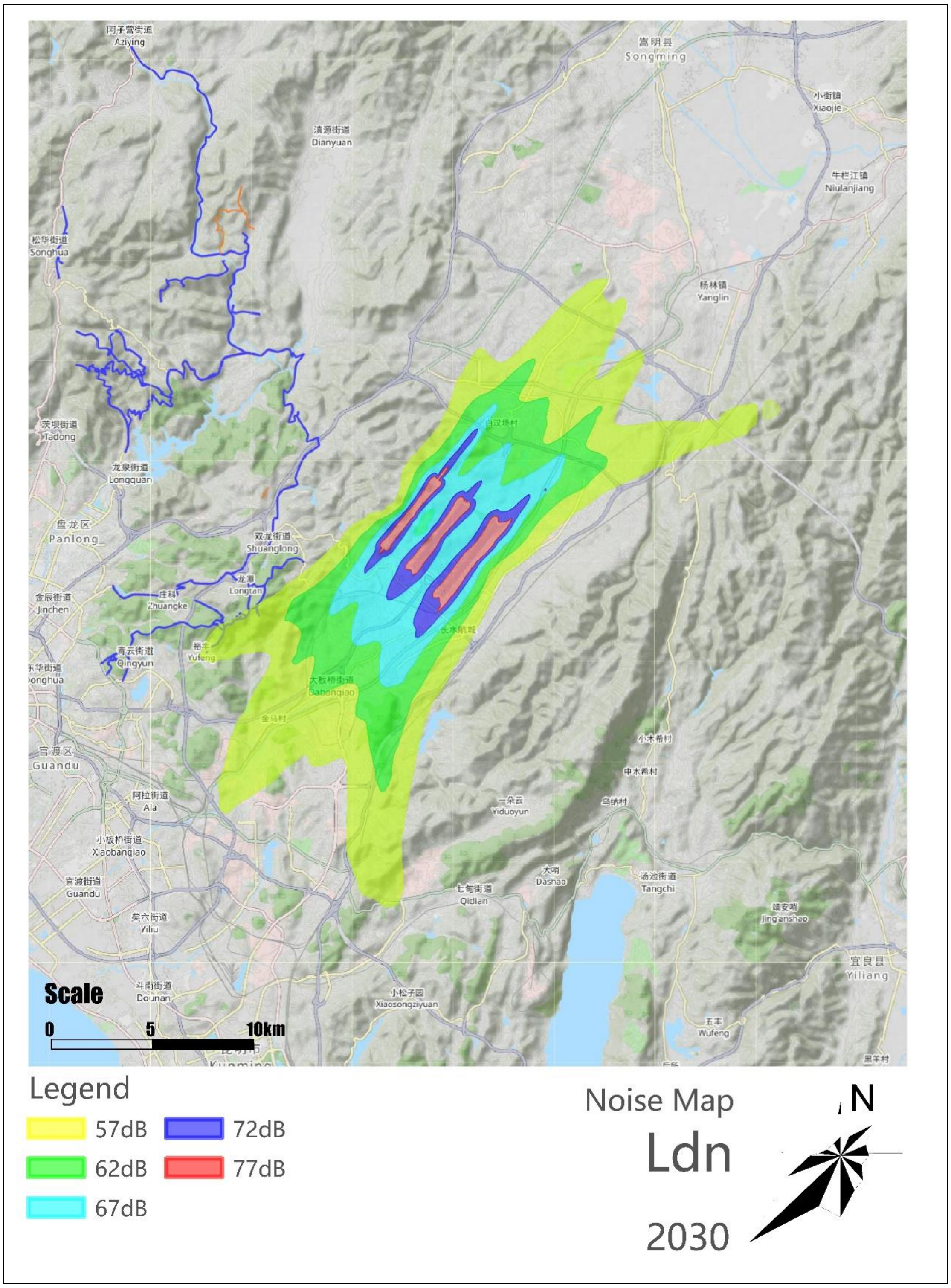


Figure 0-14 Distribution of Contour Lines of Aircraft Noise at Different Sound Levels Ldn of Kunming Changshui International Airport in 2030

The YLdn impact degrees of main sensitive sites (receptors) within the assessment scope of this phase are listed in the following Table ;

Table 0-28 Impact Degrees of Aircraft Noise YLdn of Kunming Changshui International Airport on Different Sensitive Sites in 2030

Unit: dB(A)

S/N	Type of Sensitive Site	Environmental Protection Targets	Yldn	Exceedance	Remarks
1	General residential area	Dacunzi	68.4	11.4	Exceed the standard
2		Heibo Village	66.6	9.6	Exceed the standard
3		Xialiqi	62.9	5.9	Exceed the standard
4		Tanglipo	58.5	1.5	Exceed the standard
5		Yijia	63.1	6.1	Exceed the standard
6		Erjia	62.7	5.7	Exceed the standard
7		Sanjia	62.7	5.7	Exceed the standard
8		Sijia	62.7	5.7	Exceed the standard
9		Wujia	63.9	6.9	Exceed the standard
10		Zhuangke Village	62.2	5.2	Exceed the standard
11		Xichongkou	60.9	3.9	Exceed the standard
12		Shanjiao Village	60.0	3.0	Exceed the standard
13		Liziyuan	61.0	4.0	Exceed the standard
14		Wajiao Village	61.3	4.3	Exceed the standard
15		Ayi Village	62.2	5.2	Exceed the standard
16		Bakou	57.8	0.8	Exceed the standard
17		Dadongchong	63.6	6.6	Exceed the standard
18		Xinfu Village	61.3	4.3	Exceed the standard
19		Adi Village	67.3	10.3	Exceed the standard
20		Gaoshitou	65.3	8.3	Exceed the standard
21		Hongshapo	65.2	8.2	Exceed the standard
22		Shagou Village	64.1	7.1	Exceed the standard
23		Caojiachong	63.6	6.6	Exceed the standard

24		Xiaokanglangxiao Village	71.1	14.1	Exceed the standard
25		Xiaokanglangda Village	70.6	13.6	Exceed the standard
26		Fuxing Village	68.4	11.4	Exceed the standard
27		Xinqiao Village	70.6	13.6	Exceed the standard
28		Ganluochong	68.3	11.3	Exceed the standard
29		Yangtianchong	64.5	7.5	Exceed the standard
30		Erlongba	58.0	1.0	Exceed the standard
31		Xinfa Village	54.5		
32		Yangtaoqing	52.8		
33		Ganhaizi	72.5	15.5	Exceed the standard
34		Chahe New Village	51.9		
35		Chahe Village	47.7		
36		Yangbachong	47.9		
37		Fanggangqing	45.7		
38		Laohuqing	52.5		
39		Wayao Village	53.2		
40		Xiaobaitu Village	60.4	3.4	Exceed the standard
41		Dabaitu Village	59.6	2.6	Exceed the standard
42		Haizi Village	59.2	2.2	Exceed the standard
43		Old village	56.6		
44		New Village	56.2		
45		Xiaogaopo, Dagaopo, Xiaopulian	58.6	1.6	Exceed the standard
46		Sanwa Village	58.3	1.3	Exceed the standard
47		Jinma Village	60.0	3.0	Exceed the standard
48		Ala Village	58.9	1.9	Exceed the standard
49		Baishuitang	55.2		
50		Xiacun	59.3	2.3	Exceed the standard

51		Zhongshang Village	59.4	2.4	Exceed the standard
52		Liangmian Temple	50.7		
53		Yufeng Village	57.6	0.6	Exceed the standard
54		Hangzishan	57.6	0.6	Exceed the standard
55		Dabai	54.8		
56		Sanshimu	50.1		
57		Ayi Jiayuan (under construction)	61.4	4.4	Exceed the standard
58		Dongyuan Qicheng (under construction)	60.9	3.9	Exceed the standard
59		Resettlement Area in Xichong Area	61.8	4.8	Exceed the standard
60		Country Garden · Dongyuan Community	52.2		
61		Lingdong Zijun	50.9		
62		198 Property Management Community	57.9	0.9	Exceed the standard
63		Yincheng Jiayuan*	58.4	1.4	Exceed the standard
64		Yunxiangyuan*	67.1	10.1	Exceed the standard
65		Xingyue Lanwan, Konggang Jiayuan*	68.7	11.7	Exceed the standard
66		Xianghuiyuan and other areas within Chance-Way Airport Town*	66.8	9.8	Exceed the standard
67		Huaqing Village	72.5	15.5	Exceed the standard
68		Yanjiazhuang	60.6	3.6	Exceed the standard
69		Zhushaqing	48.7		
70		Lizichong	50.4		
71		Dapingdi	49.1		
72		Shangmazhong	55.4		
73		Machong	51.5		
74		Zhangjiapo	56.9		
75		Shihuiyao	42.4		
76		Changpo Village	75.4	18.4	Exceed the standard
77		Yunqiao Village	63.1	6.1	Exceed the standard

78		Xichong Village	69.9	12.9	Exceed the standard
79		Getenggou	67.4	10.4	Exceed the standard
80		Baihanchang	65.1	8.1	Exceed the standard
81		Yangguanzhuang	70.0	13.0	Exceed the standard
82		Baizhongqing	66.8	9.8	Exceed the standard
83		Xiangshui Village	58.4	1.4	Exceed the standard
84		Xinfangzi	53.8		
85		Tu'erguan	50.9		
86		Suomei'ao	54.3		
87		Sanchahe	53.0		
88		Zhongduilong	54.1		
89		Xiaduilong	50.7		
90		Wushan	52.8		
91		Zhangjiatun	58.0	1.0	Exceed the standard
92		Hamazui	52.5		
93		Bajia Village	57.0		
94		Shajing Village	47.9		
95		Lengkou	42.0		
96		Zhangzigou	43.9		
97		Yemaochong Village	56.7		
98		Lingyuan Village	61.2	4.2	Exceed the standard
99		Yunrui Community	63.1	6.1	Exceed the standard
100		Yuntianyuan	58.6	1.6	Exceed the standard
101		Lingxiu Knowledge City, Phase I	49.2		
102		Evergrande Cultural Tourism City in Kunming	47.1		
1		China Merchants Shekou Holdings · Evian	57	0.5	Exceed the

03		International Community	.5		standard
104		Xiaoshao Community*	64.8	7.8	Exceed the standard
105		Xiaoshidong	58.5	1.5	Exceed the standard
106		Nanchong	57.7	0.7	Exceed the standard
107		Laoyutun Village	57.5	0.5	Exceed the standard
108		Mahuangjing	57.8	0.8	Exceed the standard
109		Diantou	58.2	1.2	Exceed the standard
110		Wulongshan	54.3		
111		Dashuying Village	53.0		
112		Xiaobaozi	57.7	0.7	Exceed the standard
113		Xinnong Village	54.2		
114		Qiliwan Community*	59.5	2.5	Exceed the standard
115	Schools, hospitals, etc.	Kunming Yunqiao Hospital*	62.1	5.1	Exceed the standard
116		Liyun Hospital*	59.5	2.5	Exceed the standard
117		Dabanqiao Subdistrict Community Health Service Center, Guandu District*	62.0	5.0	Exceed the standard
118		Xichong No.2 Kindergarten	60.4	3.4	Exceed the standard
119		Yijia Central Yizi Kindergarten	62.7	5.7	Exceed the standard
120		Beibei Feixing Kindergarten*	62.9	5.9	Exceed the standard
1		Kunming Airport Economic Zone No.1	60	3.5	Exceed the

21		Kindergarten	.5		standard
122		Dongfang Jinbaobei Kindergarten*	62.2	5.2	Exceed the standard
123		Xingyuan Kindergarten*	61.6	4.6	Exceed the standard
124		Hongsha Beibei Kindergarten*	62.8	5.8	Exceed the standard
125		Wutongyu Kindergarten*	63.2	6.2	Exceed the standard
126		Haitian Kindergarten*	65.2	8.2	Exceed the standard
127		Yunnan Bohui Kindergarten*	66.2	9.2	Exceed the standard
128		Beibei Kindergarten*	63.0	6.0	Exceed the standard
129		Aibeier Kindergarten	59.4	2.4	Exceed the standard
130		Xiaozhaoyang Kindergarten	62.8	5.8	Exceed the standard
131		Morningstar Kindergarten	62.0	5.0	Exceed the standard
132		Xichong Kindergarten	60.6	3.6	Exceed the standard
133		Fuxing Primary School	68.6	11.6	Exceed the standard
134		Xinfa Primary School	54.2		
135		Lizhi Primary School	62.7	5.7	Exceed the standard
136		Xichong Primary School	60.9	3.9	Exceed the standard
137		Qinglong School	59.9	2.9	Exceed the standard
138		Xingjie Primary School	62.4	5.4	Exceed the standard
1		Mingzhu School	62	5.5	Exceed the

39			.5		standard
140		No.4 Primary School of Kunming Economic and Technological Development Zone	58.9	1.9	Exceed the standard
141		Gaopo Branch	58.2	1.2	Exceed the standard
142		Airport Experimental School of Kunming No.3 Middle School	59.5	2.5	Exceed the standard
143		Banqiao Middle School	62.5	5.5	Exceed the standard
144		Shagou Central School	67.3	10.3	Exceed the standard
145		Yunnan Kunming No. 17 Middle School	60.2	3.2	Exceed the standard
146		Yunnan Xixinan Technical School*	62.9	5.9	Exceed the standard
147		Yunnan Vocational College of Judicial Police	67.4	10.4	Exceed the standard
148		Compulsory Isolation Drug Rehabilitation Center for Women in Yunnan Province*	68.7	11.7	Exceed the standard
149		The Seventh Compulsory Isolation Drug Rehabilitation Center in Yunnan Province*	70.1	13.1	Exceed the standard
150		Airport Economic Zone No.2 Kindergarten	58.9	1.9	Exceed the standard
151		Kunming Airport No.1 Primary School	59.3	2.3	Exceed the standard
152		Dabanqiao Xiaoshao Community Health Service Station, Guandu District	64.5	7.5	Exceed the standard
153		Kangle Kindergarten*	70.1	13.1	Exceed the standard
154		Baihanchang Central Kindergarten*	63.2	6.2	Exceed the standard
155		Xiaoshao Borui Kindergarten*	63.4	6.4	Exceed the standard
156		Changshui Chenxing Kindergarten	62.5	5.5	Exceed the standard
1		Baihanchang Central School	63	6.4	Exceed the

157			.4		standard
158		Changshui Central School	62.6	5.6	Exceed the standard
159		Kunming Guanghua School	63.4	6.4	Exceed the standard
160		Xiaoshao Middle School, Guandu District	62.6	5.6	Exceed the standard
161		Jinqiao College of Kunming University of Science and Technology	57.4	0.4	Exceed the standard
162		Yunnan Vocational College of Agriculture	64.5	7.5	Exceed the standard
163		Zhongduilong Central School, Guandu District, Kunming	53.9		
164		Kunming Preschool Teachers College	47.8		

Note: (1) The standard is based on the 57dBA limit for Class I area in the *Environmental Quality Standards for Aircraft Noise in the Surrounding Area of the Airport* (Draft for Comments);

(2) Sites with the symbol * are new buildings within the control scope of the previous EIA planning.

With 3dB as the interval, the number distribution of different types of sensitive sites (receptors) in different sound level ranges is shown in the following Table ;

Table 0-29 Number Distribution of Different Types of Sensitive Sites in Different Sound Level Ranges

Sound Level Range / Type of Sensitive Site	Less than 57dBA	57-60dBA	60-63dBA	63-66dBA	More than 66dBA	Total
Villages, general residential areas	41	27	16	12	18	114
Schools and hospitals	3	9	23	8	7	50
Total	44	36	39	20	25	164

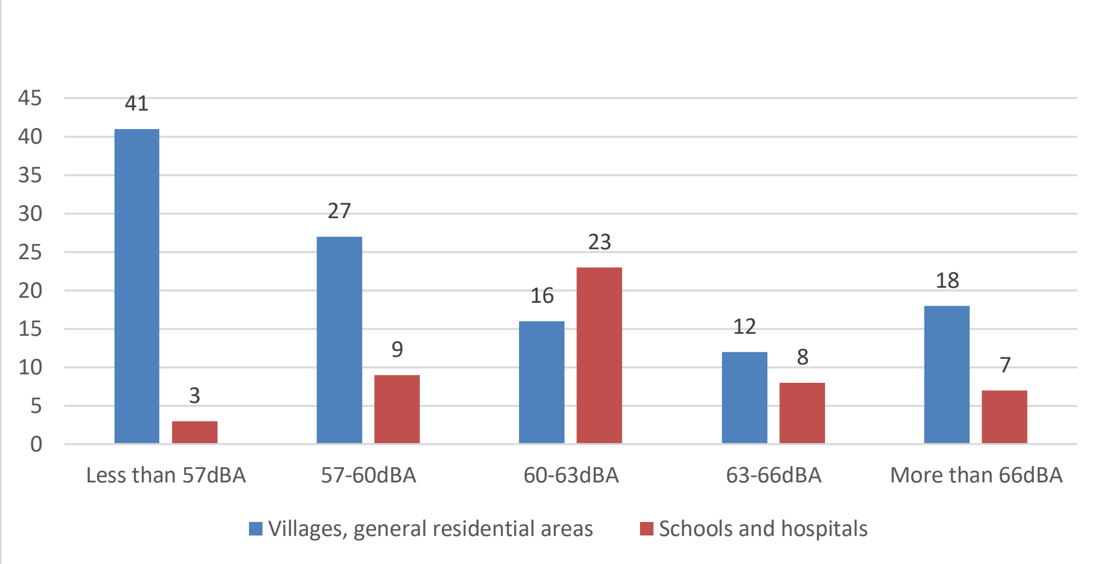


Figure 0-15 Number Distribution of Different Types of Sensitive Sites in Different Sound Level Ranges

Villages, general residential areas, hospitals, schools and other similar facilities are uniformly considered as Class I areas. The number distribution of sensitive sites in different sound level sections YLdn of Kunming Changshui International Airport in 2030 is shown in the following Figure .

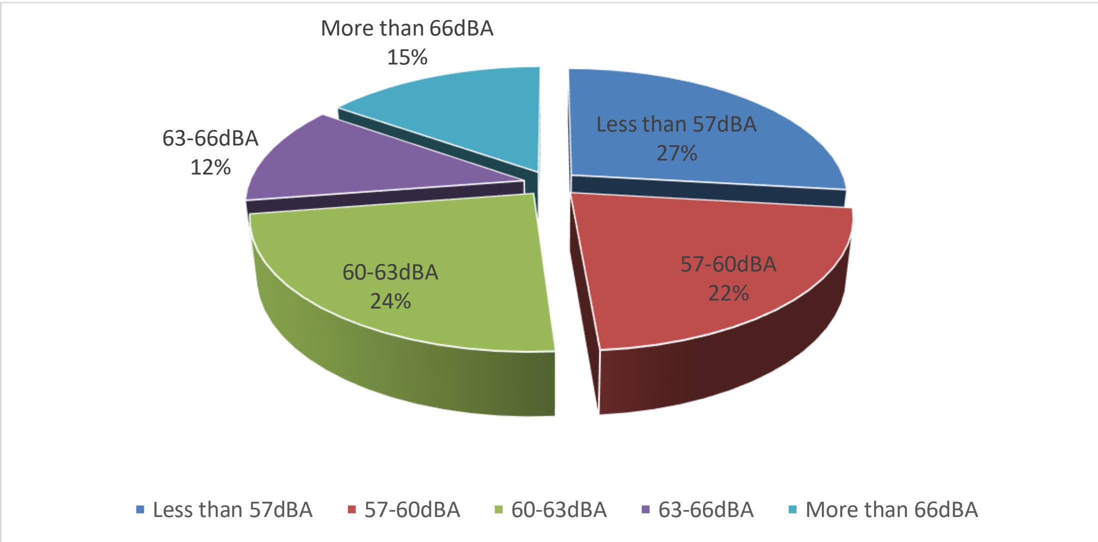


Figure 0-16 Distribution of Class I Sensitive Sites to Different Sound Levels YLdn

It can be seen from the above that with YLdn as the assessment index and 57dBA as the standard limit, YLdn≤57dBA is only found at 44 sensitive points, including 3 schools and hospitals and 41 general residential areas, accounting for 27% of the total number of all sensitive points (receptors) in the assessment area. Among all 162 environmental sensitive points (receptors) within the assessment scope in the current period, 20 sensitive points are located in the range of 63-66dBA, accounting for 12% of the total, including 8 schools and hospitals and 12 general residential areas. 15% of sensitive points (receptors) are located in areas above 66dBA, totaling 25, including 18 residential areas and 7 schools and hospitals.

To sum up, when Yldn is taken as the assessment index, all sensitive points are treated as Class I areas, and YLdn is less than 60dB. The number of general residential areas is relatively large, totaling 68. If YLdn is between 57dB and 63dB, there are relatively large numbers of schools/hospitals, totaling 32.

11.7 Comparison of Noise Impact under Different Standards

The comparison of Ldn 57dBA and Lwecpn 70dB contour distribution ranges is shown in the following Figure :

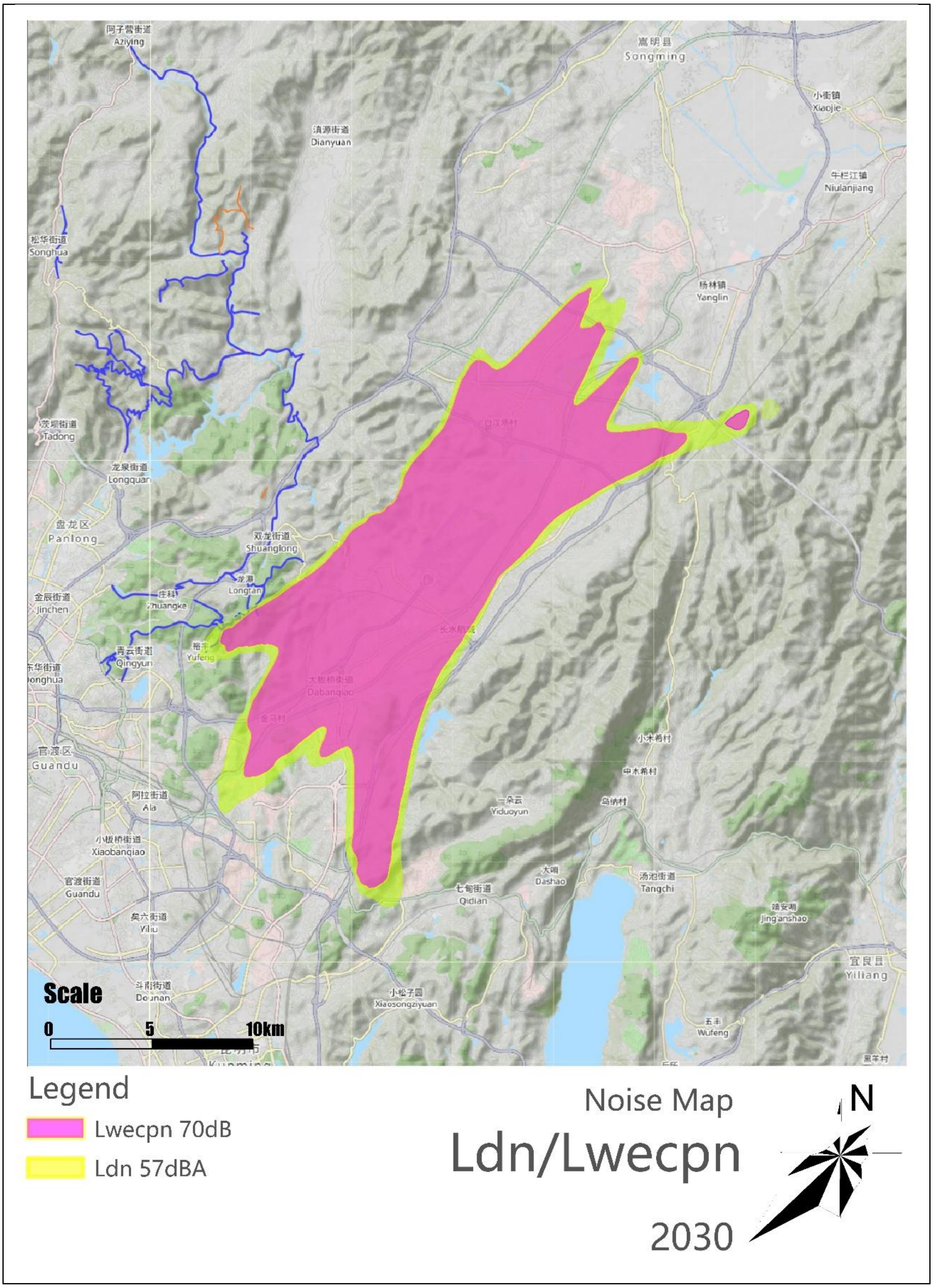


Figure 11-17 Comparison of Distribution of Impact Ranges of Ldn and Lwecpn of Kunming Changshui International Airport in 2030017

Although there is a certain conversion relationship between Ldn and WECPNL, the impact range of YLdn57dB (A) is still slightly greater than that of WECPNL70dB according to the calculation results.

(1) Comparison of results of general residential areas

The comparison of the quantity distribution of general residential areas with different sound levels between WECPNL and Yldn is listed in the following Table ;

Table 11-30 Distribution of Number of Residential Areas with Different Indicators and Different Sound Levels030

Assessment Indicator	Sound level interval				
WECPNL	Less than 75dB	75~78dB	78~81dB	81~84dB	More than 84dB
Quantity (Nr.)	84	12	8	5	5
YLdn	Less than 57dBA	57-60dBA	60-63dBA	63-66dBA	More than 66dBA
Quantity (Nr.)	41	27	16	12	18

If the standard limits corresponding to WECPNL and YLdn are taken as reference and the interval of 3dB is taken as the interval, the comparison of the number distribution of sensitive points in different out-of-limit intervals of the two indicators under different systems is shown in the following Figure .

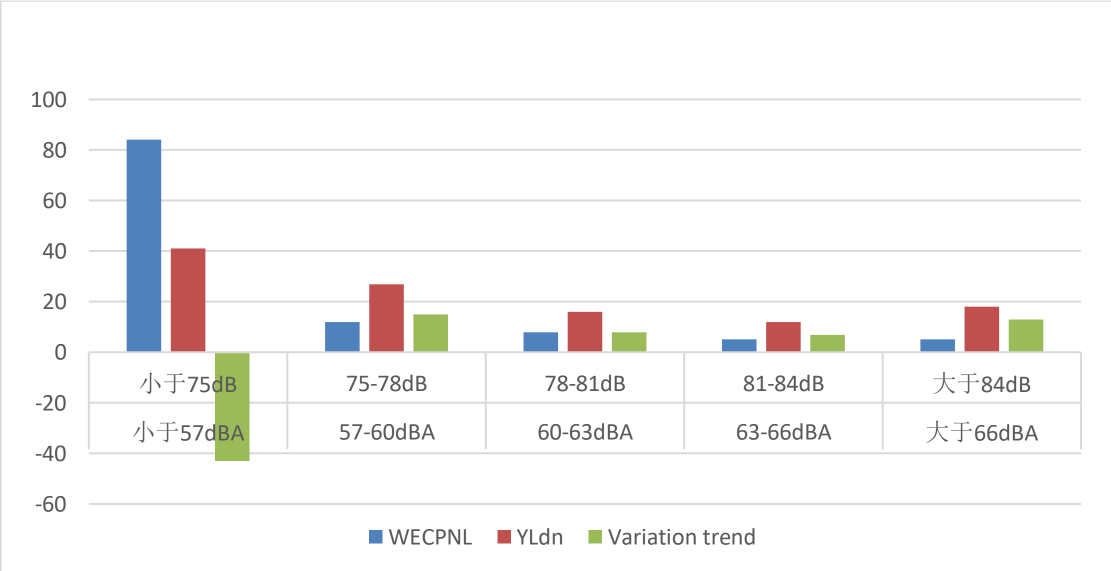


Figure 11-18 Comparison of Distribution Intervals of Residential Areas in Different Out-of-Limit Intervals under Different Standard Systems018

Since WECPNL selects the standard limit of Class II area set forth in *Environmental Standard for Noise Emitted by Aircraft around Airport* (GB9660-88), while YLdn selects the standard limit of Class I area, the number of sensitive points (receptors) in different sound level intervals under the two indicators is quite different.

(2) Comparison of Results of Schools and Hospitals (Class I Areas)

The comparison of the number distribution of schools and hospitals with different sound levels under WECPNL and Yldn is listed in the following Table ;

Table 11-31 Number Distribution of Schools and Hospitals with Different Sound Levels under Different Indicators031

Assessment Indicator	Sound level interval				
WECPNL	Less than 70dB	70~73dB	73~76dB	76~79dB	More than 79dB
Quantity (Nr.)	5	12	22	5	6
YLdn	Less than 57dBA	57-60dBA	60-63dBA	63-66dBA	More than 66dBA
Quantity (Nr.)	3	9	23	8	7
Variation trend	-2	-3	1	3	1

If the standard limits corresponding to WECPNL and YLdn are taken as reference and the interval of 3dB is taken as the interval, the comparison of the number distribution of sensitive points in different out-of-limit intervals of the two indicators under different systems is shown in the following Figure .

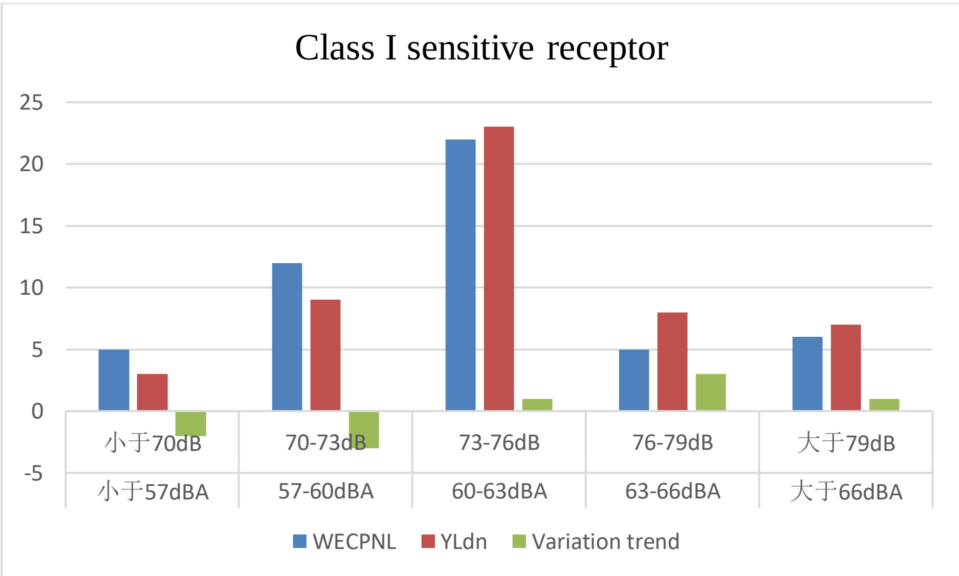


Figure 11-19 Number Distribution of Schools and Hospitals in Different Out-of-Limit Intervals under Different Indicators019

It can be seen from the above Table that WECPNL and YLdn both select their corresponding Class I area standard limits, with no sharp different found therebetween, indicating that the currently applicable Environmental Standard for Aircraft Noise around Airports (GB9660-88) in China is basically close to the assessment standard used for the Environmental Quality Standards for Aircraft Noise around Airports (Second Draft for Comments). It is also almost equivalent to the aircraft noise standards of EU and Japan. *The main difference lies in the more detailed provisions for different functional areas that are specified in the Environmental Quality Standards for Aircraft Noise around Airports (Draft for Comments), which further specifies that the same consideration shall be given to lands for* *residential, educational and medical purposes.*

11.8 Prevention and control measures for noise pollution during the operation period

11.8.1 ICAO Balanced Approach for Aviation Noise Management

Aircraft noise constitutes the most important cause of adverse community responses associated with airport operations and expansion. This is expected to continue in most regions of the world for the foreseeable future. Therefore, limiting or reducing the number of people affected by significant aircraft noise is taken as one of ICAO's main priorities.

The ICAO's main overall policy on aircraft noise is the Balanced Approach to Aviation Noise Management, which was adopted by the 33rd session of the ICAO General Assembly (2001) and reaffirmed at all subsequent General Sessions (Reference: Appendix C of ICAO Resolution A39-1).

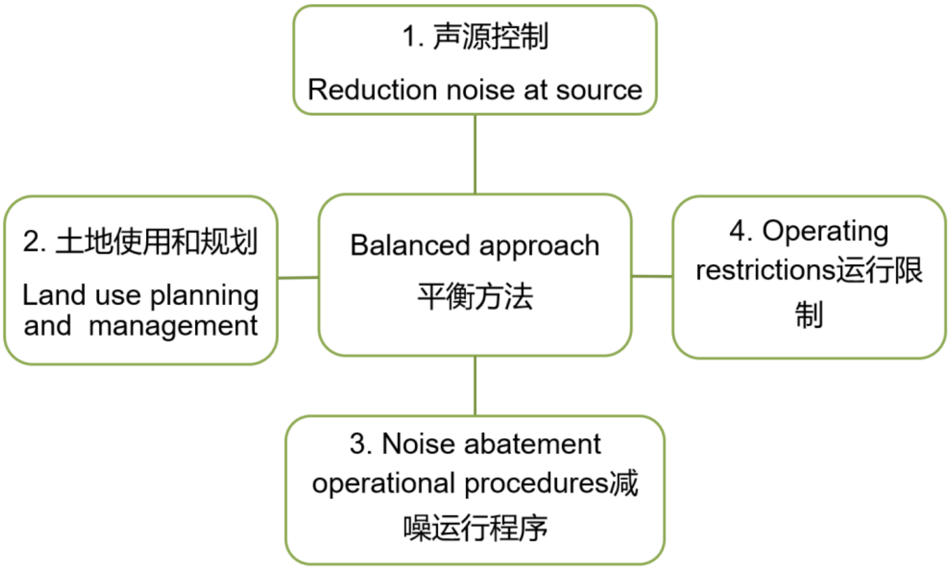


Figure 11-20 Four Basic Components of the Balanced Approach for Aviation Noise Management020

The "balanced approach" involves identifying noise problems at specific airports and analyzing possible measures by studying various noise abatement measures, which can be divided into four main elements, as shown in the Figure above. The objective is to provide solutions for noise issues according to the characteristics of each airport and to identify noise-related measures with objective and measurable rules so as to maximize the environmental and cost-effectiveness.

Balanced Approach for Aviation Noise Management published by ICAO serves as the main reference for formulating the prevention and control measures of noise pollution for the Project in current period:

11.8.2 Summary of Current Aircraft Noise Prevention and Control Measures for Airports

According to the previous EIA and the approval opinions of relevant environmental protection authorities, the currently applicable aircraft noise prevention and control measures at the airport mainly include the following aspects:

11.8.2.1 Land use planning around the airport

Kunming International Airport has coordinated with Kunming Municipal Planning Administration to control the land use and planning around the airport. The planning and construction of special residential areas such as concentrated residential areas, schools, hospitals and nursing homes shall be restricted within the range of airport noise contour LWECPN>70dB. Within the range of 80dB>LWECPN>75dB, the distance from the village residential areas to the airport shall be strictly controlled, since this area will affect the daily life of village residential areas. Any building sensitive to acoustic environment is not allowed to be built in the area above LWECPN>80dB, where buildings with low requirements for acoustic environment quality such as logistics and warehousing can be built instead.

11.8.2.2 Planning, adjustment and control

The airport and its surrounding areas are included in the scope of relevant planning With the implementation of the planning, a certain scale of industrial production, commercial development and other construction activities will be carried out in the surrounding areas of the airport. The acoustic environment sensitive targets related to the airport are located in the above areas. At that time, most of the environmental sensitive targets will be subject to land acquisition, relocation or demolition. The impact range of airport noise on sensitive points will be reduced so that the level of such impact will be mitigated to certain degree.

11.8.2.3 Sound insulation measures and relocation plan

(1) Sound insulation measures:

Shagou Central School has taken measures such as the sound insulation window, while other residential sensitive points and schools have not taken engineering measures for noise reduction. As revealed by the acceptance monitoring data, the current environmental noise of Yunnan Vocational and Technical College of Agriculture has dropped below LWECPN by 70dB, indicating that noise reduction measures are not necessary in this case.

(2) Relocation:

Xiaoshao Primary School has been canceled, while Qinglong Wenwu School and Provincial Women Re-education Institute have been relocated, indicating that noise reduction measures are not necessary in this case.

Three households in Wuxi Village and Xiagang Village have been relocated to Yunrui Community. The position of Ganhaizi Village remains unchanged (116 households). After the Phase II Project of Kunming Comprehensive Bonded Zone is started, the Ganhaizi Village will be relocated according to the Land Acquisition and Demolition Work Plan of Ganhaizi

Village (Land Acquisition and Demolition Work Plan of Kunming Comprehensive Bonded Zone Phase II Project).

(3) Miscellaneous:

If the LWECPN of Yunnan Vocational and Technical College of Agriculture is lower than 70dB, it is not necessary to provide any sound insulation measures. Xiaoshao Primary School has been canceled, while Qinglong Wenwu School and Provincial Women's Reeducation Institute have been relocated, indicating that no sound insulation measures are required in this case. Sound insulation windows have been installed in areas with LWECPN of 70-75dB in Shagou Central School and Changshuihangcheng Community, while other sensitive targets have not taken any sound insulation measures.

The implementation of sound insulation measures for Kunming Changshui International Airport is shown in the following Figure ;

Example of hollow double-layer casement sound insulation window

Kunming Airport Economic Zone No.1 Kindergarten (with sound insulation windows installed)

Kunming Airport Economic Zone No.2 Kindergarten (with sound insulation windows installed)

Kunming No. 17 Middle School (with sound insulation windows installed)

Kunming Airport No.1 Primary School (with sound insulation windows installed)

Shagou Primary School (with sound insulation windows installed)

Figure 11-21 List of Implementation of Sound Insulation Measures for Some Sound Insulation Windows021

(4) Monitoring of sound insulation effect of sound insulation window

On May 29, 2022, Yunnan Kunfa Environmental Tech Co., Ltd. was entrusted to monitor the sound insulation effect in the classrooms of Shagou Central School.

Type of sound insulation window: double-layer single-glass sliding sound insulation window.

Monitoring method: positioned at 1m from the window outside the classroom; 1m from the window and wall and 1.2m from the ground in the classroom,

conduct monitoring and close the window during the period so as not to be affected by TV, air conditioner, fan, clock, watch, etc.

Monitoring time: measure twice, 30min each time.

Monitoring factors: aircraft transit time Leq (A) and monitoring period Leq (A).

Monitoring results:

Table 11-32 Monitoring Results of Sound Insulation Effect of Sound Insulation Window of Shagou Primary School032

Test point	Time of test (HH:MM)	Leq(A)	Executive standard	Up-to-standard analysis
Inside the classroom	14:02	40.6	General Code for Building Environment (GB55016-2021) Located in Class 2 acoustic environment functional area, the noise source outside the building spreads to the classroom, with the noise limit of ≤45dB(A).	Yes
	15:11	39.4		Yes

Shagou Central School is located in a Class 2 acoustic environment functional area. As revealed by the monitoring results, both the indoor noise generated by a single aircraft flying by and the indoor environmental noise within a certain period of time meet the standard limit requirements (45dB(A)) for the spread of external noise sources of buildings to classrooms as provided in the General Environmental Code for Buildings (GB55016-2021), indicating that the sound insulation effect of the sound insulation window can meet the sound insulation requirements.

11.8.2.4 Other operation optimization measures

The airport has optimized the take-off and landing flights in different time sections by considering the EIA opinions of the previous period.

The landing flights account for more than 70% from 07:00 to 19:00 in the daytime, more than 59% from 07:00 to 19:00, while the remained from 22:00 to 7:00 and 19:00 to 22:00 in the nighttime.

The model of arrival aircraft is optimized, mainly Type C aircraft.

Optimize the airport flight procedures, move the runway port inward, and improve the climb rate at the departure stage. Turn ahead of time to avoid densely populated areas on the premise of ensuring aviation safety.

11.8.2.5 Implementation Plan of Noise Prevention and Control Measures

Seven villages such as Heibo Village are not provided with sound insulation measures, while the airport and its surrounding areas are included in the relevant scope of planning. As the implementation of the planning proceeds, most of the environmentally sensitive targets related to the airport will be challenged with land acquisition, relocation or demolition. At the same time, and considering the airport expansion project in this phase, some sensitive points involved in the airport that need to take sound insulation measures will be demolished, indicating that no sound insulation measures will be taken in this case.

In addition, according to the Noise Reduction Plan for 7 Villages such as Heibo Village in the Airport Noise Contour Area of 75-80 dB formulated by the Management Committee of Kunming Airport Economic Zone of Yunnan Province on June 11, 2019, the noise reduction plan proposes the demolition work plan for Heibo Village and Ganluochong Village, which will be relocated and combined "step by step"; two schools (Changshui Kindergarten and Wuxi Primary School) will be relocated together as the villages are relocated and combined; while the remained five schools (private Kunming Guanghua School, Lizhi Primary School, Xiaozhaoyang Kindergarten, Banqiao Middle School and Xingjie Primary School) will be relocated as the implementation of the planning proceeds.

Short-term work plan: In combination with the construction of Kunming International Aviation Hub Project and the reconstruction and expansion of Changshui Airport, the relocation of two villages such as Wusazhuang Village and Changpo Village will be completed before 2025.

Medium- and long-term work plan: In combination with the implementation of the regulations and the provincial unified loan project (Phase IX) for the reconstruction of urban shantytowns in Yunnan Province from 2013 to 2017, the relocation of 5 villages including Heibo Village, Ganluochong Village, Shagou Village and Shapo Village of Adi Village will be completed by 2030 according to the development sequence of key areas such as shantytown reconstruction, Airport Business District and Kunming Comprehensive Bonded Zone Development Zone in Dabanqiaoji Town Area of Airport Economic Zone.

11.8.3 Implementation Rules of Aircraft Noise Prevention and Control Measures for the Project

With reference to the "balance approach" proposed by ICAO: 1) sound source control (using quieter aircraft); 2) reasonable planning and management of land around the airport; 3) use of aircraft noise reduction operation procedures; 4) restriction of aircraft operation at the airport, the aircraft noise control measures of the Project are formulated according to the following principles:

(1) Formulate the land use planning around the airport according to the aircraft noise prediction results, and implement the construction and development around the airport in strict accordance with the planning;

(2) Control the aircraft noise emission from the source, including selecting more optimized take-off and landing procedures, controlling the take-off and landing operations of high-noise aircraft, adjusting the take-off and landing ratios of different runways on the premise of ensuring the sTable operation of the airport, and reducing the utilization rate of runways close to sensitive points;

(3) Treatment of Exceeding Standard

a. If the sensitive targets of residential buildings exceed LWECPN by more than 85 dB, relocation measures shall be taken, and sound insulation measures shall be taken for 75 dB–85 dB;

b. If the LWECPN of sensitive cultural, education, and health targets exceeds 80 dB, relocation measures shall be taken, and sound insulation measures shall be taken for 70 dB–80 dB.

Refer to Code for Design of Sound Insulation of Civil Buildings (GB 50118-2010) for sound insulation of existing buildings. Refer to the General Code for Building Environment (GB 55016-2021) for sound insulation of new buildings.

(4) Follow-up monitoring

For sensitive receivers that have not exceeded the standard at this stage but are relatively greatly affected by aircraft noise at the airport, regular aircraft noise monitoring or overall assessment shall be carried out to understand the impact of aircraft noise at the actual airport.

(5) Noise assessment

If the airport flight procedures and flight volume are greatly adjusted, or the follow-up monitoring results generally exceed the standard, the noise assessment shall be carried out again to determine the actual impact scope and degree of airport aircraft noise, and necessary prevention and control measures shall be taken in time.

11.8.4 Reference standards for noise prevention and control measures

Refer to Code for Design of Sound Insulation of Civil Buildings (GB 50118-2010) for sound insulation of existing buildings;

Refer to the General Code for Building Environment (GB 55016-2021) for sound insulation of new buildings;

After the implementation of sound insulation measures: the indoor noise of residential, office and cultural, and educational buildings within the assessment scope of the airport in this phase meets the limit requirements of Ld (07:00–22:00) 55 dBA in the daytime and Ln 45 dBA at night in the EHS guidelines of the World Bank;

After implementation of sound insulation measures: The indoor noise of residential, office and cultural, and educational buildings within the assessment scope of the airport in this phase can also meet the limits of Lden≤45 dB and Lnight≤40 dBA in the Guidelines for the Prevention of Environmental Noise for the European Region (2018) issued by WHO.

11.8.5 Prevention and control measures for noise pollution during the operation period

On November 21, 2022, the Environmental Impact Assessment Report of this expansion project was officially approved by the Ecology and Environment Bureau of Kunming Dianzhong New Area, indicating that all noise prevention and control measures in the Environmental Impact Report of Kunming Changshui International Airport Reconstruction and Expansion Project have been approved by the relevant environmental protection authorities and meet the Environmental Impact Assessment Law of the People's Republic of China and other relevant environmental protection laws and regulations.

There are 164 sensitive points within the noise assessment scope in this phase, including 114 villages and residential communities (97 villages and 17 residential communities), 44 schools (20 kindergartens and 24 schools), 4 hospitals and 2 drug rehabilitation centers. Among them, 6 residential communities and 18 school and hospitals are within the control scope of the previous EIA planning and will be constructed after the approval of the previous EIA.

According to Article 52 of the Law of the People's Republic of China on Prevention and Control of Noise Pollution: If it is really necessary to build noise-sensitive buildings in restricted construction areas, the Employer shall carry out building sound insulation design for noise-sensitive buildings to meet the requirements of relevant standards for sound insulation design of civil buildings. The Employer shall bear the cost of sound insulation for the above 6 villages and settlements (Class II sensitive receptors) and 18 schools and hospitals (Class I sensitive receptors).

Excluding the new sensitive buildings approved in the previous EIA, after the implementation of the expansion project in this phase, the aircraft noise LWECPN of 26 villages and settlements (Class II sensitive receivers) and 27 schools and hospitals (Class I sensitive receivers) in this phase exceeds the corresponding standard limits.

There are three implementation subjects of noise control measures involved in the expansion project in this phase:

a) New construction unit: including 6 villages and settlements (Class II sensitive receptors) and 19 schools and hospitals (Class I sensitive receptors) construction units. According to Article 52 of the Law of the People's Republic of China on Prevention and Control of Noise Pollution: If it is really necessary to build noise-sensitive buildings in the restricted construction area, the construction unit shall carry out building sound insulation design for noise-sensitive buildings to meet the requirements of relevant standards for sound insulation design of civil buildings. The required funds are "self-raised" by the owners of the new building and are not included in the scope of the airport and other relevant responsible subjects.

b) The responsible subject of the previous expansion project (Kunming Changshui International Airport): For the 5 villages (Heibo Village, Adi Village, Hongshapo Village, Shagou Village, and Ganluochong Village) and 13 schools and hospitals (Yunnan Vocational College of Agriculture, Kunming Guanghua School, Baihanchang Central School, Changshui Central School, Yunnan Vocational College of Judicial Police, Yunnan Horticultural School, Lizhi Primary School, Xiaochaoyang Kindergarten, Banqiao Middle School, Xingjie Primary School, Shagou Central School, Xiaoshao Township Hospital, and Xiaoshao Middle School) where sound insulation measures are required to be installed in the previous phase of the Project, relevant measures shall be implemented by the responsible unit of the previous period in this reconstruction and expansion, and repeated accounting of environmental protection investment is not considered this time. Kunming Changshui International Airport, as the actual operation department, is also the main responsible person for excessive noise.

c) Responsibility subject of the expansion project in this phase (Kunming Changshui Airport): If the aircraft noise at the existing acoustic environment sensitive points (receptors) caused by the expansion project in this phase exceeds the standard, the responsibility subject of the expansion project in this phase, i.e. Kunming Changshui Airport, shall implement it;

This assessment focuses on the noise control measures to be implemented by the responsible subject in b) and c). According to the Yunnan Provincial People's Government Meeting Minutes, "Minutes of the Fourth On-site Meeting of the Yunnan Provincial People's Government to Accelerate the Construction of Kunming New Airport in 2009" (General Office of Yunnan Provincial People's Government, 10 June 2009, Issue 71), the Administrative Committee of Dianzhong New Area is the main body to implement noise abatement measures.

11.8.5.1 Planning and control of land around the airport

Land use planning around the airport is the primary prevention and control means to avoid conflicts caused by airport development. As the responsible subject, the implementation unit of the expansion project in this phase shall cooperate with the planning preparation department in the following aspects to carry out relevant work.

(1) Establish a communication mechanism

The airport shall establish a regular communication mechanism with the municipal planning department to ensure that the planning department keeps abreast of the impact of aircraft noise on the airport and the area affected by aircraft noise in the airport development target year.

(2) The airport shall actively participate in the planning preparation and relevant feedback work.

In the stage of soliciting opinions on the planning preparation of the airport and its surrounding areas, the airport shall actively participate in the feedback and put forward adjustment suggestions for possible problems in the planning.

(3) Conservation of data

The airport may set up a specialist to be responsible for the communication between the airport and the planning department, and be responsible for keeping relevant communication records, regularly sorting out and summarizing them, and forming a development planning document for the surrounding areas of the airport.

(4) Controlled Range of Areas around the Airport

Different organizations have different requirements for land use planning around airports. For example, the Federal Aviation Administration of the United States of America (FAA) has proposed the compatibility standards in Part 150 Airport Noise Compatibility Plan in accordance with the United States Aviation Safety Noise Reduction Act (49 United States Code, Part 2101 and subsequent sections), but China has not carried out systematic legislative work on land use planning around airports. At present, the planning of land use around the airport is mainly based on the Environmental Standard for Aircraft Noise around Airport (GB9660-88) and the Reply on the Interpretation of Relevant Items of Environmental

Standard for Noise in the Surrounding Area of Airports (State Environmental Protection Bureau HH (2004) No. 163), with Lwecpn 70 dB and 75 dB as the main control values.

In this assessment, it is suggested to use Ldn as the main index for the planning of land around the airport for the following reasons:

First, Ldn and the current Environmental Quality Standard for Noise (GB3096-2008) are of the same noise system. It can more intuitively reflect the impact degree of aircraft noise in the surrounding area of the airport;

Secondly, Ldn has good compatibility with the EHS Guidelines of the World Bank, WHO Environmental Noise Guidelines for the European Region (2018), and other airport noise assessment standards of major economies of the world;

Thirdly, the planning and control of the surrounding land of the airport for Ldn can be used for reference.

Fourthly, Ldn is the recommended index of the Environmental Quality Standard for Aircraft Noise in the Surrounding Area of the Airport (Draft for Comments), which also gives the planning control standard for land around the airport applicable to Ldn in China, and is more perfect than the current planning control index. It is also scientific and reliable to some extent. The only problem is that the Environmental Quality Standards for Aircraft Noise in the Surrounding Area of the Airport (Draft for Comments) is still in the research stage, and no statutory norms and standards have been formed.

After comprehensive consideration, since there is no existing reference basis for the current planning and control of land use around the airport in China, for the development of the airport and from the perspective of better protecting the people around the airport from the impact of aircraft noise, the aircraft noise control standards proposed in the Environmental Quality Standards for Aircraft Noise in the Surrounding Area of the Airport (Draft for Comments) are selected in this phase to propose the guidance scope for the planning of land use around the airport.

According to the Environmental Quality Standards for Aircraft Noise in the Surrounding Area of the Airport (Draft for Comments), the planning and control of land around the airport in 2030 of Kunming Changshui International Airport is divided into the following contents:

1) Area with Ldn ≤ 57 dBA

The scope of Kunming Changshui International Airport Ldn 57 dBA in 2030 is shown in the following Figure :

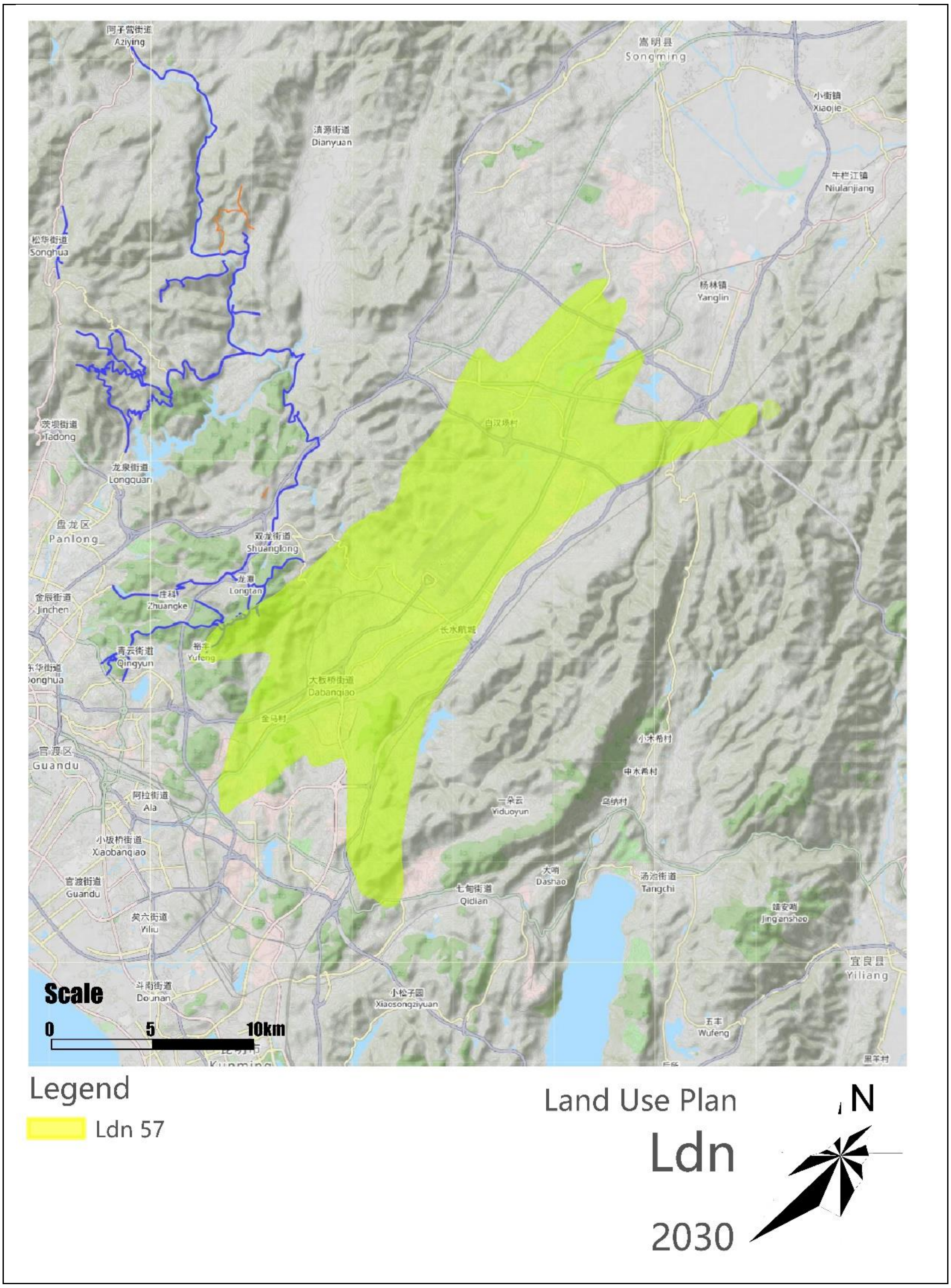


Figure 11-22 Distribution of Aircraft Noise Ldn57dBA Impact Area of Kunming Changshui Airport in 2030022

Ldn ≤ 57 dBA, i.e. Class I area, and the area beyond the impact scope of Ldn 57dBA is also planned. Buildings and land types that are relatively sensitive to noise, such as residences, hospitals, and schools, can be planned.

2) Area with 57 < Ldn ≤ 62 dBA

It is a Class II area, which can be planned as sensitive buildings and land for administrative office, culture, commerce, etc. The regional distribution of Ldn 57–62 dBA of Kunming Changshui Airport in 2030 is shown in the following Figure ;

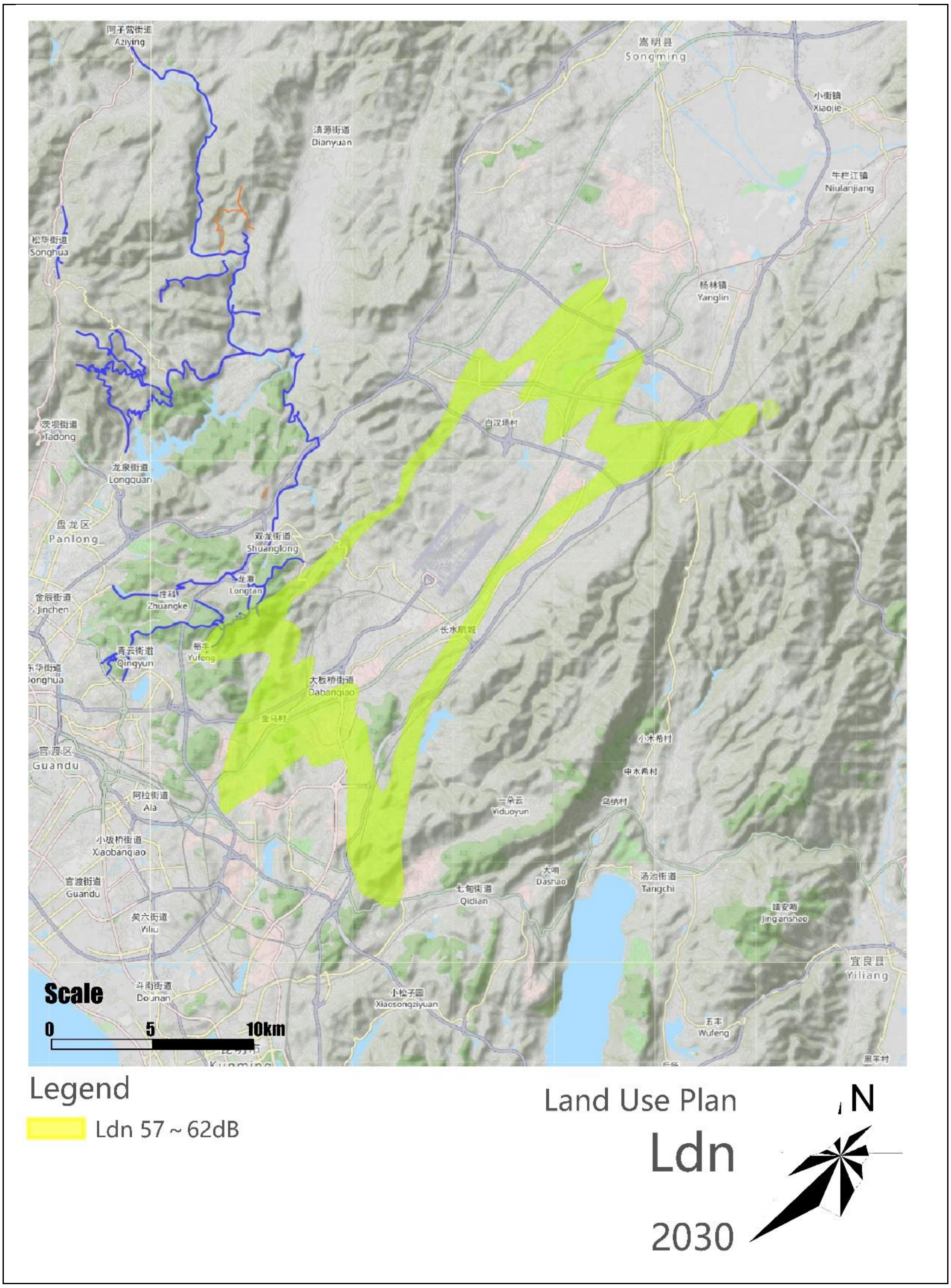


Figure 11-23 Distribution of Aircraft Noise Ldn57~62dBA Impact Area of Kunming Changshui Airport in 2030023

3) Area with 62 < Ldn ≤ 67 dBA

It is a Class III area that can be planned as buildings or lands that are less sensitive to noise such as industry, storage, and entertainment. The regional distribution of Ldn 62–67 dBA of Kunming Changshui International Airport in 2030 is shown in the following Figure ;

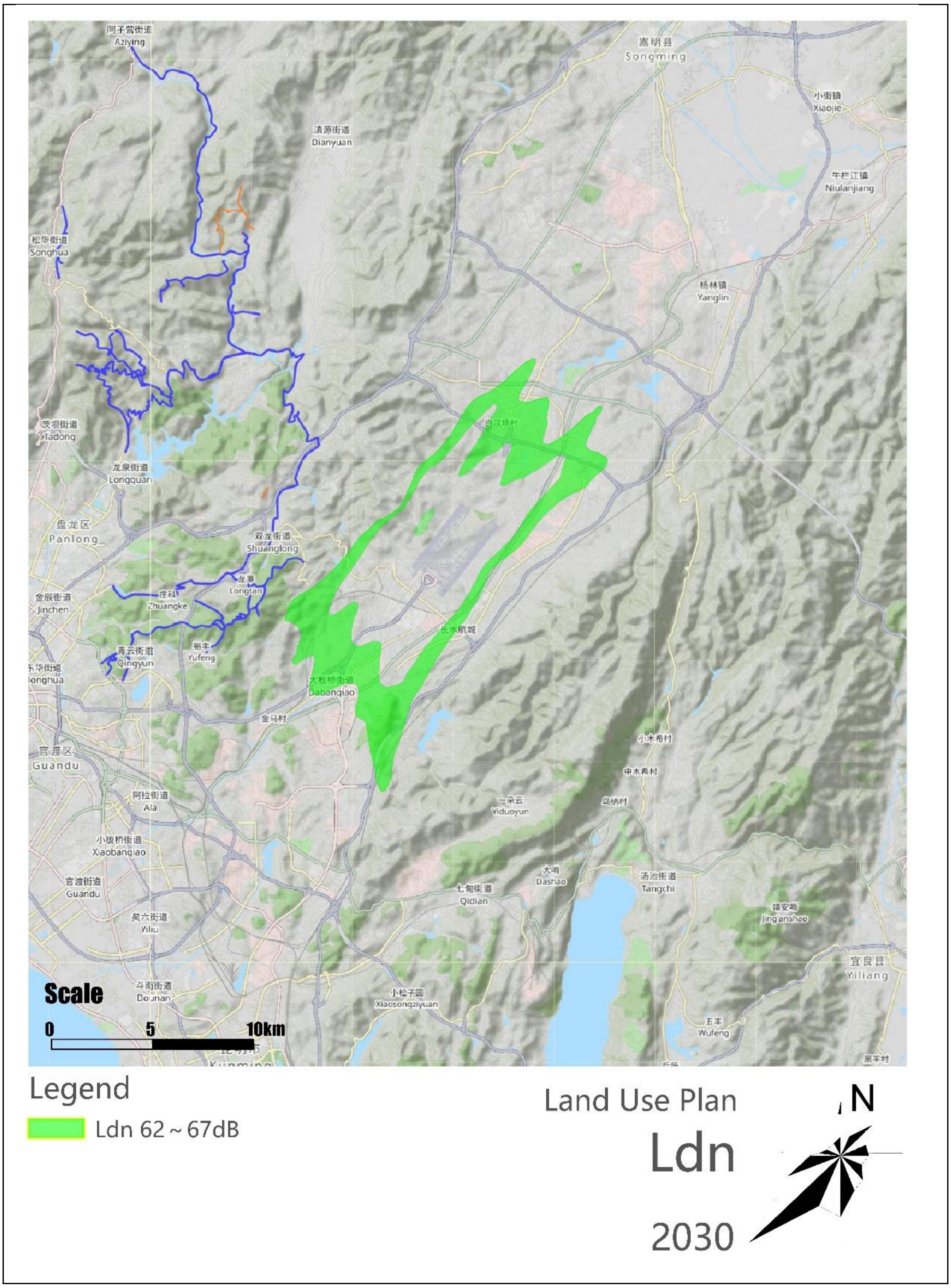


Figure 11-24 Distribution of Aircraft Noise Ldn62~67dBA Impact Area of Kunming Changshui Airport in 2030024

4) Ldn>67 dBA area

It is a Class IV area that can be planned as land types that are not sensitive to noise, such as agriculture, mining, and transportation, in addition to the airport land. The regional distribution of Ldn>67 dBA in Kunming Changshui International Airport in 2030 is shown in the following Figure :

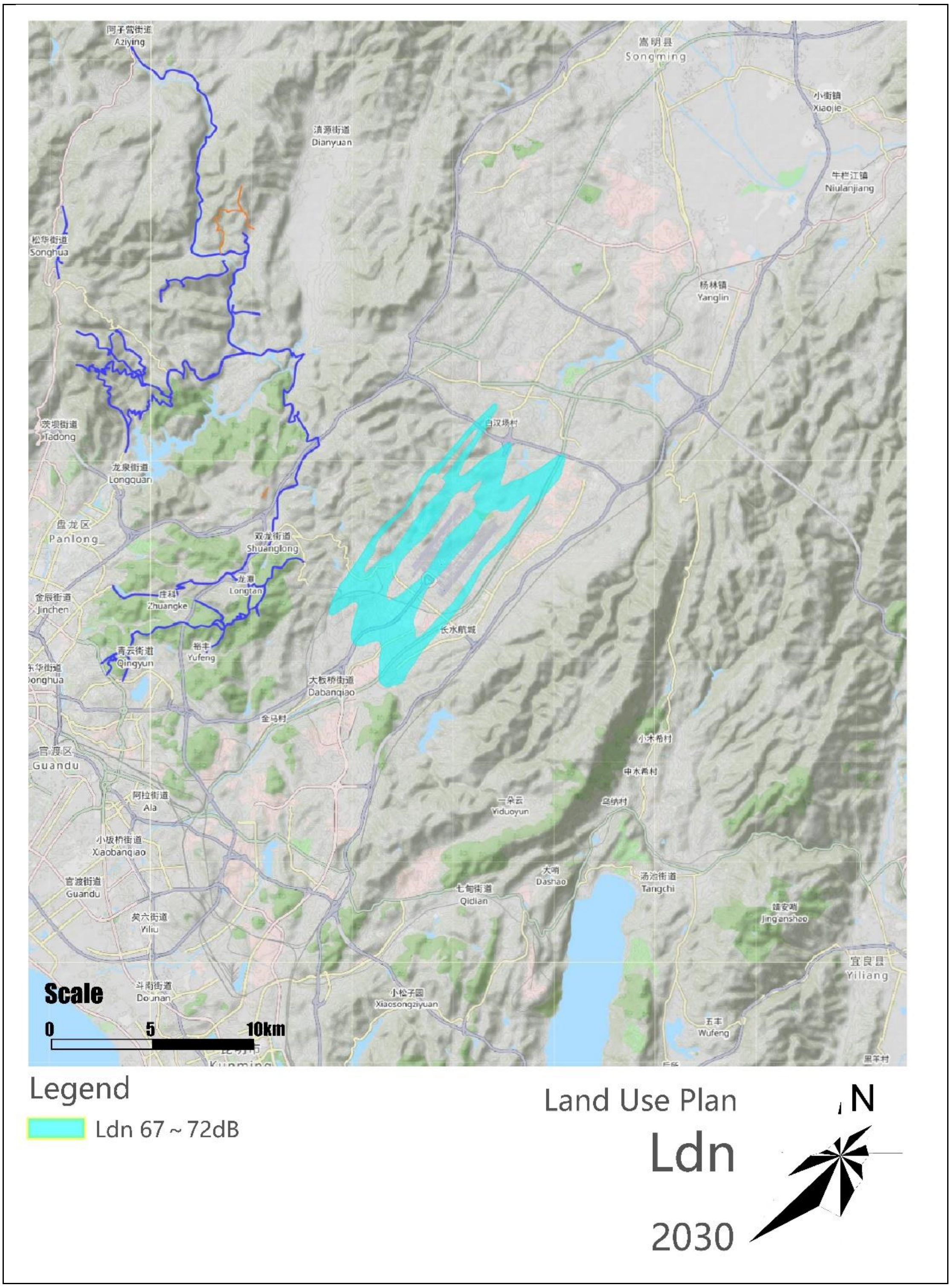


Figure 11-25 Distribution of Aircraft Noise Ldn>67 Impact Area of Kunming Changshui Airport in 2030025

In addition, if the planning department needs to plan noise-sensitive buildings within the noise impact range according to economic development and other factors, sound insulation treatment shall be carried out according to the General Code for Building Environment (GB 55016-2021) to ensure that the indoor noise of new buildings can meet the noise standard limits corresponding to their functional areas and the daytime Ld (07:00-22:00) 55dBA in the World Bank EHS Guidelines. The nighttime Ln 45 dBA limit is required by the Environmental Noise Guidelines for the European Region (2018) Lden≤45 dB and Lnight≤40 dBA limits issued by WHO.

11.8.5.2 Sound insulation relocation measures

(1) Targets of sound insulation measures

Among the acoustic environmental protection targets, a total of 23 villages enter the aircraft noise contour line WECPNL 75-85 dB, of which 5 villages (Heibo Village, Adi Village, Hongshapo Village, Shagou Village, and Ganluochong Village) are sensitive points required by the previous EIA to set sound insulation windows, and the remaining 18 villages need to install soundproof windows for this reconstruction and expansion.

Among acoustic environmental protection targets, 26 schools and hospitals enter the aircraft noise contour line (WECPNL) within 70-80 dB, including 12 schools and hospitals (Yunnan Vocational College of Agriculture, Kunming Guanghua School, Baihanchang Central School, Changshui Central School, Yunnan Vocational College of Judicial Police, Lizhi Primary School, Xiaochaoyang Kindergarten, Banqiao Middle School, Xingjie Primary School, Shagou Central School, Dabanqiao Xiaoshao Community Health Service Station in Guandu District, and Guandu Xiaoshao Middle School) that are required to set sound insulation windows for the previous EIA. Soundproof windows have been installed in Kunming No.17 Middle School, No.1 Kindergarten of Airport Economic Zone, No.2 Kindergarten of Airport Economic Zone, and Kunming Airport No.1 Primary School in Yunnan Province; the remaining 10 schools and hospitals need to be equipped with soundproof windows for this reconstruction and expansion.

(2) Cost standard for sound insulation measures

The area of doors and windows for residents is calculated as 25 m2 per household, and that for schools is calculated as 50 m2, with RMB 1,200 per square meter.

(3) Cost estimate of sound insulation measures

The cost estimate of noise prevention and control for the expansion project of Kunming Changshui Airport in this phase is listed in the following Table . The total cost of sound insulation is RMB 134.40 million, including RMB 29.79 million left over from the previous period and RMB 104.61 million increased this time.

Table 1133 List of Investment Estimation for Sound Insulation Measures033

S/N	Type	Noise range	Description	Predicted Noise Value (dB)	Number of households (Nr.)	Soundproof Window Area (m^2)	Unit Price of Soundproof Window (RMB)	Proposed Measures	Investment estimate (RMB ten thousand)	
									Newly added this time	Legacy of the previous period
1	Villages	80-85	Dacunzi	81.1	343	8575	1200	Class III Soundproof window 40>RW≥35	1029	
2			Xiaokanglangxiao Village	84.9	118	2950	1200		354	
3			Xiaokanglangda Village	83.8	167	4175	1200		501	
4			Fuxing Village	81.2	165	4125	1200		495	
5			Xinqiao Village	84.3	54	1350	1200		162	
6			Xichong Village	83.4	79	1975	1200		237	
7			Getenggou	80.1	32	800	1200		96	
8			Yangguanzhuang	83.7	100	2500	1200		300	
9			Ganluochong	80.8	39	975	1200			117
10		75-80	Xialiqi	75.2	92	2300	1200	Class IV soundproof window 35>RW≥30	276	
11			Yijia	75.5	499	12475	1200		1497	
12			Wujia	76	470	11750	1200		1410	
13			Dadongchong	75.9	98	2450	1200		294	
14			Gaoshitou	77.9	80	2000	1200		240	
15			Caojiachong	75.8	28	700	1200		84	
16			Yangtianchong	76.8	54	1350	1200		162	
17			Yunqiao Village	75.7	274	6850	1200		822	
18			Baihanchang	78.1	500	12500	1200		1500	
19			Baizhongqing	79.9	66	1650	1200		198	
20			Heibo Village	79.6	176	4400	1200			528
21			Adi Village	79.8	169	4225	1200			507
22			Hongshapo	77.9	108	2700	1200			324
23			Shagou Village	77	134	3350	1200			402

S/N	Type	Noise range	Description	Predicted Noise Value (dB)	Soundproof Window Area (m^2)	Unit Price of Soundproof Window (RMB)	Proposed Measures	Investment estimate (RMB ten thousand)	
								Newly added this time	Legacy of the previous period
1	Schools and hospitals	70-75	Xichong No.2 Kindergarten	72.2	250	1200	Class IV soundproof window 35>RW≥30	30	
2			Aibeier Kindergarten	71.1	400	1200		48	
3			Morningstar Kindergarten	74.1	250	1200		30	
4			Xichong Kindergarten	72.5	300	1200		36	
5			Xichong Primary School	72.8	1000	1200		120	
6			Qinglong School	71.7	450	1200		54	
7			Mingzhu School	74.7	600	1200		72	
8			No.4 Primary School of Kunming Economic and Technological Development Zone	70.7	1200	1200		144	
9			Airport Experimental School of Kunming No.3 Middle School	71.2	2000	1200		240	
10			Changshui Chenxing Kindergarten	74.6	250	1200		30	
11			Kunming Airport Economic Zone No.1 Kindergarten	72.1	Hollow double-layer sliding soundproof window installed				
12			Yunnan Kunming No. 17 Middle School	71.8	Hollow double-layer				

					casement soundproof window installed				
13			Airport Economic Zone No.2 Kindergarten	71	Hollow double-layer casement soundproof window installed				
14			Kunming Airport No.1 Primary School	70.8	Hollow double-layer casement soundproof window installed				
15			Lizhi Primary School	75	148	1200			18
16			Xingjie Primary School	74.6	419	1200			50
17			Banqiao Middle School	74.8	444	1200			53
18			Changshui Central School	74.7	242	1200			29
19			Xiaoshao Middle School, Guandu District	74.8	296	1200			36
20	Schools and hospitals	75-80	Xiaozhaoyang Kindergarten	75.1	944	1200	Class III Soundproof window 40>RW≥35		113
21			Shagou Central School	79.8	Installed	/			/
22			Yunnan Vocational College of Judicial Police	79.9	4165	1200			500
23			Dabanqiao Xiaoshao Community Health Service Station, Guandu District	77.7	60	1200			7
24			Baihanchang Central School	75.7	426	1200			51

25			Kunming Guanghua School	76.5	752	1200			90
26			Yunnan Vocational College of Agriculture	77.1	977	1200			117
Subtotal								10461	2942
Total								13403	

11.8.5.3 Feasibility Demonstration of Sound Insulation Measures

(1) Sound insulation capacity of sound insulation window

See Table 1134 for the weighted sound insulation specified in the domestic sound insulation window standard Grading and Test Method for Airborne Sound Insulation Performance of Building Doors and Windows (GBT8486-2008).Table 11-34 List of Weighted Sound Insulation of Sound Insulation Windows of Different Levels**034**

Table 11-34 List of Weighted Sound Insulation of Sound Insulation Windows of Different Levels034

Grading	Weighted Sound Insulation (Rw)
1	20≤Rw＜25
2	25≤Rw＜30
3	30≤Rw＜35
4	35≤Rw＜40
5	40≤Rw＜45
6	Rw≥45

According to the Code for Sound Insulation Design of Civil Buildings, the allowable indoor noise level of bedrooms, living rooms (halls) and classrooms shall meet the requirements listed in Table 1135.Table 11-35 List of Allowable Indoor Noise Levels of Residential Buildings**035**

Table 11-35 List of Allowable Indoor Noise Levels of Residential Buildings035

Building type	Room name	Allowable noise level (sound level A, dB)	
		Daytime	Nighttime
Residential building	Bedroom	≤45	≤37
	Living room	≤45	
School building	Voice classroom and reading room	≤40	
	Classroom, laboratory, computer room, classroom office, lounge, conference room, music classroom, piano room	≤45	
	Dance classroom, gym, enclosed corridor, staircase	≤50	

According to the calculated relationship between LWECPN and diurnal equivalent sound level (Ldn), it is approximated as LWECPN=Ldn+13. In this assessment, the LWECPN sound level of schools between 70dB-75dB is equivalent to Ldn of 57dB(A)-67dB(A). According to the prediction results, the weighted sound insulation of walls and roofs of general houses can reach 40dB or above in 2030. The sound insulation of doors and windows are at low level. Where sound insulation doors and windows are adopted, the weighted sound insulation can exceed 30dB, and the insertion loss indoors and outdoors can reach more than 25dB (A). After taking sound insulation measures for doors and windows, the indoor sound level can be

37dB(A)-42dB(A), which can generally meet the indoor noise requirements specified in the Code for Design of Sound Insulation of Civil Buildings (GB50118-2010).

Generally, the sound insulation windows can effectively mitigate the impact on the civil indoor environment by the max. sound level A, which have demonstrated certain operability.

(2) Feasibility of application of sound insulation windows in humid and hot areas

As the main sound prevention and noise reduction measures, sound insulation windows are widely used in various occasions, including residents, schools and other facilities in areas affected by road noise and airports. They are also widely used in Guangzhou, Shenzhen and other regions. According to the different functions of sound insulation windows, they can be divided into general sound insulation windows and ventilation and sound insulation windows. Considering the perennial humid and hot weather in Kunming, the general sound insulation windows, despite their good sound insulation effects, is not suiTable for noise reduction and sound insulation of residents and schools around Kunming Changshui Airport considering their poor ventilation performance. In this phase, it is recommended to select the ventilation and sound insulation windows with good sound insulation performance as the main sound insulation means.

Ventilation and sound insulation window is a new type of sound insulation window developed in recent years. The function of ventilation and noise reduction is achieved by installing blocking and sound absorption materials on general sound insulation windows. Such windows can be divided into natural ventilation and electrically operated ventilation considering their different ventilation patterns. Taking the "Shanghai Case Pavilion" in the Urban Best Practice Area of Shanghai World Expo as an example, the performance and applicability of ventilation and sound insulation external windows in the domestic market are analyzed. And as shown by the performance acceptance results of on-site measurement, such windows can indeed provide good sound insulation and ventilation effects (Application of Practical Sound Insulation and Ventilation Windows in the World Expo Best Practice Area, Wu Jianchun et al., 017.02.2011).

According to different materials, the sound insulation capacity of ventilation and soundproof windows can reach 25–32 dB(A), which can meet the requirements of 30 dB(A) for sound insulation and noise reduction in this phase on the premise of ensuring that the materials meet the standards.

After some sound insulation and noise reduction measures are taken, the indoor noise of residential, office and cultural, and educational buildings within the assessment scope of the airport in this phase meets the limit requirements of Ld (07:00-22:00) 55 dBA in the daytime and Ln 45 dBA at night in the EHS guidelines of the World Bank.

After the implementation of sound insulation measures in this phase, the out-of-standard indoor noise of residential, office and cultural, and educational buildings within the assessment scope of the airport in this phase can also meet the limit requirements of Lden≤45dB and Lnight≤40dBA in the Environmental Noise Guidelines for the European Region (2018) issued by WHO.

11.8.5.4 Environmental Relocation involving Excessive Noise

(1) Implementation target

In addition to the land occupation and demolition area of the Project, 3 villages (Ganhaizi, Huaqing, and Changpo villages) in the acoustic environmental protection target are within 85 dB of the aircraft noise contour line, of which Ganhaizi is the environmental protection relocation point in the previous environmental impact assessment. Among the schools and hospitals, only Fuxing Primary School is located within 80 dB of the aircraft noise contour line. According to the principle of environmental protection relocation measures, it is proposed to take relocation measures for residents exceeding 85 dB in this phase.

(2) Demolition standard

The compensation standard for noise relocation shall be implemented according to the relevant regulations issued by the local government. The following accounting only includes the cost of homestead relocation, and other expenses involved shall be determined through negotiation between the local government and the Employer. The compensation for village relocation is calculated at RMB 3,500/m2 per 450 m2/household, and the compensation for school relocation is calculated at RMB 4,000/m2.

(3) Investment cost for environmental protection relocation

The estimation of environmental protection and demolition costs is listed in the following Table ;

Table 11-36 List of Investment Estimation for Environmental Protection Relocation Measures036

S/N	Type	Description	Predicted value (dB)	Number of households (Nr.)	Area (m^2)	Unit Price (RMB)	Investment Estimation (RMB 10,000)	
							Current period	Previous period
1	Villages	Ganhaizi	85.6	125		3500		19688
2		Huaqing Village	90.8	162		3500	25515	
3		Changpo Village	89.8	303		3500	47723	
4	Schools	Fuxing Primary School	81.5	/	300	4000	120	
Subtotal							73358	19688
Total current period							93046	

The total cost of environmental protection and demolition is RMB 930.46 million, including RMB 196.88 million left over from the previous period and RMB 733.58 million increased this time.

(4) Source of funds

Due to various reasons, the relocation of the village (Ganhaizi) to be relocated in the previous project has not been implemented yet, and the relevant measures will be implemented by the responsible unit for demolition in the previous phase in this reconstruction and expansion. Repeated accounting of environmental protection investment will not be considered this time.

Two new villages (Huaqing Village and Changpo Village) and one school (Fuxing Primary School) will be relocated for environmental protection in this reconstruction and expansion. The Dianzhong New Area Committee will be responsible for the relocation and resettlement, with a cost budget of RMB 733.58 million.

11.8.5.5 Summary of Noise Exceedance and Prevention Measures Related to East Runway 2

As a whole, it is difficult to quantify the noise impact of a runway on a single sensitive point in the actual operation stage of the airport, but it can be roughly distinguished according to the runway layout and the relative position between the sensitive point and the runway;

(1) Sensitive points related to East Runway 2 with excessive noise

According to the characteristics of aircraft noise and the operation mode of Kunming Changshui International Airport in Yunnan Province, the noise impact scope of the take-off and landing aircraft on the east runway 2 is mainly concentrated in the areas 1.5 km on both sides and 10 km within both ends of the runway. At the sensitive points close to the runway, the correlation with the runway noise impact is relatively large, and with the increase of distance, the correlation decreases accordingly.;

According to the location relationship between sensitive points and East Runway 2, the impact degree is divided into the following three categories:

- A. Main impact: The noise impact mainly comes from the East Runway 2;
- B. Partial impact: The noise impact mainly comes from other runways, but is also affected by the superposition of East Runway 2;
- C. No significant correlation: Since the noise impact mainly comes from other runways, the East Runway 2 will not produce any impact basically.

The correlation between the noise exceeding points in this phase and the noise impact of East Runway 2 is listed in the following Table .

Table 11-37 Correlation Analysis of Noise Out-of Limit Points and Noise Impact of East Runway 2 in Current Period037

S/N	Description	WECPNL values in 2030 (dB)	Relative to East Runway 2	Impact correlation
1	Dacunzi	81.1	SW	C
2	Xiaokanglangxiao Village	84.9	SW	C
3	Xiaokanglangda Village	83.8	SW	C
4	Fuxing Village	81.2	SW	C
5	Xinqiao Village	84.3	SW	C
6	Xichong Village	83.4	NW	C
7	Getenggou	80.1	NW	C
8	Yangguanzhuang	83.7	N	A
9	Ganluochong	80.8	SW	C
10	Xialiqi	75.2	SW	C
11	Yijia	75.5	SW	C
12	Wujia	76.0	SW	B
13	Dadongchong	75.9	SE	A
14	Gaoshitou	77.9	SE	A
15	Caojiachong	75.8	SE	A
16	Yangtianchong	76.8	SW	C
17	Yunqiao Village	75.7	NE	A
18	Baihanchang	78.1	NW	C
19	Baizhongqing	79.9	NW	C
20	Heibo Village	79.6	SW	C
21	Adi Village	79.8	S	A
22	Hongshapo	77.9	S	B
23	Shagou Village	77.0	S	B
24	Xichong No.2 Kindergarten	72.2	SW	B
25	Aibeier Kindergarten	71.1	SW	C
26	Morningstar Kindergarten	74.1	SW	C
27	Xichong Kindergarten	72.5	SW	C
28	Xichong Primary School	72.8	SW	C
29	Qinglong School	71.7	SW	B
30	Mingzhu School	74.7	SW	C
31	No.4 Primary School of Kunming Economic and Technological Development Zone	70.7	SW	B
32	Airport Experimental School of Kunming No.3 Middle School	71.2	SW	B
33	Changshui Chenxing Kindergarten	74.6	NE	A
34	Lizhi Primary School	75.0	SW	C
35	Xingjie Primary School	74.6	SW	C
36	Banqiao Middle School	74.8	SW	C
37	Changshui Central School	74.7	NE	A
38	Xiaoshao Middle School, Guandu District	74.8	NW	C
39	Xiaozhaoyang Kindergarten	75.1	SW	C
40	Shagou Central School	79.8	S	A
41	Yunnan Vocational College of	79.9	SW	B

	Judicial Police			
42	Dabanqiao Xiaoshao Community Health Service Station, Guandu District	77.7	NW	C
43	Baihanchang Central School	75.7	NW	C
44	Kunming Guanghua School	76.5	N	A
45	Yunnan Vocational College of Agriculture	77.1	NW	B
46	Ganhaizi	85.6	S	A
47	Huaqing Village	90.8	W	C
48	Changpo Village	89.8	N	A
49	Fuxing Primary School	81.5	SW	C

As shown by the Table , there are 21 points where the noise exceeds the standard due to the operation noise produced by East Runway 2, wherein 9 points are partially affected, i.e., 12 points where the noise exceeds the standard are mainly affected by the noise produced from the East Runway 2.

(2) Summary of Noise Control Measures Related to East Runway 2

According to the implementation rules of noise prevention and control measures, the noise prevention and control measures related to East Runway 2 are summarized in the following Table .

Table 11-38 List of Correlation between Noise Prevention and Control Measures and Noise Impact of East Runway 2 in Current Period038

S/N	Description	WECPNL values (dB)	Prevention measures	Investment Estimation (RMB 10,000)		Impact correlation
				Additional	Previous period	
1	Yangguanzhuang	83.7	Sound insulation window	300	/	A
2	Wujia	76.0		1410	/	B
3	Dadongchong	75.9		294	/	A
4	Gaoshitou	77.9		240	/	A
5	Caojiachong	75.8		84	/	A
6	Yunqiao Village	75.7		822	/	A
7	Adi Village	79.8		/	507	A
8	Hongshapo	77.9		/	324	B
9	Shagou Village	77.0		/	402	B
10	Xichong No.2 Kindergarten	72.2		30	/	B
11	Qinglong School	71.7		54	/	B
12	No.4 Primary School of Kunming Economic and Technological Development Zone	70.7		144	/	B
13	Airport Experimental School of Kunming No.3 Middle School	71.2		240	/	B

14	Changshui Chenxing Kindergarten	74.6		30	/	A
15	Changshui Central School	74.7		/	29	A
16	Shagou Central School	79.8		/	Installed	A
17	Yunnan Vocational College of Judicial Police	79.9		/	500	B
18	Kunming Guanghua School	76.5		/	90	A
19	Yunnan Vocational College of Agriculture	77.1		/	117	B
20	Ganhaizi	85.6	Overall relocation	/	19688	A
21	Changpo Village	89.8		47723	/	A
22	Total			51371	21657	/

Due to the close distance between East Runway 1 and East Runway 2, it is difficult to divide the separate impacts of the two runways in detail.; After the completion of the East Runway 2, it will be used as the main take-off and landing runway to replace some of the original functions of the East Runway 1. The sensitive points originally affected by the East Runway 1, such as Ganhaizi, Changshui Central School, Yunnan Vocational College of Judicial Police, Kunming Guanghua School, Yunnan Vocational College of Agriculture, Adi Village, Hongshapo Village, Shagou Village, etc., will also be included in the Excessive Noise Contribution Value of the East Runway 2.

11.8.5.6 Aircraft Noise Monitoring System

(1) Monitoring contents

① Monitor and analyze the LAmax, LEPN and Td of the noise of a single aircraft of different models of different airlines operating in Kunming Airport, and determine the models that need to be eliminated and adjusted by airlines during their operation period.

② Provide the contribution of different airlines to the aircraft noise of Kunming Airport and their responsibilities.

③ Monitor and analyze the monthly and annual variation trends of boundary noise within the control range of aircraft noise at different levels in the airport.

④ Monitor and analyze the compliance of aircraft noise at main petition points.

⑤ Check the fixed-point monitoring results in combination with the actual flight trajectory and aircraft noise.

⑥ Monitor and analyze the control effect of different measures in combination with the implementation of aircraft noise control measures at Kunming Airport.

(2) Setting and Investment of Monitoring Points

As shown by the airport noise contour map, and in combination with the aircraft flight path and the distribution of surrounding sensitive points, a noise monitoring system is set up, comprising 12 aircraft noise monitoring points, as listed in the following Table .

Table 11-39 List of Point Settings of Aircraft Noise Monitoring System039

/ N	Name of Monitoring Point	Longitude (E°)	Latitude (N°)	Objective Setting
1	Xiaokanglangxiao Village	102.89065361	25.09643270	Sensitive point
2	Xinqiao Village	102.8866939	25.09240424	Sensitive point
3	Lingyuan Village	102.95306861	25.17952467	Sensitive point
4	Banqiao Middle School	102.8708345	25.04905296	Sensitive point
5	The Seventh Compulsory Isolation Drug Rehabilitation Center in Yunnan Province	102.91027665	25.06908401	Sensitive point
6	Getenggou	102.96260655	25.14400746	Sensitive point
7	Kunming Guanghua School	102.99752355	25.15798252	Sensitive point
8	Adi Village	102.9009741	25.04993263	Sensitive point
9	Shagou Village	102.89480001	25.04287064	Sensitive point
10	Yunnan Vocational College of Agriculture	102.9754635	25.16928395	Sensitive point
11	Baihanchang	102.9549619	25.17072683	Sensitive point
12	Heibo Village	102.8772531	25.08106521	Sensitive point

Estimated total investment is up to RMB 24,000,000.

11.8.5.7 Management Measures

The current aircraft noise management measures to be taken in accordance with the above regulations are as follows:

① The Kunming Municipal People's Government, with reference to the 2030 aircraft noise contour map, jointly formulates the prohibited and restricted construction areas for noise-sensitive buildings around Kunming Airport with planning, land and environmental protection authorities, and implements control.

② Under the guidance of the noise control zone, the relevant district and municipal planning departments shall formulate the land use plan in the aircraft noise control zone of the airport and actively promote the implementation of the plan.

③ When the project is constructed in the noise control area, the aircraft noise impact assessment shall be carried out, and the opinions of the airport shall be sought at the same time. If the project is incompatible with the aircraft noise where it is located, and the Employer is still willing to build the project, the Employer shall bear all legal responsibilities arising therefrom.

④ During building sound insulation measures, the Dianzhong New Area Committee shall negotiate with the owner and the school to jointly take sound insulation measures to solve the interference of aircraft noise to life and study.

⑤ The Kunming Changshui Airport shall disclose the monitoring results of conventional aircraft noise in a timely manner, and set up a noise-related complaint acceptance agency.

11.8.5.8 Summary of Noise Control Measures and Costs

(1) Summary of Noise Control Measures

According to the currently applicable management regulations of environmental protection in China, Kunming Changshui Airport is mainly responsible for WECPNL exceeding the standard of aircraft noise at sensitive points around the airport. The target year of noise control measures in this phase is 2030.

Kunming Changshui International Airport, as the responsible subject, shall regularly file the monitoring results with the local environmental protection department according to the daily monitoring mechanism. According to the operation conditions of the airport, including changes in data such as air traffic volume, the compliance of aircraft noise at the above sensitive points of the Management Committee of Yunnan Dianzhong New Area and the opinions on whether to implement sound insulation and relocation shall be submitted.

According to the Minutes of the Fourth Site Meeting of the People's Government of Yunnan Province in 2009 on Accelerating the Construction of Kunming New Airport (General Office of the People's Government of Yunnan Province, Issue 71, June 10, 2009), the Management Committee of Yunnan Dianzhong New Area, as the main body implementing noise control measures, shall timely implement relevant measures according to the feedback from the airport. Ensure that all measures are in place by 2030.

According to the types of noise control measures and different implementation subjects, implementation objects and responsible objects, the summary of noise control measures in the current period is as follows.

Table 11-40 List of Noise Prevention and Control Measures in Current Period040

Type of measures	Noise prevention and control measures	Objects	Quantity	Responsible subject	Implementer	Remarks	Cost Estimate (RMB 10,000)	Sources of funds
Management Measures	Restriction on take-off and landing of high-noise models	Airlines	/	Kunming Changshui International Airport	Kunming Changshui International Airport		/	/
	Continuous approach instead of conventional approach	Airlines	/	Kunming Changshui International Airport	Kunming Changshui International Airport		/	/
	Optimization of runway utilization	Airport	/	Kunming Changshui International Airport	Kunming Changshui International Airport		/	/
	Restriction on percentage of take-off and landing at night	Airport	/	Kunming Changshui International Airport	Kunming Changshui International Airport		/	/
Planning control	Ldn≤57	Land around the airport	/	Natural Resources and Planning Bureau of Yunnan Dianzhong New Area	Natural Resources and Planning Bureau of Yunnan Dianzhong New Area		/	/
	57dB<Ldn≤62dB	Land around the airport	/	Natural Resources and Planning Bureau of Yunnan Dianzhong New Area	Natural Resources and Planning Bureau of Yunnan Dianzhong New Area		/	/
	62dB<Ldn≤67dB	Land around the airport	/	Natural Resources and Planning Bureau of Yunnan Dianzhong New Area	Natural Resources and Planning Bureau of Yunnan Dianzhong New Area		/	/
	Ldn≥67dB	Land around the airport	/	Natural Resources and Planning Bureau of Yunnan Dianzhong New Area	Natural Resources and Planning Bureau of Yunnan Dianzhong New Area		/	/

Sound insulation measures	Residential area	5	Kunming Changshui International Airport	Management Committee of Yunnan Dianzhong New Area	Legacy of the previous period	1878	/
		6	Kunming Changshui International Airport	New building construction subject	Newly added after the previous EIA	/	Self-raised
		18	Kunming Changshui International Airport	Management Committee of Yunnan Dianzhong New Area	Additional	9657	Pooled funds
	Schools	12	Kunming Changshui International Airport	Management Committee of Yunnan Dianzhong New Area	Legacy of the previous period	1101	Pooled funds
		4	Kunming Changshui International Airport	Management Committee of Yunnan Dianzhong New Area	Available	/	Pooled funds
		18	Kunming Changshui International Airport	New building construction subject	Newly added after the previous EIA	/	Self-raised
		10	Kunming Changshui International Airport	Management Committee of Yunnan Dianzhong New Area	Additional	10461	Pooled funds
Relocation	Residential area	1	Kunming Changshui International Airport	Management Committee of Yunnan Dianzhong New Area	Legacy of the previous period	19688	Pooled funds
		2	Kunming Changshui International Airport	Management Committee of Yunnan Dianzhong New Area	Additional	73238	Pooled funds
	Schools	1	Kunming Changshui International Airport	Management Committee of Yunnan Dianzhong New Area	Additional	120	Pooled funds

Notes: 1. Considering the different sources of funds for noise control measures and the differences in budget and price levels at different stages, in order to ensure that noise prevention and control measures can be implemented in place, it is suggested that the investment in new noise control measures and the investment in remaining measures in the previous period should be managed as a whole (hereinafter referred to as pooled funds for noise control) according to the fund management specifications of Yunnan Provincial Department of Finance on the expansion project of Kunming Changshui Airport in this phase. Special personnel shall be assigned for supervision.

2. The new construction subject refers to the buildings or facilities built by enterprises or individuals within the scope of airport noise impact assessment after the approval of the previous EIA. According to Article 52 of the Law of the People's Republic of China on the Prevention and Control of Noise Pollution: If it is really necessary to build noise-sensitive buildings in the restricted construction area, the construction unit shall carry out building sound insulation design for noise-sensitive buildings, which shall meet the requirements of relevant standards for sound insulation design of civil buildings. The required funds are "self-raised" by the main body of the new building and are not included in the scope of the airport and other relevant responsible parties.

(2) Summary of Investment in Noise Control Measures

The noise control of Kunming Changshui Airport in this phase includes the installation of soundproof windows, relocation and installation of aircraft noise monitoring systems. According to the source of funds, it can be divided into two categories: new expenses in this phase and remaining expenses in the previous phase. Considering the different sources of funds for noise prevention and control measures and the differences in budget and price levels at different stages, in order to ensure that noise control measures can be implemented in place, it is suggested that the investment in new noise control measures and the investment in remaining measures in the previous period should be managed as a whole (hereinafter referred to as pooled funds for noise control) according to the fund management specifications of Yunnan Provincial Department of Finance on the expansion project of Kunming Changshui Airport in this phase. Special personnel shall be assigned for supervision.

The costs of each item are summarized below;

Table 11-41 List of Fund Investment in Noise Prevention and Control Measures041

S/N	Item	New cost (RMB 10,000)	Legacy cost (RMB 10,000)
1	Installation of soundproof window	10461	2942
2	Relocation	73358	19688
3	Noise monitoring system	2400	/
Total		86219	22630

11.9 Summary of Noise Assessment

Among the 164 sensitive points within the noise assessment scope in this phase, the aircraft noise WECPNLs of 32 general residential areas (Class II sensitive receivers) and 45 schools and hospitals (Class I sensitive receivers) exceed the corresponding standard limits.

Taking YLdn as the reference assessment indicator: Among all 160 acoustic environment sensitive points (receivers) within the assessment scope in this phase, there are 120 points where the YLdn exceeds the YLdn limit of 57 dB(A) to varying degrees. Compared to WECPNL, there is a significant increase in the number of non-conforming points of general residential areas (Class II sensitive receivers) due to changes in the executive standard. However, there is a relatively small change in the number of non-conforming points of schools and hospitals (Class I sensitive receivers).

Based on the assessment results by Yldn, the aircraft noise from Kunming Changshui International Airport significantly affects the surrounding environment. In terms of development, planning and control recommendations for the land around the airport and Yldn limit of 57 dB(A) should be taken as key reference indicators for the planning and development of residential, educational, and medical land and land for other purposes, to ensure that the airport's future development has no additional negative impacts to the neighboring communities.

Among the 164 sensitive points (including 52,842 housholds/150,194 persons)within the noise assessment scope in this phase, 140 sensitive points (Class II sensitive receivers) are environmental protection targets of the project, including 108 (about 29,495 households/92,592 persons) are general sensitive recievers and 32 are schools and hospitals (Class I sensitive receivers) exceed the corresponding standard limits. As the remaining 6 settlements and 18 schools and hospitals are included in the previous EIA planning and control scope and will be constructed following approval of the previous EIA report, these locations are not included in the implementation scope of noise prevention and control measures in this phase.

Excluding the new sensitive buildings according to the approved previous EIA report, after the implementation of the expansion project in this phase, the aircraft noise WECPNLs of 26 villages and settlements (Class II sensitive receivers) and 27 schools and hospitals (Class I sensitive receivers) in this phase will exceed the corresponding standard limits.

Among the 26 villages and general settlements (Class II sensitive receivers), there are 3 locations where the WECPNL exceeds 85 dB. For these locations, relocation measures will be implemented as an environmental protection effort. And installation of soundproof windows will be adopted for the other 23 sensitive points for noise prevention and control. Among the 27 schools and hospitals (Class I sensitive receivers), one with a WECPNL exceeding 80 dB should be relocated, while for the remaining 26, installation of soundproofing windows may be adopted.

Based on the analysis of implementation results of noise protection measures, it can be guaranteed that the indoor noise levels at the main acoustic environment sensitive points around the airport meet the prescribed limits required by the World Bank's EHS guidelines, specifically, Ld of 55 dBA in the daytime (07:00-22:00), and Ln of 45 dBA in the nighttime.

After the implementation of sound insulation measures in this phase, the indoor noise levels of the majority of residential, office and cultural, and educational buildings within the assessment scope of the airport in this phase can meet the limit requirements of Lden≤45 dB and Lnight≤40 dBA in the *Environmental Noise Guidelines for the European Region* (2018) issued by WHO.

To sum up, the impact of the expansion project of Kunming Changshui Airport on the surrounding environment is within an accepTable range from the perspective of aircraft noise impact.

11.10 Vibration

11.10.1 Vibration sources and calculation methods

According to the characteristics of the airport project, there is no large vibration source in the operation stage of the airport. Although the take-off, landing and taxiing stage of the aircraft have a certain impact on the ground, but most of the rubber tires and the ground contact, coupled with the damping effect of the landing gear, the vibration in the operation stage of the airport is very small. According to the vibration monitoring results of other airports at home and abroad for the take-off and landing stage of the airport, the airport operation stage almost has no vibration effect.

The current Technical Guidelines for Environmental Impact Assessment (HJ/T 87-2002) and Acoustic Environment for Environmental Impact Assessment (HJ2.4-2021) do not put forward requirements for vibration assessment during construction and operation of airport projects.

To sum up, the vibration impact of the current project mainly occurs in the construction stage, including the vibration impact of various construction machinery construction. According to the "Environmental Vibration Standards for Industrial Enterprises" (GB10068-2008), the vibration values, vibration speeds and vibration levels of the main construction machinery involved in this period are listed in the following table.

Table 11-42 Range of vibration of main construction machinery 0

Type of machine	Range of vibration values (m/s2)	Vibration velocity (mm/s)	Lv (dB)
Impact driller	7.1 ~ 28	2.5 ~ 10	90-100
Concrete mixer	2.2 ~ 4.4	2.0 ~ 4.0	85-90
Concrete pump	2.2 ~ 4.4	2.0 ~ 4.0	85-90
Concrete vibrator	2.2 ~ 11	2.0 ~ 4.0	85-90
Static pile driver	15-80	1.8 ~ 9.0	80-90
Hydraulic wheel excavator	2.2 ~ 8.8	2.0 ~ 4.0	75-85
Bulldozer	2.2 ~ 17	2.0 ~ 4.0	75-85
Grader	2.2 ~ 17	2.0 ~ 4.0	75-85
Wheeled carrier	2.2 ~ 11	2.0 ~ 4.0	75-85
Vibratory roller	3.5 ~ 25	2.5 ~ 6.0	80-90
Double wheel double vibration roller	3.5 ~ 25	2.5 ~ 6.0	80-90
Three-wheel roller	3.5 ~ 25	2.5 ~ 6.0	80-90
Tire roller	2.2 ~ 25	2.0 ~ 6.0	80-90

Note: The above parameters are measured at 1m of the vibration source using the effective value method.

The formula for calculating the attenuation law of ground vibration propagation, combined with the derivation of elastic theory, semi-theoretical and semi-experimental and experimental empirical formula, can be uniformly expressed as the following formula:

ar=k0a0 (r0/r) eK1

Where: r0 is the distance between the ground reference point and the vibration source, m;

r is the distance between the prediction point and the vibration source, m;

a0 is the ground vibration value at r0, m/s2;

ar is the vibration value at the distance from the vibration source r, m/s2;

k0 is the constant related to the vibration source;

k1 is the attenuation characteristic coefficient of body wave and surface wave synthesis;

k2 is the specific attenuation coefficient of soil's absorption of vibration energy;

Considering the single-frequency vibration level, if Lv is taken as the main evaluation index, then:

Lv12= LV-20 ×log10 (d2/d1)

Where: Lv is1 the vibration level at1 d, i.e., reference value in Table 1121, dB;**错误!未找到引用源。**

Lv2 is the vibration level at d2, dB;

d1 is the distance between the reference value and the vibration source, m;

d2 is the distance between the predicted point and the vibration source, m;

Vibration Assessment

According to the construction characteristics of airport projects, the main effects may be as follows:

(1) Building structure damage: the vibration of construction machinery will be transmitted to the building structure through the building foundation, causing structural damage, such as cracks, deformation, damage and so on.

(2) Safety risks: the vibration of construction machinery will lead to the surrounding roads, Bridges, tunnels and other buildings and facilities, safety risks, such as structural loosening, instability, collapse, etc.

(3) Human health: long-term exposure to the vibration environment of construction machinery will have an impact on human health, such as hearing loss, blurred vision, turbulence and other uncomfortable symptoms, and may even cause chronic diseases.

The vibration values and levels (Lv) of typical construction machinery at different distances are listed in Table 11-43 and Table 11-44.

Table 11-43 Vibration attenuation changes at different distances042

Distance (m)	Vibration value (m/s²)
1	80.0
5	16.0
10	8.0
20	4.0
50	1.6
100	0.8
200	0.4

Table 11-44 Vibration level (Lv) attenuation changes at different distances043

Distance (m)	Lv (dB)
10	87.5
20	82.2

50	75.8
100	69.6
150	65.2
200	61.8
250	59.0

The surrounding area of Kunming Changshui Airport is mainly populated by residents, cultural and educational areas. As can be seen from Table 1144, the distance between the day and the construction boundary is 100m, which can meet the corresponding standard limit of the "Urban Area Environmental Vibration Standard" (GB 10070-88). Table 11-44 Vibration level (Lv) attenuation changes at different distances043At night, it takes about 150m to meet the corresponding standard limit. According to the distribution of environmentally sensitive targets around the construction site, several residential areas such as Xichong Village, Changpo Village, Changshui Hangcheng and Xiaokangda Village may be affected to some extent.

12 Impact on ecological environment

12.1 Impact on Ecological Environment during Construction Period

Most of the Project is located within the scope of Kunming Airport, featuring low biodiversity, and absence of protected plant species, while artificial secondary vegetation are provided there instead.

92 species of birds are recorded in the assessment area. Passeriformes is the most abundant species, with 59 species, accounting for 64.13% of the recorded species of birds. The remained 33 species that are not passeriformes, account for 35.87% of the recorded species of birds. The common species include the asteraceae, wagtail, bulbulidae, thrush, chickadee, and sparrow, which are widely distributed in various habitats in the assessment area.

The impact on birds during the construction period is mainly manifested as follows: All kinds of noise and human disturbance generated during the construction of the Project will make the native habitat no longer suiTable for some birds, and produce a direct impact on the birds that originally inhabited these woodlands, such as dicrurus macrocercus and turdus eunomus. However, most of such birds are climbing birds and songbirds, featuring a larger number than other birds, a wider distribution range, a wide range of food sources and easiness to find similar habitats nearby. The birds affected by the project construction can find similar habitats nearby, and quickly adapt to the new environment after a short adjustment of the scope of activities. As long as the construction process does not affect the habitat or breeding site densly inhabited by birds, the bird species and its long-term survival and reproduction environment in the assessment area will not be affected. Construction activities will lead to an increase in the number of birds that are associated with human activities such as motacilla alba, pycnonotus xanthorrhous, passer montanus, etc. However, other birds may be affected and forced to leave the impact assessment area in a short time, which however will not result in the reduction of bird species and the significant decrease in the number of birds.

In general, the assessment area is subject to the frequent human activities. In addition, the existing Kunming Airport will regularly take a variety of bird repellent measures to prevent "bird-strike" incidents during the operation period. The long-term adaptation results in relatively strong anti-interference ability of birds living in this area. The Project only occupies a small part of woodland. There are no natural forests, tall and dense woods, habitats and breeding places for concentrated birds, and regular breeding places for birds under special national protection within the construction area. Human activities and construction noise produced during the construction period will frighten and interfere the birds living in the area occupied by the Project and in the surrounding areas, forcing birds to temporarily to find foods out of the affected areas. Since most of the birds are active and stay in a large range, impact of the construction on birds is limited. To sum up, the impact of the project construction on the survival of birds is within the accepTable range and at a low level, and will gradually disappear with the completion of the project.

(3) Analysis of Impact on Mammals during Construction Period

There are 14 species of mammals recorded in the assessment area, including 9 species of rodents, accounting for 64.28% of the number of mammals recorded in the assessment area; 2 species of chiroptera, accounting for 14.29% of the number of mammals recorded in the assessment area. It can be seen that the rodents take a predominance in the species and quantity of mammals in the assessment area, such as callosciurus erythraeus, tamiops swinhoei, rattus norvegicus, rattus tanezumi, mus musculus and mus pahari.

The land occupied by the Project will squeeze the living space of animals in this area and reduce the number and appearance frequency of the bird species involved.

The main impacts on mammals during construction period are as follows: the damage to the ecological environment where the animal foraging site is located, including the damage to the forest vegetation in the construction area, the noise generated by felling and blasting of woodlands, the operation in the spoil area, the interference caused by the construction personnel and construction machinery, etc., and has changed the assessment area and its surrounding environment. The affected species are mainly rodent species suiTable for cultivated land and grass. However, some rodent species accompanying human life, esp. mus musculus and mus pahari will increase. After the project construction is completed, and with the recovery of vegetation, improvement of ecological environment, and decrease of human disturbance, many migrated mammals will return to their original habitats.

12.2 Analysis of Impacts on Animals by Operation Period

Various interference factors are produced by the airport operation, such as noise pollution, visual pollution, pollutant emission, etc. Wherein, the noise pollution has a significant impact. The impact on terrestrial animals during the operation period of the airport mainly refers to the noise produced by aircraf take-off and landing has a certain adverse impact on the habitat and reproduction of animals, such as affecting the mating and spawning of animals. Animals usually avoid and stay away from the airport when choosing habitats and establishing nest areas.

(1) Separation impact

The expanded Kunming Changshui International Airport will significantly increase the floor area, and the scope of the airport land may separate and hinder the original habitat and survival activities of amphibians and reptiles to a certain extent. Most of the animals in the assessment area are widely distributed species, and most species are suiTable for more than two types of habitats. There are many suiTable habitats outside the airport. Therefore, the animal separation effect generated by airport operation is limited.

(2) Analysis on Environmental Pollution

Noise, exhaust gas and airport road runoff generated during airport operation will cause certain pollution to the living environment of animals in the airport area. Traffic noise, aircraft and ground vehicle lighting, etc. will have a certain adverse impact on animal habitat and reproduction, forcing some small animals to avoid the airport area when choosing habitats and establishing nest areas.

The vegetation around the airport mainly consists of woodland, grassland and cultivated land, with frequent human activities and no large mammals. The species and quantity of amphibians and reptiles in the assessment area are also limited. Therefore, the airport operation has little impact on mammals and amphibians and reptiles.

(3) Impact on Birds

The impact on birds during the airport operation period mainly refers to the impact of aircraft take-off and landing on bird death which is caused by bird strike, called "bird strike phenomenon" in the aviation industry. "Bird strike" is a common phenomenon challenging the global aviation airports. Bird strike is related to the aviation operation characteristics of the airport, as well as the species, habits and habitats of locally distributed birds.

1) Resident Bird

There are 47 species of resident birds among the 92 species recorded in the assessment area, accounting for 51.09% of the total number of bird species in the assessment area. There are 6 common resident birds in the assessment area, including, Hirundo rustica, Anthus hodgsoni, Pycnonotus xanthorrhous, Passer montanus, Motacilla alba, Carduelis ambigua. The implementation of the Project has a great impact on the resident birds that inhabit the assessment area all year round.

There are 22 species of summer migrant birds in the assessment area, accounting for 23.91% of the birds in the assessment area. Summer migrant birds usually nest and incubate broods in the north in spring and summer. The birds may actively avoid the unfavorable environment since the implementation of bird strike prevention and control measures which are taken for the airport and being affected by the noise that is incurred during the operation period of airport. Moreover, the stay of the birds in the assessment area is short, not exceeding 6 months. As shown by the research and actual conditions, bird strikes occur frequently in areas with intensive bird activities, to be specific, they mostly occur near important migration passages of birds. However, there are no rivers and reservoirs in the assessment area, neither tall and dense forests in the vegetation. Besides, the assessment area does not function as the main migration passage of birds. Meanwhile, the interview with the surrounding residents revealed that there are no flocks of migratory birds living around the airport. Therefore, the impact of airport operation on summer migrant birds is relatively limited.

There are 15 species of winter migrant birds in the assessment area, accounting for

16.30% of the birds in the assessment area. Winter migrant birds overwinter in the south in winter and fly to the north for breeding in the next spring. In autumn, the young birds, after growing up, will fly back to the original area to overwinter. During the whole year, the stay of the winter migrant birds in the assessment area is usually within 6 months (inclusive), indicating that the minimum impact is produced by the airport operation on the winter migrant birds.

2) Ecological habits

As shown by the statistics of behavioral habits and habitat characteristics, the birds in the assessment area mainly consist of wading birds, raptors, land birds, climbing birds and songbirds, with the basic information as follows:

Wading birds refer to birds that live in swamps and watersides. They are featured long legs and necks, are suiTable for wading and swimming, and often stand with one foot at rest. Most of the wading birds obtain food from the bottom of water, sludge or the ground. Herons and snipes belong to this category. However, there are a certain number of Egretta garzetta and Bubulcus ibis living in the farmland in the assessment area of the Project. The implementation of the Project will occupy part of the cultivated land which may squeeze its living space and intensify human interference, leading to a great impact on these birds.

Raptors usually have large sizes, with sharp mouths and claws and strong wings. They are good at flying and soaring at high altitudes. They are carnivorous birds with fierce characteristics and prey on other animals with their mouths and claws. Less raptors are seen in the assessment area, no matter in species or quantities, mainly including accipiter nisus, buteo buteo, elanus caeruleus, glaucidium cuculoides, otus sunia and falco tinnunculus. The implementation of the project has a great impact on the raptors.

Land birds mainly inhabits, runs and forages on land, and is not suiTable for long-distance flight. The cursores in the assessment area mainly include mountain turtledove, Streptopelia chinensis, etc. The implementation of the project will occupy a small part of its habitat (farmland and woodland), which will have a certain impact on them.

Most climbing birds live in the woodlands and are good at climbing trees. Their feet are specially structured, enabling them to grasp effectively. Less climbing birds are seen in the assessment area, no matter in species or quantities, mainly including eudynamys scolopaceus and caprimulgus indicus. The implementation of the project will occupy a small part of its habitat (woodland), which will have a certain impact on them.

Songbirds mainly refer to the passeriformes. Forest shrubs and cultivated land take a predominance in the habitats in the assessment area, which are mainly inhabited by many songbird species, accounting for 62.2% of the bird species in the assessment area, also taking a predominance in quantities. Most of them are small birds, such as passer rutilans, dicrurus macrocercus, dicrurus leucophaeus and hirundo rustica. The implementation of the project has a great impact on the raptors.

(3) Active Time

The birds in the assessment area are basically the birds that are active in daytime. Therefore, the noise caused by the take-off and landing of aircraft, as well as the and human disturbance during the daytime have a great impact on birds. But some birds such as pycnonotus xanthorrhous, motacilla alba and passer montanus, are gradually adaptive to these influences.

4) Bird cluster activities in the assessment area

The cluster birds frequently seen in the assessment area mainly include anthus hodgsoni, plain Prinia, hirundo rustica, passer montanus and carduelis ambigua. As long as the land use changes, the species and quantity of clustered birds in native habitats will change greatly, such as anthus hodgsoni, passer montanus and carduelis ambigua, which are mainly active in agricultural areas, will decrease.

5) Flight altitude

Regarding the flying height of birds in the assessment area, several types of hawks will fly at a higher altitude, usually up to thousands of meters. The flying height of other birds is lower, generally below 400 m. The flying height of those small songbirds in large quantities is generally not more than 300 m. Therefore, the passeriformes are subject to important impact during the operation period.

To sum up, the direct impact of airport operation on birds is the impact of aircraft flight on birds, that is, the bird strike. Kunming Changshui International Airport is located in Changshui Village in the northeast of Guandu District, Kunming City. There are only small rivers and streams in the northeast and southwest of the assessment area, and there are many small reservoirs. The vegetation is dominated by woodland, grassland, and cultivated land, without tall and dense forests. According to the interview with the surrounding villagers, no relatively fixed and roughly repeated flocks of winter migratory birds are seen in the assessment area in winter. In addition, according to the literature analysis, such as the National Master Plan for the Protection of Migratory Bird Migration Routes and other documents, although the assessment area is close to the migration channel of waterfowl and wading birds, it is not the main channel for migratory birds to migrate; therefore, the assessment area is not the main channel for migratory birds to migrate. The assessment area lacks the conditions for concentrated breeding and overwintering of birds, so the assessment area does not belong to the area of concentrated breeding and overwintering of birds.

Investigations and studies have shown that bird strikes are mostly found in areas with intensive bird activity, i.e. near important migration channels of birds and important concentrated breeding sites and concentrated wintering sites. Kunming Airport and its surrounding areas are located in the northern suburbs of Kunming. The location is not an area with intensive bird activities, not an important migration channel for birds, and not an important concentrated breeding place and concentrated wintering ground. Statistics from the International Civil Aviation Organization (ICAO) show that the probability of bird strikes is about one in ten thousand based on the bird strikes at military and civil airports. According to the bird monitoring data of Kunming Airport, 24 bird strikes due to negligence and 1 incident occurred in Kunming Airport from 2017 to 2021.

The indirect impacts on birds during the airport operation period include noise affecting the breeding success rate of birds, light interfering with the migration and navigation of birds, light causing strikes of phototactic birds, and concrete ground under the light making birds mistaken for the water surface. The number of species of birds and the number of birds in this area are small. Small songbirds are the main birds, which has a low impact on birds. According to the aviation operation characteristics after the completion of the Yunnan Kunming Changshui Green Airport Development Project and the bird characteristics around the airport (assessment area), the operation of Kunming Changshui International Airport has a great impact on the 47 species of resident birds in the assessment area. Other summer and winter migratory birds live in the local area for a short time every year. Airport operation has little impact on it. In addition, from the perspective of bird habits, the operation of Kunming Changshui International Airport has a relatively large impact on songbirds flying at low altitudes, such as *Passer rutilans*, *Dicrurus macrocercus*, *Hirundo rustica*, etc. For raptors flying mainly at high altitudes (*Accipiter nisus*, *Buteo buteo*, *Elanus caeruleus*, *Glaucidium cuculoides*, *Otus sunia, Falco tinnunculus*, etc.). There are no tall trees or wetlands around Kunming Airport, and the airport's operation basically has no impact on scansorial birds such as *Caprimulgus indicus* and *Eudynamys scolopaceus*.

According to the operation records of Kunming Changshui International Airport, there were 24 bird strikes due to negligence and 1 incident from 2017 to 2021. Indirect impacts of airport operation on birds (including noise affecting the breeding success rate of birds, light interfering with bird migration and navigation, light causing strikes of phototactic birds, concrete ground under the light making birds mistaken for the water surface, etc.) Although it is ineviTable and has a certain negative impact on nearby birds, birds will gradually adapt to the new environment to reduce such indirect impacts. Therefore, the impact of the Project on birds in the assessment area is generally small after it is put into operation.

12.3 Analysis of Impact on Protected Animals

According to the previous analysis, the impact of airport construction and operation on birds mainly includes the impact of land occupation during the construction period, the impact of direct bird strikes during the operation period, and other indirect impacts during the operation period.

(1) Impact on national key protected animals

There are 12 species of birds under national key protection in the assessment area, including *Accipiter nisus*, *Buteo buteo*, *Elanus caeruleus*, *Milvus migrans*, *Glaucidium cuculoides*, *Otus sunia*, *Otus lettia*, *Falco tinnunculus*, *Falco subbuteo*, *Falco amurensis*, *Halcyon smyrnensis*, and *Luscinia calliope*, as well as 2 species of mammals classified as national Class II protected animals i.e *Prionailurus bengalensis* and *Martes flavigula*.

Protected birds include *Accipiter nisus*, *Buteo buteo*, *Elanus caeruleus*, *Milvus migrans*, *Glaucidium cuculoides*, *Otus sunia*, *Otus lettia*, *Falco tinnunculus*, *Falco subbuteo*, *Falco amurensis*, etc., with an extensive range of activities. The forest land in the assessment area is mainly distributed in the west and southeast. Although a small part of forest land is included in the new land occupation scope of the airport expansion, most of the surrounding areas are cultivated land and residential areas, but there is a lack of tall natural forests, which are not nesting and breeding areas for raptors. The assessment area is only a small part of its vast foraging area. Due to the construction of the airport, the extent of reducing the foraging scope of raptors is limited. Therefore, the expansion of Kunming Airport has little impact on these raptors. *Prionailurus bengalensis* and *Martes flavigula* mainly inhabit mountain forests, suburban shrubs, and near forest-edge villages. Although the expansion of the airport reduces their range of activities, these two animals are highly adapTable to the environment, so the airport construction has little impact on these two animals.

The protected bird *Luscinia calliope* is a songbird, which usually moves in dense forests and secondary vegetation, feeds on insects, and also eats a small amount of plant food such as fruits. Therefore, the impact of the project implementation on it is mainly to compress the living space and make it temporarily far away from the assessment area, with little impact.

Impact of bird strike during the operation period: According to the records of Kunming Airport, there were 24 bird strikes due to negligence and 1 incident from 2017 to 2021. Bird strikes often occur in the low altitude range when aircrafts are descending or shortly after takeoff when they are ascending. However, the birds of prey in the assessment area usually fly at a high altitude and only approach the low altitude when they dive downward for hunting. At this time, the probability of a bird strike is extremely low, which is a very small probability event. Among them, the radome, windshield, and engine are the main impact parts. From 2017 to 2021, there were 10 incidents on the west runway and 6 incidents on the east runway. Since the runway number was not specified in the reported incident, the runway number of 9 bird strikes due to negligence was unknown.

Table 0-1 Number of Bird Strikes due to Negligence at Kunming Airport in 2017–2021

Year	2017	2018	2019	2020	2021
Quantity (No.)	10	6 (including 1 incident)	4	2	3
From 2017 to 2021, there were a total of 24 bird strikes due to negligence and 1 incident.					

Other indirect impacts during the operation period: The indirect impacts on birds during the airport operation period include noise affecting the breeding success rate of birds, light interfering with the migration and navigation of birds, light causing strikes of phototactic birds, and concrete ground under the light making birds mistaken for the water surface. As mentioned above, the assessment area lacks tall forests and trees and is not a nesting and breeding area for these raptors. Therefore, the noise generated by airport operations has little impact on the breeding of raptors. Raptors such as eagles and falcons are not phototaxis birds and fly high. The lights during the airport operation period are not enough to affect the flight of raptors, and will not cause raptors to pounce on the concrete ground of the airport due to the light lure.

To sum up, the operation period after the expansion of Kunming Airport has little impact on the key protected birds in the assessment area.

(3) Impact on endemic animals

There are 9 endemic species of amphibians and reptiles in the assessment area, namely *Bombina maxima*, *Kaloula verrucosa*, *Rana chaochiaoensis*, *Rana pleuraden*, *Hebius octolineatum*, *Macropisthodon rudis,* and *Japalura varcoae*. They are all distributed in Sichuan, Guizhou, and Yunnan, and are rare in farmland, still water areas, and its vicinity in the assessment area. However, the area occupied by Kunming Airport is mostly cultivated land and villages, so the construction and operation of the airport have no significant impact on the endemic species of these amphibians and reptiles.

There are also 2 endemic species of mammals distributed in the assessment area, i.e. *Rhinolophus rex* and *Eothenomys miletus*, which are rare and common species in various woodlands and grasses and shrubs in the assessment area. The airport site only occupies a small area of forest land, and its construction and operation have little impact on these two mammals.

Table 0-2 List of Impacts of Project Construction on Protected Animals and Endemic Animals

Conservation Grade	Species	Grade	Distribution	Impact
Protected animals	*Accipiter nisus*, *Buteo buteo*, *Elanus caeruleus*, *Milvus migrans*, *Glaucidium cuculoides*, *Otus sunia*, *Otus lettia*, *Falco tinnunculus*, *Falco subbuteo*, *Falco amurensis*, *Halcyon smyrnensis*, *Luscinia calliope*, *Martes flavigula*, and *Prionailurus bengalensis*.	Natioanl II	Over the assessment area, cultivated land or woodland	It is mainly noise and impacts on habitat. The disturbance of construction noise will keep it away from the construction area and find new places for activities and food in other places.

Endemic animals	*Bombina maxima*, *Kaloula verrucosa*, *Rana chaochiaoensis*, *Rana pleuraden*, *Hebius octolineatum*, *Macropisthodon rudis*, *Japalura varcoae*, *Rhinolophus rex*, and *Eothenomys miletus*.	Unique to China	Farmland, forest edge shrubs, and reservoirs	Airport land occupation, noise and man-made interference

13 Pysical Cultural Resources

There are no known physical and cultural resources within the scope of the project. The Contractor shall establish incidental discovery procedures for the discovery of material and cultural resources: If any cultural relics are discovered during construction, (1) construction shall be stopped in accordance with Article 32 of the Law of the People's Republic of China on the Protection of Cultural Relics; (2) the site shall be protected and immediately reported to the Kunming Cultural Relics Administration; (3) the construction plan shall be adjusted according to the opinions of the Cultural Relics Administration of Kunming Municipality; (4) construction shall not be resumed until approved by the Cultural Relics Administration.

14 Social Impact Assessment

14.1 Social Impact Assessment Task

According to AIIB's Environmental and Social Framework (ESF), the objective of the social impact assessment is to avoid or minimize adverse environmental and social (ES) risks and impacts; Where unavoidable, identify these risks and impacts and develop and implement the necessary mitigation measures in accordance with the relevant laws and regulations of the People's Republic of China and the Bank's Environmental and Social Policy (ESP). Therefore, the social impact assessment of the Project is carried out to identify the positive and negative impacts of the Project through social participation methods such as data collection, field investigation, questionnaire survey, symposium, in-depth interviews, and agency interviews. The project will also develop social management plans to mitigate potential social risks, improve project design, safeguard the basic rights and interests of relevant stakeholders, and promote fair participation of all stakeholders in the project.

The main tasks of this social impact assessment are:

(1) Identify the main stakeholders of the project and understand the interests and needs of each stakeholder through extensive participation;

(2) Conduct appropriate investigations into the applicability of ESS 3 to ethnic minorities;

(3) Understand the possible social impacts of the Project, including positive and negative impacts, and identify the potential social risks of the Project according to the relevant requirements of AIIB's Environmental and Social Framework;

- Assess impacts on communities around the project, such as temporary access restrictions, and construction disturbances to traffic and other utilities. Impacts on residential and commercial units shall be studied to understand short- and medium-term disruptions caused by construction.
- Analyze labor health and safety, and the impact of labor influx on the community, and develop measures to manage interactions between the community and workers
- Analyze the risks to community health and safety during the construction and operation phases.

(4) Identify different levels of stakeholders, describe their key expectations, and analyze impacts, issues, and concerns associated with each of its stakeholder subgroups.

(5) Identify the risks and impacts faced by vulnerable groups, understand the attitudes of women and poor groups towards the Project, identify the impacts of the Project on them, and formulate risk mitigation measures.

(6) Assess the potential positive and negative social impacts of the project interventions on different stakeholder subgroups or beneficiaries, assess and prioritize impacts based on their significance, and propose measures to minimize negative impacts and maximize benefits from positive impacts.

(7) Strengthen the extensive participation of the public, put forward suggestions on project optimization design, and establish an information disclosure and complaint mechanism.
(8) Identify the possible adverse risks and impacts of the project, formulate mitigation measures to reduce these risks and impacts, and promote the realization of the project objectives. Use gender-disaggregated data and analysis and consider strengthening the design of projects to promote equality of opportunity and the socio-economic empowerment of women, particularly in the provision of services and employment.

14.2 Object and Scope of Social Impact Assessment

14.2.1 Objects of the Social Impact Assessment

The social impact assessment of the Project is conducted for both the major and minor stakeholders of the Project. The major stakeholders of the Project are the direct beneficiaries within the scope of influence of the Project and the groups negatively affected by the construction of the Project, including residents, vulnerable groups, households affected by land acquisition, teachers and students in schools, employees of enterprises and public institutions within the scope of Changshui Subdistrict and Dabanqiao Subdistrict under the jurisdiction of Kunming Airport Economic Zone, as well as airport passengers, airport construction and operation personnel, airline employees and other groups.

The minor stakeholders include Yunnan Airport Group Co., Ltd., Kunming Changshui International Airport Co., Ltd., Management Committee of Yunnan Dianzhong New Area, Natural Resources and Planning Bureau, Land Acquisition and Demolition Office, Housing and Urban-Rural Development Bureau, Comprehensive Law Enforcement Bureau, Transportation Bureau, Emergency Management Bureau, Health Commission, Human Resources and Social Security Bureau, Disabled Persons' Federation, Women's Federation, Changshui Subdistrict and Dabanqiao Subdistrict Offices, as well as design consultants (such as feasibility study/environmental impact assessment units), the Supervisor, contractors, media, etc. Meanwhile, attention should be paid to the situation of vulnerable groups and women in terms of livelihoods, development, and public participation.

14.2.2 Scope of the Social Impact Assessment

The scope of the social impact assessment of the Project covers 2 subdistricts and related affected communities within the scope of 7 subprojects in Kunming, as well as affected villages/communities, enterprises and public institutions, and other stakeholder groups in the surrounding areas.

14.2.3 Main matters of the Social Impact Assessment

The social matters to be focused on in this social impact assessment mainly include:
(1) Identify primary and secondary stakeholders and understand their attitudes and needs towards the project, including the needs of engineering construction, engineering operation,

employment and income increase, infrastructure, information disclosure, public participation, labor management, gender equality, health and safety, emergency management, etc.;

(2) Identify the potential social impacts of the project, including social benefits and social risks. For example, the main sensitive points and main concerns of residents/villagers, the possible impact of land acquisition and demolition during construction and implementation, the willingness of residents around the project area to participate and community health and safety, the identification of ethnic minorities, the impact of migrant workers on the local area, the evaluation of the employment system of the construction contractor, and the occupational health and safety system;

(3) Analyze the labor situation and its working conditions in the project area, including labor management and GBV management;

(4) Analyze the impact of the project on ethnic minorities and identify whether it is necessary to formulate an ethnic minority development plan;

(5) Analyze the impact of the project on women and the needs of women in the project area for the project, and identify whether there is any gender difference;

(6) Information disclosure and public participation in the Project, including the awareness, support, and participation degree of the APs in the Project;

(7) Project grievance mechanism and records, including grievance process and specific cases;

(8) Incorporate social factors into the project plan design, and propose measures to avoid or reduce negative impacts;

(9) Formulate the social management action plan of the Project, so that urban and rural residents in the project area can understand the Project as much as possible and participate in the implementation of the Project.

14.3 Objects of the Social Impact Assessment

With the close cooperation of Yunnan Airport Group Co., Ltd., AIIB Project Office, Management Committee of Central Yunnan New Area, relevant government departments, sub-district offices, communities/villages and individuals, the environmental and social impact assessment investigation team (including the environmental impact assessment investigation team and social investigation team) carried out public investigation in 4 communities within the scope of project implementation and relevant project sites around the airport from February 7 to 15, 2023.

(1) Agency interviews. For institutions and departments involved in the project area, such as Yunnan Airport Group Co., Ltd., AIIB Project Office, Management Committee of Central Yunnan New Area, Emergency Management Bureau, Natural Resources and Planning Bureau, Ecological Environment Bureau, Statistics Bureau, Human Resources and Social Security Bureau, Rural Revitalization Bureau, Ethnic and Religious Affairs Bureau, Women's Federation, Civil Affairs Bureau, Ecological Environmental Protection Bureau and

Transportation Administration Bureau, 14 institutional interviews and symposiums were conducted, and basic data and literature closely related to the project were collected. Details of the interviews are provided in the table below.

Table 14-1 List of Interviews with Project Districts and Counties01

	Interviews (Nr.)	Interview Department Details
Program Area	14	Yunnan Airport Group Co., Ltd., AIIB Project Office, Management Committee of Central Yunnan New Area, Emergency Management Bureau, Natural Resources and Planning Bureau, Ecological Environment Bureau, Statistics Bureau, Human Resources and Social Security Bureau, Rural Revitalization Bureau, Ethnic and Religious Affairs Bureau, Women's Federation, Civil Affairs Bureau, Transportation Administration Bureau and other institutions and departments, and sub-district offices of Changshui Sub-district and Dabanqiao Sub-district
Total	14	-----------------

Field Investigation The social impact assessment team conducted a field survey on the townships, streets, communities/villages affected by the construction of the Project, the surroundings of the airport, road conditions and infrastructure conditions, as well as the construction site of the project station. We have a more practical and objective understanding of the impact of the Project on the production and life of the surrounding residents and the land acquisition; the social and economic living conditions of the urban and rural residents and the affected people in the beneficiary area of the Project, as well as their suggestions, main concerns and demands for the Project and supporting facilities. The field investigation in each project area is shown in the following figure, and the details of the field investigation are shown in the following table.

Figure 14-1 Field Survey Map of Social Assessment Survey Team01

Table 142 Field Investigation in Each Project Area02

Municipal level	District Level	Streets in the project area	Visit communities/villages
Kunming City	Guandu District	Changshui Subdistrict	Wuxi, Fuxing, Hua Qing
		Dabanqiao Subdistrict	Changshui

(3) Focus group discussion. In order to have a more comprehensive understanding of the needs and suggestions of the affected people in the project area (including urban and rural residents, women, low-income groups and vulnerable groups in the project area), the assessment of the social and environmental impacts of the project beneficiaries near the current residential area and their expectations for the construction of the project, as well as the concerns and suggestions brought by the implementation and construction of the project, The social assessment team adopted a focus group discussion method in the field survey. The social impact assessment team held 14 resident focus group symposiums in different streets and communities in the project counties and districts, with a total of 193 participants. Among them, 93 are women, accounting for 48.19%; 78 are the elderly, accounting for 17.22%; 241 are heads of relevant departments, neighborhood committees and villagers' representatives, accounting for 53.2%.

Figure 14-2 Focus Group Symposium02

Interview on Key Information Provider The social assessment team interviewed the key informants at the levels of project county, township street and village/community respectively, so as to fully understand the attitude of stakeholders towards the project and provide better suggestions for project design and implementation. Interviews were mainly conducted with 42 key informants in the project area.

Figure 14-3 Interviews with Key Informants03

(5) Questionnaire survey. According to the probability-scale proportional sampling (PPS sampling) method, when the 95% confidence coefficient and the maximum absolute error d are 5%, the social assessment team calculated that the sample size of the questionnaire survey of this project is about 400, and the actual number of completed surveys is 400, which meets the statistical requirements. During the field investigation, the social assessment team completed a total of 400 one-to-one face-to-face questionnaires in the project area. After statistical inspection and screening, 400 of them were valid, and the validity rate of the questionnaires was 100%.

Figure14-4 Site Photos for Questionnaire Survey04

14.4 Identification of Stakeholders

Stakeholders refer to those individuals or groups that can affect or be affected or benefited by the realization of project objectives. Stakeholders can be divided into primary and secondary stakeholders.

According to the nature of the Project itself, the field investigation results and interviews with relevant institutions, the direct beneficiaries of the Project and the groups negatively affected by the construction of the Project are identified, including residents, vulnerable groups, land acquisition affected people, teachers and students of schools, employees of enterprises and public institutions within the scope of Changshui Subdistrict and Dabanqiao Subdistrict under the jurisdiction of Kunming Airport Economic Zone. as well as airport passengers, airport construction and operation personnel, airline employees and other groups.

The minor stakeholders include Yunnan Airport Group Co., Ltd., Kunming Changshui International Airport Co., Ltd., Management Committee of Yunnan Dianzhong New Area, Natural Resources and Planning Bureau, Land Acquisition and Demolition Office, Housing and Urban-Rural Development Bureau, Comprehensive Law Enforcement Bureau, Transportation Bureau, Emergency Management Bureau, Health Commission, Human Resources and Social Security Bureau, Disabled Persons' Federation, Women's Federation, Changshui Subdistrict and Dabanqiao Subdistrict Offices, as well as design consultants (such as feasibility study/environmental impact assessment units), the Supervisor, contractors, media, etc. Meanwhile, attention should be paid to the situation of vulnerable groups and women in terms of livelihoods, development, and public participation.

14.4.1 Secondary stakeholders

The main stakeholders of the Project include the direct beneficiaries of the Project and the groups negatively affected by the construction of the Project.

(1) Beneficiaries of the Project

① Residents in the surroundings of the project area

The direct beneficiaries of the Project are the residents in Dabanqiao Subdistrict and Changshui Subdistrict under the jurisdiction of the Airport Economic Zone (mainly including residents, women, vulnerable groups, teachers and students of schools, employees of enterprises and public institutions, floating population, etc. in the project area). The implementation of the project will directly benefit 81,700 people in the region, including 41,400 women, accounting for about 50.67%, and 849 vulnerable people, accounting for about 1.04%. The direct beneficiaries of the project area are detailed in Table 14-3 below.

Table 14-3 Overview of Direct Beneficiaries in the Project Area03

Program Area	Airport Economic Zone		Total
Subdistrict	Dabanqiao Subdistrict	Changshui Subdistrict	
Total Population (10,000 persons)	4.37	3.8	8.17
Number of female beneficiaries (10,000 persons)	2.21	1.93	4.14
Percentage of female beneficiaries	50.57%	50.79%	50.67%
Population of vulnerable groups	0.0497	0.0352	0.0849

(10,000 persons)			
Percentage of vulnerable groups	1.14%	0.93%	1.04%

Data source: from the feasibility study report of the Project and the social and economic statistical report of towns and townships in the Kunming project area in 2022.

② Airport Passengers

In addition to the residents in the project area, the airport passengers are also the main beneficiary groups of the Project. With reference to the feasibility study report and airport throughput of the Project, it is estimated that the passenger throughput of Kunming Changshui International Airport will reach 95 million in the future, so the annual number of beneficiary tourists will reach 95 million.

(2) Groups negatively affected by project construction

① Land acquisition-affected persons

It includes the groups whose normal production and life are negatively affected due to factors such as project construction and land acquisition, mainly including residents affected by permanent land acquisition, and also includes vulnerable groups in the project area, such as some low-income population and women.

According to the statistics of the resettlement impact investigation of the Project, the resettlement impact of the Project is mainly caused by the land acquisition involved in the reconstruction and expansion of the airport. The resettlement impact of the Project only involves the Wuxi Community, affecting 4 people in 1 household, all of which are affected by the permanent land occupation. The associated project involves the Wuxi Community, affecting 2 households and 9 people, all of which are affected by the permanent land occupation. For details, please refer to the Resettlement Plan of the Project.

② Noise affected persons

After the completion of the project, it is expected that the increase in flights will aggravate the noise levels in the affected communities. After assessing the baseline and projected noise assessment, relocation measures may be implemented in villages, schools, and hospitals in areas with noise contours above 85 dB and above 80 dB to address noise risks. Based on the noise prediction results of the environmental assessment, the noise mainly affected by Runway E2 is relocated to Changpo Village and Ganhaizi which is the leftover problem of noise relocation in the previous period, with a total of 1500 people. The relocation due to noise accumulated by the airport includes Huaqing Village and Fuxing Primary School, with a total of 833 people. Since the relocation due to noise occurs after the airport operation, there is no accurate information on the implementation of the relocation at present.

14.4.2 Secondary stakeholders

The secondary stakeholders of the Project include the PMO, the Project Owner, the government, and its relevant functional departments.

- Yunnan Airport Group Co., Ltd., Office of Asian Infrastructure Investment Bank Project Loan Special Working Group (hereinafter referred to as "AIIB PMO", the same below), Yunnan Dianzhong New Area Management Committee, etc.
- As the construction and operation and maintenance organization of the Project, the Project Owner is specifically responsible for and coordinates the business relations of all parties and is responsible for the organization and management of the project construction.
- The relevant government departments involved in the Project mainly include Yunnan Dianzhong New Area Management Committee, Natural Resources and Planning Bureau, Land Acquisition and Demolition Office, Housing and Urban-Rural Development Bureau, Comprehensive Law Enforcement Bureau, Transportation Bureau, Emergency Management Bureau, Health and Health Commission, Human Resources and Social Security Bureau, Disabled Persons' Federation, Women's Federation, Changshui Subdistrict and Dabanqiao Subdistrict, etc. At the same time, the implementation of the project also involves the grass-roots staff of specific community/village committees in the project implementation area. The smooth implementation of the project is inseparable from the coordination and cooperation of various government departments.
- The secondary stakeholders of the Project also include the consultant undertaking the design consulting work, the construction contractor undertaking the project construction, etc.

14.4.3 Analysis of the needs of stakeholders in the project area

(1) Residents' demand for reducing negative construction impacts

According to the field investigation of the social impact assessment team, the residents around the Project hope to reduce the negative impacts during the construction process, such as road blockage, dust emission, large vehicle access, noise aggravation, etc. caused by construction.

> Visit Record 14-1: Mr. Fu, aged 43, among others from Fuxing Community
> "I hope there will be less dust during the construction here in the future. Kunming is very dry and dusty this season. There are many open spaces near our home. As soon as vehicles pass by, a lot of dust will be raised. If the reconstruction and expansion of the airport starts, so many vehicles will definitely be dirty."
> "I still support the reconstruction and expansion of the airport. I hope that there will be fewer large vehicles and more large vehicles during the construction process. We are afraid that they will roll over when we drive nearby, which will still have some potential safety hazards."

(2) Residents' demands to reduce noise pollution

This project is a green airport development project. In 2019, the annual take-off and landing sorties of Kunming Airport were 360,000. After the completion of the project, the target year will be 2030, with 622,000 passenger aircraft take-off and landing sorties and 10875 cargo aircraft take-off and landing sorties. After the reconstruction and expansion of Kunming Airport, the flight volume will increase significantly. Aircraft noise also results in a significant increase in the number of noise-affected populations around the airport. Through the preliminary investigation and summary of the AIIB PMO and each relevant unit in the project area and the field investigation of the social impact assessment team, it is found that whether the noise has been generated now or may be generated after the reconstruction and expansion, the more urgent need of surrounding residents for airport reconstruction and expansion is to reduce noise pollution.

> Visit Record 14-2: Mr. Liu, aged 63, from Changpo Village
> "The noise is still quite loud. Actually, our village is quite a considerable distance from the airport, but we can still hear it. We the elders can accept it after getting used to it. But the youngsters like to sleep in, and getting woken up can really tick them off."

> Visit Record 14-3: Ms. Wang, aged 48, from Huaqing Village
> "There are airplanes flying over here every day. It's not too bad during the day, but at night it's so noisy that my daughter has to sleep with earplugs every time she comes home."
> "Our village is relatively close to the airport. Although the location is okay, the airplane noise is really annoying. It comes every so often and often causes ringing in my ears."
> "There is indeed noise, but it doesn't affect me much, as I'm used to it. Just like living next to a train track, once you get used to these sounds, you become less sensitive to them."

(3) Residents' Demand for Increasing Income Opportunities and Employment Opportunities

Through field research, it is found that the demand of stakeholder groups for increasing income opportunities and employment opportunities is significant. On the one hand, the surrounding residents hope that the facts of the Project can create more jobs and improve the original income; on the other hand, the residents also hope that the facts of the Project can promote the circulation of their own inherent assets, such as house rental and land circulation, thus increasing their income.

> Visit Record14-4: Mr. Li, aged 36, from Wuxi Community
> "In fact, from an overall perspective, the airport has indeed brought many benefits to the people around like us. After the construction of the first phase project, I resigned from the factory in another city I used to work at and found a job in a company nearby, earning over 5000 yuan a month. Now I hope that there will be more businesses after the completion of the second phase project, so that our salaries and benefits will be improved."

Visit Record 14-5: Ms. Zhang, aged 39, among other interviewees, from Changpo Village

"We all strongly support the Changshui Green Airport Development Project. Just look at our village. There are many shops and the business is booming. My parents also opened a small shop themselves. With more people around, business naturally grows. Even if one doesn't want to run a business themselves, renting out their property is also a profitable option."

"Well, it's a double-edged sword when it comes to airport expansion. If you ask me about the benefits, it definitely means more job opportunities. It would be great for my son to work close to home, and it's always better to keep the family together."

(4) Residents' Demand for Increasing Income Opportunities and Employment Opportunities

The carrying capacity of Terminal 1 of Changshui Airport is 38 million passengers, which has been overloaded as early as 2016. Although the S1 satellite hall was built later to increase the carrying capacity of the airport, it still cannot solve the problem. The long-term overload makes the experience of tourists at Changshui Airport worse, which greatly delays the travel time. Some tourists often complain that if they want to catch a plane at Changshui Airport, they must arrive at the airport three hours in advance. Every link of boarding needs to be queued. There are often delays in the plane due to the large number of tourists, which greatly reduces the travel experience of tourists.

During the construction of Phase I of the Project, the planning and construction of Terminal 1 of Changshui Airport are aimed at building a centralized terminal for mixed-use by multiple airlines. The landside rail transit is mainly positioned to share the traffic pressure of arrival and departure. Except for the partially completed Metro Line 6, no construction conditions for other rail transit modes are reserved. From the requirements of hub airport construction, the current Terminal 1 is relatively insufficient in adaptability to base airlines, transfer process, landside rail transit, and connection conditions with satellite concourses.

At present, the challenges faced by Kunming Airport mainly include the following aspects:

- The insufficient capability of resource support. With the rapid growth of the Yunnan aviation market, the capacity bottleneck of Kunming Airport has been very prominent in recent years. The runway, apron, and terminal are all in saturated operation, which is difficult to meet the strong demand of aviation passengers.
- The transit time is too long, the process needs to be improved urgently, and the service quality needs to be improved.
- The construction of the comprehensive transportation system is not perfect, and the comprehensive transportation hub with the airport as the core has not yet been formed.
- Therefore, tourists have urgent requirements for Yunnan Kunming Changshui Green Airport Development Project.

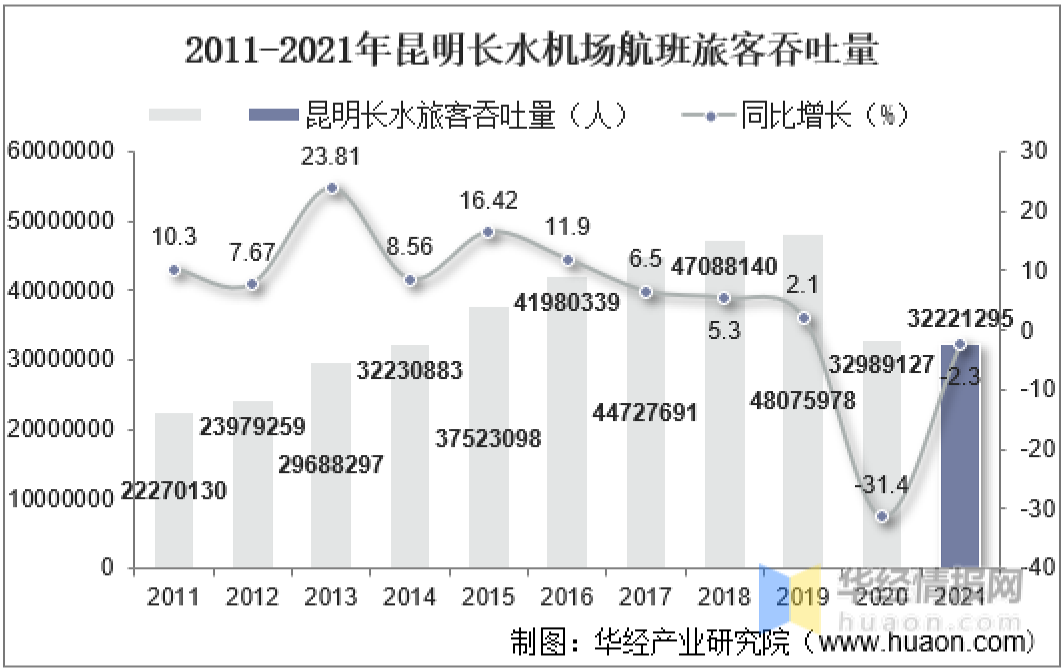


Figure 14-5 Passenger Throughput of Kunming Changshui International Airport in 2011–202105

(5) Needs of Stakeholder Groups for Project Information Awareness

In the process of field investigation, interview, and discussion, the ESIA preparation unit found that the staff of the relevant government functional departments or grass-roots government departments of the Project had a certain degree of improvement in the awareness rate of the construction content of the Project, and most residents in the project area knew the construction content of the Project through various ways. However, the primary way for the general residents in the project area to know about the Project is to hear others say that the awareness and participation rate of the grass-roots masses still need to be improved, and it is necessary to further increase the project publicity and actively guide the public participation.

Visit Record 14-6: Mr. Ma, aged 52, among others from Wuxi Community

"We are all very concerned about the Changshui Green Airport Development Project, and especially worried about whether our village will be demolished. The sooner we know the news, the sooner we can get prepared."

"At present, we obtain information through community broadcasting or word of mouth from relatives and neighbors. Online, you may receive push notifications of such information if you follow certain public accounts. I could not tell you more since I have yet to follow any. The issue we have now is that there is abundant information being shared between neighbors, but we can not tell what is true and what is false."

(6) Stakeholders' needs for participating in the project development

In the field interview, it was found that the stakeholders of the Project have a high demand for project participation, including participating in the villagers' congress, participating in the jobs provided during the construction period of the Project, participating in various mass supervision activities, etc. In addition, the people in the project area have high support for the project. If there is a long-term job opportunity, they are willing to participate in the project during the implementation and operation of the project, such as working as site workers during the construction period, which increases the family's economic income and also takes into account the household chores.

Visit Record 14-7: Mr. Fu, aged 42, among others from Fuxing Community
"I have been attending collective meetings whenever I am free, and sometimes there are researchers like you who come to investigate. We are all willing to answer."
"I'm really interested in participating in the project, especially in taking a job. If there's a construction team recruiting workers, I would definitely apply. I don't have much to do at home, and it's not easy to find a job."

14.5 Social Impact Analysis

The preparation unit of the environmental and social impact assessment (hereinafter referred to as the "ESIA preparation unit", the same below) completed a total of 400 questionnaires in 2 sub-districts within the scope of project implementation from February 7 to 15, 2023. After statistical inspection and screening, there were 400 valid questionnaires, and the validity rate of the questionnaires was 100%. Respondents included 203 males and 197 females of different ages, education levels, and occupations. At the same time, the ESIA preparation unit held 11 resident-focus symposiums with 193 participants, of which 93 were women, accounting for 48.19%.

14.5.1 Social benefits

According to the field investigation, the direct benefit scope of the implementation of the Project is Dabanqiao Subdistrict and Changshui Subdistrict in Kunming Airport Economic Zone, the indirect benefit scope is Guandu District of Kunming City, and the radiation benefit scope is the annual throughput population of Kunming City and Changshui Airport. See Table 14-4 for specific data.

Table 14-4 List of Beneficiaries of the Project04

	Direct benefited	Indirect benefited	Radiation benefited
Total Population (10,000 persons)	8.18	161.09	10350.20
Female population (10,000 people)	4.14	75.22	5055.24
Percentage of women (%)	50.61%	46.69%	48.84%

Data source: The population data is from the project feasibility study report and the statistical report on national economic and social development in the project area.

On the whole, combined with the field investigation and the statistical analysis results of

400 questionnaires, it can be found that the positive impacts of the implementation of the Project mainly include the following aspects: (1) 92.25% of residents believe that the project construction can expand the airport throughput; (2) 86.75% of the residents think that they can bring the development of animal industry around the airport; (3) 88% of residents believe that the project construction can enrich the employment opportunities of residents in the project area; (4) 80.25% of the residents believe that the project construction will promote the rural modernization in the project area.

Table 14-5 List of Resident's Awareness of the Positive Impact of Project Implementation05

Statistical indicators Specific Options	What are the possible positive impacts of the implementation of the Project?				
Awareness of residents	Expand airport throughput	Enrich employment opportunities	Promote income increase of residents	Consolidate and enhance the results of poverty alleviation	Promoting rural modernization
Sample size	369	355	352	318	329
Proportion (%)	92.25	88.75	88.00	79.50	82.25

Expand airport throughput

The carrying capacity of Terminal 1 of Kunming Changshui International Airport is 38 million person-times. According to Table 14-6, as early as 2016, the tourist throughput of Changshui International Airport reached 41.98 million person-times, and then increased year by year. By 2019, it reached its peak, with the tourist throughput reaching 48.076 million person-times, far exceeding the actual carrying capacity of Terminal 1. Affected by the COVID-19 pandemic after 2020, the tourist throughput of Changshui Airport decreased to 32.991 million, but for tourists, the reconstruction and expansion project of Changshui Airport is still urgent.

The long-term overload makes the experience of tourists at Changshui Airport worse, which greatly delays the travel time. Some tourists often complain that if they want to catch a plane at Changshui Airport, they must arrive at the airport three hours in advance. Every link of boarding needs to be queued. There are often delays in the plane due to the large number of tourists, which greatly reduces the travel experience of tourists. However, the reconstruction and expansion of T2 can directly expand the throughput of Changshui Airport, increase the carrying capacity to 95 million person-times, alleviate the overload of T1, reduce the boarding time of tourists, and improve the comfortable travel experience of tourists.

Table 14-6 Comparison of Forecasted and Actual Passenger Throughput of

Kunming Airport06

Year	2008 Master Plan	Original Feasibility Report	Project Study	Actual
2010	1800	2035		2019.2
2011	1907	2239		2227.0
2012	2020	2500		2397.9
2013	2139	2808		2968.8
2014	2266	3145		3223.1
2015	2400	3400		3752.3
2016	2631	3771		4198.0
2017	2884	4091		4472.8
2018	3162	4419		4708.8
2019	3466	4750		4807.6
2020	3800	5000		3299.1

In addition, the positive benefits brought by the Project can also be confirmed by the support of the respondents for the Project. As shown in the figure below, no respondents object to the Project, 82% of the respondents strongly support the Project, 17.5% support the Project, and 0.5% say they are neutral.

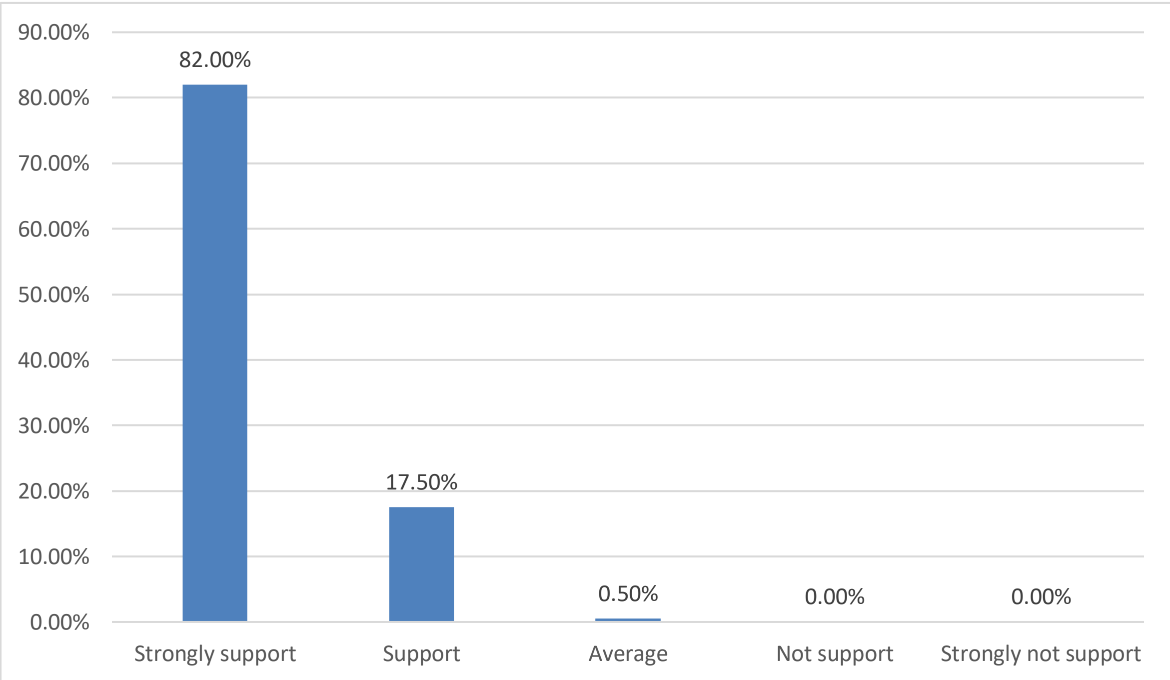


Figure 14-6 The Satisfaction with the Construction of the Project06

(2) Enrich employment opportunities

Direct employment opportunities. On the one hand, during the construction of the Project, some temporary and low-technology jobs will be provided for the surrounding villagers, including unskilled workers such as construction, cleaning, logistics, transportation, and catering support. Such jobs will be recruited by the Construction Contractor, and the salary is mostly RMB 100–200/day, which is flexible. In order to protect the rights and interests of women, the construction contractor is required to give priority to the employment of female employees, and the proportion of female workers shall not be less than 20%. Details of direct employment opportunities can be found in 3.5 Labour and working conditions.

Indirect employment opportunities. In 2022, 16 major industrial projects will be declared in the Airport Economic Zone, including 6 projects worth more than RMB 1 billion and 2 Fortune Global 500 enterprises. At present, there are 15,843 market entities in the Airport Economic Zone, an increase of 1,430 compared with 14,413 at the end of December 2021. In addition, the Airport Economic Zone has cultivated 6,637 enterprises and 9,847 individual businesses, with an annual target of 296 new businesses and an actual completion of 949 businesses. According to the field investigation, the implementation of the Project will promote the development of introduced industries, including modern agriculture, processing, manufacturing, service, and cultural tourism. The modern agriculture includes special fruit and vegetable picking, and agritainment, etc., such as strawberry, peach, plum, grape picking, etc., which are mainly distributed in the villages near Changshui Airport and contracted by villagers privately. The scale is not large, but the quantity is large. After years of development, it gradually forms a scale. The processing and manufacturing industry fully reflects the characteristics of the airport. It mainly focuses on non-ferrous and rare precious metals, new materials, biomedicine, high-end equipment manufacturing, and optoelectronic equipment, and focuses on the development of high-end airport economic industries such as intelligent environmental protection, high-end manufacturing, new technology research and development, electronic communication and biomedicine. The service and cultural tourism industry focuses on the exchange groups near the airport, focuses on the development of airport business industries such as business office, building economy, headquarters economy, hotels, shopping, and financial services, and strives to build an integrated logistics area dominated by modern aviation logistics and supplemented by business office facilities. On the other hand, in the operation stage of the project, with the settlement of more industrial clusters, the number of jobs will increase significantly. Both professional and low-skilled jobs require a large number of labor forces, and the surrounding residents can be employed nearby according to their own actual situation. Taking the upcoming Outlets as an example, the mall will attract more than 100 stores, each of which can create jobs for 3–10 people, and more than 650 people can also be created by an average of 6.5 people.

Figure 14-7 Development of Surrounding Industries in the Project Area07

(3) Promote the increase of residents' income

The implementation of the Project will increase the income increase opportunities of surrounding residents, which are reflected in the improvement of wages and the revitalization of inherent assets.

Promotion of wages and benefits. Before the construction of Changshui Airport, there were few employment opportunities and low wages around the airport, with an average monthly income of about RMB 2,000, which was far lower than that of the main urban area of Kunming, so there were many migrant workers. With the construction of the airport, the industry develops accordingly, the number of jobs increases, and the salary is also improved. The average monthly income can reach about RMB 3,500. The employee security system is also more perfect, which can not only retain local residents, but also attract more non-local workers.

Vitalization of inherent assets. The implementation of the Project will also promote the appreciation of idle self-owned assets of residents in the project area, and effectively promote the revitalization and utilization of idle houses and land assets. In terms of houses, implementing and completing the Project can drive the increase of local enterprises, cooperatives, and people flow, and increase the demand for local housing, catering, leisure, and shopping. On the one hand, local residents can rent out their own houses and obtain rental income. On the other hand, they can also use their own real estate to do small businesses to obtain stable income. In the case of land. In addition, due to physical and age reasons, residents in the project area can transfer out the land that is unsuitable for farming, thus obtaining rental income. If there is a certain amount of capital accumulation, residents can also choose to transfer other people's land and establish family farms to form an intensive farming mode, reduce farming costs and promote family production and income increase.

Figure 14-8 Asset Lease and Job Opportunities in the Project Area08

(X) Consolidate and enhance the results of poverty alleviation

The reconstruction and expansion project of Changshui Airport is conducive to consolidating and expanding the achievements of poverty alleviation and effectively connecting with rural revitalization. It not only promotes the export of characteristic products in Kunming and even the whole Yunnan Province, but also lays a solid foundation for the development of tourism in Yunnan Province.

In 2020, all 4.71 million registered households, 88 poverty-stricken counties, 8,502 poverty-stricken villages (including 27 deep poverty-stricken counties, 3,539 deep poverty-stricken villages, and 2,471,400 deep poverty-stricken people) and 11 "directly-transferred ethnic groups" and "ethnic groups with fewer populations" in Yunnan Province were lifted out of poverty as a whole. The problem of absolute poverty that has plagued Yunnan for thousands of years has been solved historically. However, poverty alleviation is not the focus, and how to make poor areas stable and rich is the key. In this context, the Airport Group has taken advantage of civil aviation resources and taken a series of new measures to organically combine rural revitalization with the whole industrial chain of enterprise resources. Focusing on "strong agriculture, beautiful countryside and rich farmers", the Group has fully implemented the general requirements of "prosperous industry, ecological livable environment, civilized countryside, effective governance and prosperous life" from the aspects of industry, funds, talents and policies. Vigorously implementing the rural revitalization strategy has explored a unique way of hope.

For example, the Group signed a contract with Guangnan County Plateau Characteristic Agricultural Investment and Development Co., Ltd. to transfer the management right with compensation, and provided 57.68 square meters of shops for free in the area near the center of the departure area of Kunming Changshui International Airport for the exhibition and sale of local poverty alleviation characteristic products. Calculated at the monthly rent of RMB 1,800/m2, the accumulated annual assistance value reached RMB 1.25 million. In addition, focusing on the air freight of Ninglang 2700 rock sugar apples, the Airport Group has applied for ultra-low transportation prices with airlines, made full use of the advantages of low cost of chartered cabins and guaranteed transportation volume to actively promote "Yunnan products", gave full play to the location advantages of the airport, and actively contributed the wisdom and strength of the airport to rural revitalization with practical actions. Up to now, hundreds of tons of apples have been sold. It has truly realized the direct export of "Xiaoliangshan" products to Yunnan.

By the end of 2022, the Airport Group has carried out strategic coordination with airlines and freight forwarders to reduce the freight price of some routes by about 50%, and promoted more than 10 kinds of green food and about 200,000 tons of agricultural and sideline products to fly out of Yunnan. It has opened all-cargo routes for matsutake, tea, and other agricultural and sideline products, realizing the transportation of more than 500 tons of matsutake, tea, and other agricultural and sideline products, and boosting the output value of local special agricultural products such as tea and matsutake. In the future, the expansion of the East Freight Area will further transport coffee, apples, peas, tree tomatoes, Capsicum frutescens, honey, black-bone chicken, etc. from Yunnan to all parts of the country by air, so as to better build air bridges and service channels for rural revitalization.

In addition, as the aviation transportation hub of Yunnan Province, Changshui Airport is the only way for passengers to fly to cities in Yunnan Province. The development of Changshui Airport is an opportunity to promote the development of tourism in Kunming and even Yunnan Province.

(5) Promote rural modernization

For the surrounding residents, the Project can improve the contact opportunities between the residents in the project area and the outside world, and expand their horizons and visions, thus driving their mindset changes and accelerating the mobilization of rural modernization in the project area.

First of all, the implementation and operation of the Project will bring many income increase opportunities to the surrounding communities. Villagers will integrate their own resources according to the needs of people near the airport and actively become rich by opening restaurants, homestays, supermarkets, express stations, maintenance shops, parking lots, car washes, etc.

Second, in order to enhance the competitiveness of peers, some residents will learn driving skills and purchase vehicles to provide pick-up and drop-off services for homestay residents, thus increasing the number of vehicles and improving the employment skills and ability of the masses.

Finally, an increasing number of tourists have brought a more modern lifestyle, which has implicitly guided the changes of local people, such as the improvement of a sanitary environment, the introduction of a modern lifestyle, and the upgrading of toilets to water closets.

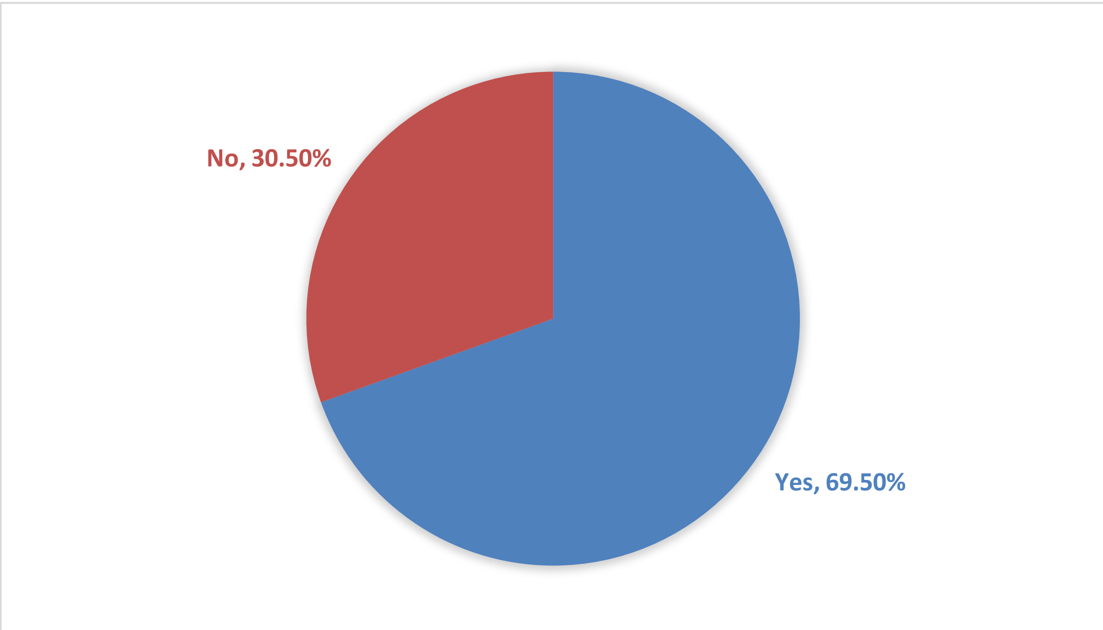


Figure 149 Own a Car or Not09

Visit Record 14-8: Mr. Weng, aged 53, from Wuxi Community
"Changshui Airport sure brings us many benefits. In the past, the young in our village worked in the city, and the old worked on the land. Now with more non-local people coming here, the villagers have learned to utilize existing resources to make a living. "You might have seen that there are all kinds of shops over there at the village entrance, such as restaurants, homestays, supermarkets, and courier stations. Many of them are operated by the villagers themselves, and of course, some shop fronts are rented by nonnatives to do business. This is something we couldn't have imagined before."

14.5.2 Social risks

According to the field investigation and the statistical analysis results of 400 questionnaires, the negative impacts of the implementation of the Project mainly include the following aspects:: (1) 66.5% of residents believe that the project construction will have an impact on land acquisition; (2) 94.5% of residents believe that the project construction will bring noise pollution risks; (3) 54.75% of the residents believe that the project construction will bring air pollution, water pollution and other environmental impacts; (4) 78.75% of the residents believe that the project construction will have an impact on the health of local residents caused by the influx of workers during the construction period.; (5) 61.75% of the residential heat will bring traffic safety risks to the project construction.

Table 14-7 Statistics of Negative Impact on Residents' Awareness during Project Construction and Operation07

Indicator category	Possible negative impacts during the implementation of the Project				
Awareness of residents	Influence of land acquisition	Risk of noise pollution	Other environmental impacts such as atmospheric and water pollution	Impact of influx of workers on health of local residents during construction period	Traffic safety risk
Sample size	266	378	219	315	247
Proportion (%)	66.50	94.50	54.75	78.75	61.75

1. Land Acquisition Impact

The Project and related projects involve the permanent occupation of 213.83 mu of collective land (67.36 mu of related projects), of which 146.46 mu of new collective land is acquired for the Project, including 20.68 mu of shrubs and 95.4 mu of arbors. The compensation standard is calculated in mu, and the ownership is the Wuxi Community Village Collective, which affects the Wuxi Village Collective and one household and four people in the village. 67.36 mu of collectively-owned land is newly acquired for related projects, including 0.56 mu of shrubs and 63.64 mu of arbors. The compensation standard is calculated in mu, and the ownership is the Wuxi Community Village Collective, which affects the Wuxi Village Collective and 2 households and 9 people in the village.

The Project and related projects do not involve temporary land occupation, residential house demolition, etc. The existing state-owned land basically belongs to the existing land of Yunnan Airport Group, and there are no remaining problems. Therefore, the social assessment team believes that the land acquisition impact caused by the construction of the Project is medium and low risk. See the RAP for details.

Risk of noise pollution

In the Phase I Project of Changshui Airport, according to the environmental impact monitoring results, the monitoring values of N1 Ganhaizi Village, N12 Kunming Guanghua School, N18 Xingyuan School and N20 Yunnan Agricultural Vocational Technical School in the 20 monitoring points exceeded the standard limit of Environmental Standard for Aircraft Noise around Airport (GB9660-88). For the above out-of-limit points, Xingyuan School has stopped running schools, and other points have not taken engineering measures such as relocation and sound insulation reconstruction. According to the calculation of the current annual average noise impact level, under the current air traffic volume level of Kunming Airport, 18 acoustic environmental protection targets have exceeded the standard, including 8 villages, 10 colleges and hospitals. The current noise of the airport shall have a significant impact on the surrounding acoustic environment, and engineering measures such as door and window sound insulation have been taken at 1 of the 18 exceeding points. 6 villages and 3 schools exceeding the standard shall be relocated step by step according to the planning of the airport area. However, compared with the noise prediction results in 2020 of the previous EIA target year (similar to the current flight volume in 2019), there are still 3 new over-standard points, namely Dacunzi (76.1 dB), Xinqiao Village (75.6 dB) and Fuxing Primary School (71.5 dB). The new point location exceeds the standard, which is caused by changes in some operating conditions (aircraft type combination and flight procedures) during the actual operation of this phase.

Based on the monitoring data of Phase I, the predicted values of 53 acoustic environmental protection targets in the Phase II Project of Changshui Airport exceed the Class I and Class II regional standards of Environmental Standard for Aircraft Noise around Airports (GB9660-88). There are 26 affected residential areas, and 3,598 households/10,991 people are located in areas exceeding 75dB. A total of 27 schools are affected, and the airport noise will have a significant impact on the surrounding acoustic environment.

The air pollution of the Project is divided into implementation period and operation period. The noise pollution during the construction period mainly comes from site excavation and the noise emitted by construction machinery and motor vehicles, including mechanical construction, earth excavation, construction of runways, tunnel excavation, and paving, transportation of large vehicles, excavation of mountains, take-off, and landing of aircraft, etc., which will affect the surrounding residents. During the operation period, the noise mainly comes from the take-off and landing of the aircraft, which will be particularly obvious from 20:00 p.m. to 6:00 a.m. During the field investigation, the social assessment team found that some Phase I noise protection works in the project area were not implemented in place, and residents had a low understanding of the noise impact. In addition, the cumulative impact of Phase II construction will be obvious.

For this purpose, different measures can be taken according to different noise impacts in decibels and different places, such as strengthening sound insulation protection and changing takeoff time. In addition, considering the cumulative impacts of Phase II, it is recommended to manage in accordance with the noise management plan that has been prepared.

Other environmental impacts

Other environmental impacts include air pollution risk, water pollution risk and communication signal interference risk. These risks have minor impacts, and the specific analysis is detailed below.

Air pollution risk The air pollution of the Project is divided into implementation period and operation period. During the implementation period, on the one hand, large-scale excavation, construction of access roads, and rolling of motor vehicles during construction operations, and the dry climate in Kunming make it inevitable to generate a large amount of dust pollution. On the other hand, during the construction period, there will be more outside vehicles and exhaust emissions will also increase, which will aggravate air pollution to some extent. During the operation period, air pollution is mainly manifested as aircraft and station washing, aircraft exhaust emissions, and exhaust emissions from passing vehicles. In view of this, on the one hand, it is necessary to strictly control the loading and access of construction vehicles, and spray water to reduce dust in time during construction; on the other hand, it is necessary to encourage everyone to use new energy vehicles and guide them to use new energy vehicles from public transportation and taxis, so as to reduce exhaust emissions.

Risk of water pollution Water pollution mainly refers to the pollution of regional surface water, especially drinking water in residential areas, during the construction of the Project. In terms of airport construction, although the Project does not produce industrial wastewater and waste materials, and the water pollution is relatively light, the ESIA preparation unit still found during the investigation that some residents reported that the wastewater from aircraft washing and site cleaning flowed into their reservoirs (mainly surface water), and felt that the drinking water was polluted and the fish in the reservoirs were not as delicious as before. In general, the pollution of the reconstruction and expansion project of Changshui Airport to the surrounding residents' drinking water mainly includes: first, the domestic waste pollution of workers during the construction period; second, the dust pollution generated during the construction period, and third, the engine oil, sewage, and domestic waste pollution generated during the airport operation period. These three aspects may pollute the drinking water of the residents around the project area. While doing a good job in management and preventive measures, the construction organization of the construction contractor shall be supervised to ensure that the reasonable construction team will not discard soil at will during construction, so as to effectively reduce such risks.

Risk of interference with communication signals. For residents near the airport, it is very common for communication signals to be disturbed, but the impact on residents' daily life is not too large because it is a phased impact during take-off and landing. For example, some residents in Wuxi Community said that communication signals are occasionally affected only when aircraft take off or land, and communication signals are not always affected.

(4) Impact of influx of workers on local residents during construction period

During the construction period, the Project is expected to import about 621 labors from other places, including about 497 male workers and about 124 female workers. See the current situation of labor management for specific data. After entering the site, most of the workers will live in Wuxi Community, Changshui Community, Fuxing Community and Huaqing Community around the airport construction unit, so they will have a certain impact on the residents of these communities.

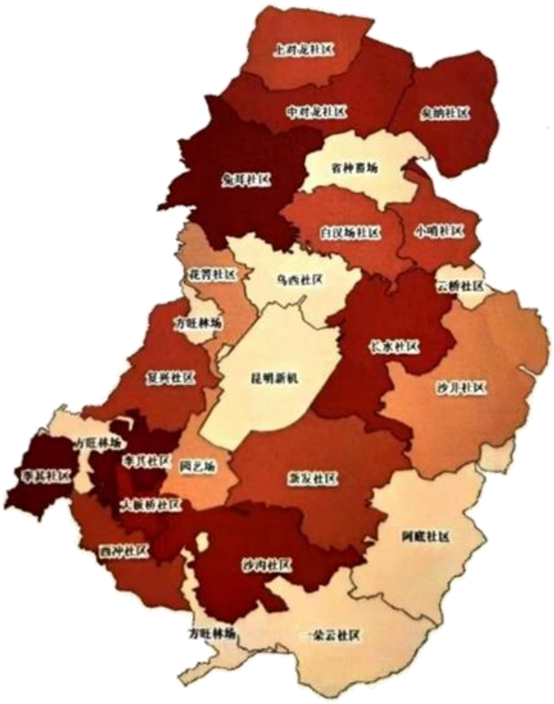


Figure 14-10 Distribution of Communities around the Airport010

On the one hand, when migrant workers come to work near the airport, most of them will choose to rent houses in the communities around the construction site. In addition to work, their daily activities are also in the surrounding communities such as Uxi Community, Changshui Community, Fuxing Community and Huaqing Community. Due to different languages, they may not recognize the village regulations and local customs of local people, resulting in obstruction of social communication. Social contradictions and problems arise. The residents of Huaqing Community reported that some outsiders came to rent houses and some came to rent shops in the community to do business. Although it promoted local development to a certain extent, it may cause conflicts with local people due to disorderly parking of vehicles and untimely payment of rent.

Figure 14-11 Community Shops and Vehicle Parking011

At the same time, during the construction period, the settlement of non-local workers in the project area for long-term operations will increase the intensity of communication and interaction with local residents to a certain extent, which is easy to cause certain health risks such as the transmission of transmitted diseases or epidemic diseases. For example, in terms of residents' health and hygiene, some epidemic diseases (including AIDS, COVID-19, influenza, etc.) have the conditions for transmission and spread. In order to mitigate the risk due to the influx of labor, appropriate worker camp management procedures need to be in place.

On the other hand, most non-local workers will choose to rent houses around the construction contractor when they come to the airport, so their daily activities other than work will also occur in communities such as Uxi Community, Changshui Community, Fuxing Community and Huaqing Community, which will lead to the intensification of the existing resource shortage in these communities. For example, Huaqing Community, Wuxi Community, and other surrounding communities basically use groundwater. The increase in population brings water pressure and frequent water cut-off, which makes local people often dissatisfied and complain. In addition to the increase in water pressure, the electricity pressure also increases. The existing households that consume electricity far exceed the original circuit planning of the community, and frequent power outages affect the daily life of residents. On the other hand, as the population increases, the domestic garbage and wastewater generated also increase, which also poses certain challenges to the local environment. Therefore, it is also necessary to provide more perfect hydropower infrastructure and garbage disposal facilities to enhance the local environmental carrying capacity and improve the convenience of residents' life.

Figure 14-12 Community Waste Disposal and Water Pipe Maintenance012

Traffic safety risk

The traffic safety risks of the Project are divided into traffic safety risks during the construction period and traffic safety risks during the operation period. The risk level is low.

During the construction period, large mechanical vehicles will shuttle and roll during the construction operation, and the number of external vehicles will increase, which will cause damage to the existing pavement around the community, and may also lead to traffic safety accident risks in some villages without traffic signs. The social assessment team found through field investigation that Wuxi Community, Fuxing Community, Huaqing Community and Changshui Community are all located within 10km from Changshui and close to the construction site, so large vehicles will inevitably pass through communities or villages near the airport during the construction period. On the one hand, the frequent passage of large vehicles will damage the existing pavement around the community, reduce the road safety factor, and may increase the potential safety hazards of the road. On the other hand, although the road infrastructure of the trunk road near the airport is relatively complete, including the provision of road traffic signs, traffic lights, street lamps, protective fences, etc., due to the large number of communities and villages near the airport, the road connection between villages is not smooth enough, and some villages lack traffic signs, traffic safety accident risks will occur.

During the operation period, with the increase of operators and vehicles in the project area, conflicts and disputes such as collision accidents and random parking will rise within a certain period of time. According to the investigation of the social impact assessment team, the current number of motor vehicles in the communities around the airport is about 5,748, and it is estimated that 1,798 motor vehicles will be added on this basis with the progress of the Project. See the following table for specific data. The increase of access vehicles will lead to an increase of collision accidents between vehicles, electric vehicles, collisions, poultry and animals, etc. In addition, the increase of vehicles will also cause traffic disorder, such as disorderly parking, which brings certain traffic safety risks.

Table 14-8 Number of Motor Vehicles in the Community Around the Airport08

Community	Registered population: 5.4 million	Migrant population (person)	Distance from Airport (km)	Number of Motor Vehicles (Nr.)	Estimated Increase of Motor Vehicles (Nr.)
Wuxi Community	1768	669	3	1025	511
Fuxing Community	2155	876	4	1652	329
Huaqing Community	1508	573	6	897	420
Changshui Community	2976	1598	5	2174	538
Total	8407	3716	——	5748	1798

14.6 Current Status of Labor Management

14.6.1 Management of migrant workers during construction period

(1) Analysis of potential labor management risks

During the construction period of the Project, the reconstruction and expansion project of Kunming Changshui International Airport involves a wide range, a deep degree, and a large number of works, so it is necessary to organize professional construction teams for construction. Once the professional construction teams cannot meet the qualification and construction requirements locally, a certain amount of labor force will need to be imported from other places (provinces, cities, and counties). It is expected that about 494 laborers will be imported from other places (about 401 male workers and about 93 (18.83%) female workers); about 817 local workers (about 665 male workers and about 152 (18.6%) female workers) will be recruited (mainly porters, scaffolders, masons, cleaners, cooks, etc.). Among them, the male labor force is mainly large workers and skilled workers, while the female labor force is mainly unskilled workers. During the construction process and in the daily affairs of the construction site, special attention shall be paid to gender-based violence, discrimination against women during employment shall be avoided, and physical and psychological or sexual harm shall be avoided to women, including gender-based violence such as threats, coercion or arbitrary deprivation of liberty. During the construction process, attention shall be paid to the proportion of male and female workers, and the proportion of female workers shall be increased.

A large number of migrant workers have settled in the project area to carry out long-term operations, which has increased the intensity of communication and interaction with local residents to a certain extent. At the same time, migrant workers will move and consume in residential communities and relevant streets and shops near the construction site, thus causing certain social and health risks. For example, in terms of residents' health and hygiene, some epidemic diseases (including AIDS, COVID-19, influenza, etc.) have the conditions for transmission and spread; At the same time, the lack of understanding of the local social culture and traditional customs of the project area by external personnel may lead to unintentional violations of local social and cultural customs (including religious beliefs, graves, temples, wedding and funeral customs, etc.), which will cause potential crises and troubles. In order to mitigate the risk due to the influx of labor, appropriate worker camp management procedures need to be in place.

Through a comparative analysis of China's legal framework on labor security and the key requirements of ESS1 labor and working conditions standards in AIIB's Environmental and Social Framework, it is found that China's legal framework on labor security is consistent with AIIB's requirements and even stricter than AIIB's requirements, such as the legal age for child labor. Therefore, the existing legal framework of the People's Republic of China is consistent with the key requirements of AIIB ESS1.

Table 14-9 List of Expected Labor Force Quantity of the Project09

		Project Construction Stage (No.)	Project Operation Stage (No.)	Total (No.)
Local labors	Total Number of Persons (person)	817	312	1129
	Number of Women (person)	152	81	233
	Percentage of women (%)	18.60%	25.96%	20.64%
Migrant labors	Total Number of Persons (person)	494	127	621
	Number of Women (person)	93	31	124
	Percentage of women (%)	18.83%	24.41%	19.97%
Total (No.)		1311	439	1750

(2) Construction Management Measures

Through a comparative analysis of China's legal framework on labor security and the key requirements of ESS1 labor and working conditions standards in AIIB's Environmental and Social Framework, it is found that China's legal framework on labor security is consistent with AIIB's requirements and even stricter than AIIB's requirements, such as the legal age for child labor. Therefore, the existing legal framework of the People's Republic of China is consistent with the key requirements of AIIB ESS1.

The specifications for labor management of the Construction Contractor include:

(1) The project team members must be hired without bias towards any particular groups including women, individuals with disabilities, migrant workers, or employees who are legally recognized as young and within the applicable working age for their occupation., in accordance with the principles of equal opportunity and fair treatment.

(2)Provide appropriate protection and assistance measures, including establishing county limits on working hours and rest periods, and providing for a system of leave to protect the safety and health of workers from a time perspective. At the same time, sufficient and complete labor protection articles shall be reasonably equipped according to the construction needs, hazardous factors in the construction site, and labor safety and health needs. Provide special attention and support to certain categories of employees, including women, individuals with disabilities, migrant workers, and employees who are legally recognized as young and within the applicable working age for their occupation.

(3) Workers are entitled to create or become a part of worker organizations that they prefer and safeguard their ability to engage in collective bargaining without any external interference, as per the laws of the country.

(4) In order to prevent sexual harassment, the Contractor will set up sufficient facilities for the separation of men and women in the temporary toilets on the construction site according to the number of female workers. Formulate relevant rules and regulations to prevent sexual harassment, assign special personnel to take charge, and clearly inform all personnel of relevant requirements. The prevention of sexual harassment will be included in the Contractor's daily management training.

Establish and clarify the complaint mechanism for handling labor complaints and reports, clarify the supervision mechanism for labor protection, and protect individual privacy according to law when handling sexual harassment complaints;

Design optimization and mitigation measures

According to the identified risk factors of potential labor management of migrant workers during the construction period, the social assessment unit has formulated relevant design optimization and mitigation measures after consultation with the AIIB Project Office, various implementing agencies and design units. See Chapter VI Social Management Plan for details.

14.6.2 Management of YAG employees

(1) Analysis of potential labor management risks

YAG currently has 13 airports, including 1 national gateway hub airport, Kunming Changshui International Airport and 12 airports in Lijiang (medium-sized hub, national Class I port), Xishuangbanna (medium-sized hub, national Class I port), Dehong Mangshi (medium-sized), Tengchong (medium-sized), Diqing Shangri-La (small branch line), Dali (small branch line), Simao Pu'er (small branch line), Baoshan (small branch line), Lincang (small branch line), Wenshan (small branch line), Zhaotong (small branch line) and Lugu Lake (small branch line). The Group has about 13,000 regular employees, including about 4,000 regular employees at Kunming Changshui International Airport, a hub airport, with women accounting for about 25%.

The social assessment team found through field investigation that YAG's potential labor management risks include the impact of aircraft noise on employees during work, possible emergencies and quality and safety accidents, risks of sexual harassment or sexual assault, risks of health and infectious diseases, and risks of lack of guarantee of wages and welfare.

(2) Construction Management Measures

The PMO and the PIA shall ensure that the construction contractors and contractors strictly abide by the relevant laws and regulations of the People's Republic of China on labor safety, ensure that relevant personnel for project implementation is treated fairly in accordance with the labor-management measures, and regulations of Kunming, and provide a safe and healthy working environment for them. To achieve the goal of labor security, the Management Committee of Yunnan Dianzhong New Area and Yunnan Airport Group Co., Ltd. have established and improved the labor rights protection and supervision mechanism to safeguard the legitimate rights and interests of workers. First, the access system shall be strictly implemented. Any unit or organization that recruits workers must hold legal certificates and formulate recruitment brochures, which can be carried out through legal channels such as releasing information, entrusting human resources service agencies, or participating in recruitment negotiations. Second, labor filing. If the employer has established a labor relationship with the laborer, a register of employees shall be established for future reference. Relevant dissolution and change of labor contracts shall be filed in time. Thirdly, routine patrol inspection and special law enforcement inspection shall be insisted on, and strict written materials review and patrol inspection shall be carried out on whether the employer abides by the prohibition of child labor, whether it abides by the special labor protection of female employees and juvenile workers, whether it abides by the regulations on working hours, rest and vacation, whether it pays laborers' wages and implements the minimum wage standard. Fourthly, the publicity system of rights protection shall be implemented, and publicity boards for workers' rights protection shall be set up or posted in labor workplaces to inform workers of their legal rights and ways of rights protection. Fifth, clarify the relevant responsibilities of various government departments and establish a coordination and supervision system. Establish a social announcement system for major violations of labor security, comprehensively publicize and implement labor security laws and regulations, strengthen social supervision, and enhance the deterrence of labor security supervision.

In terms of GBV management, the Management Committee of Yunnan Dianzhong New Area and Yunnan Airport Group Co., Ltd. have made great efforts to regulate the rights and interests of female employees such as pregnancy, maternity leave, and menstrual period protection from the physiological reality of female employees, so as to effectively protect the legitimate rights and interests of female employees and reduce gender-based labor discrimination. According to the Special Provisions on the Labor Protection of Female Employees in Yunnan Province, in terms of the protection of the reproductive rights of female employees, the employer shall not agree with female employees on restricting their legitimate rights and interests such as marriage and childbirth in the labor (employment) contract. It is not allowed to reduce the wages and welfare benefits of female employees due to their marriage, pregnancy, maternity leave, breastfeeding, and other reasons, restrict their promotion, promotion, appraisal, and employment of professional and technical positions, dismiss female employees and unilaterally terminate the labor (employment) contract. In terms of protecting female employees from sexual harassment in the workplace, employers are required to take effective measures to prevent and stop female employees from being sexually harassed in the workplace in combination with their own work and production characteristics. If female employees are sexually harassed in the workplace and other behaviors endangering the personal safety of employees are reported or complained to the Employer, the Employer shall deal with them in a timely manner and protect the personal privacy of female employees according to law. At the same time, female employees shall be encouraged to resolutely defend their individual rights, and cooperate with Kunming Women's Federation to provide consulting services, set up display boards, legal knowledge competition, door-to-door publicity, distribution of prevention and legal publicity materials, etc., in order to publicize the knowledge of preventing and eliminating gender-based violence and relevant laws and regulations to the general public, eliminate gender-based violence, and maintain healthy, civilized and harmonious social development. The hotline of the Women's Federation of Yunnan Dianzhong New Area is 0871-3162536.

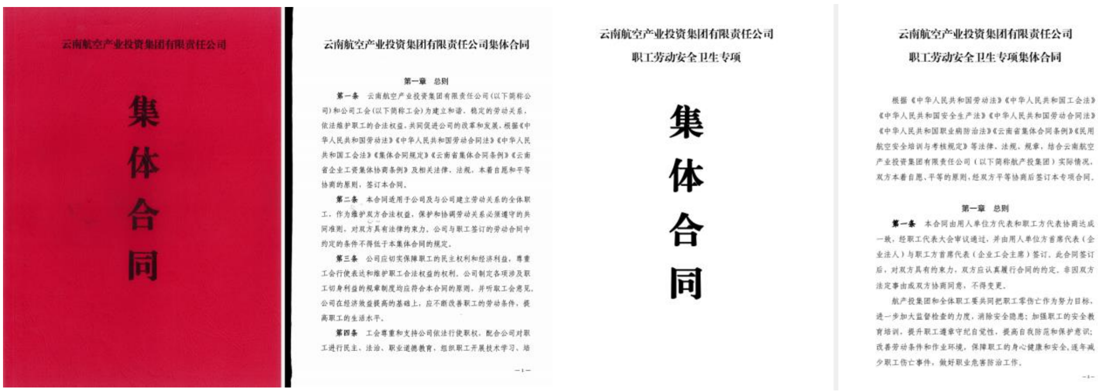

云南航空产业投资集团有限责任公司
集体合同
云南航空产业投资集团有限责任公司集体合同
第一章 总则
云南航空产业投资集团有限责任公司
职工劳动安全卫生专项
集体合同
云南航空产业投资集团有限责任公司
职工劳动安全卫生专项集体合同
第一章 总则

Figure 14-13 YAG Labor Contract013

Design optimization and mitigation measures

According to the identified risk factors of potential labor management of YAG employees, the social assessment unit has formulated relevant design optimization and mitigation measures after consultation with the Project Office, various implementing agencies and the Designer. See Chapter VI Social Management Plan for details.

14.7 Development Status of Ethnic Minorities

14.7.1 Ethnic minorities in the project area

Yunnan Province is a large province inhabited by ethnic minorities. There are 25 ethnic minorities living for generations, of which 15 are the unique ethnic minorities in Yunnan Province. The population of ethnic minorities in Yunnan Province is 15.636 million, accounting for 33.12% of the total population. The population of ethnic minorities in Kunming is 1,176,700, accounting for 13.84% of the total population. There are 10 ethnic minorities living in Kunming for generations, mainly including Yi, Hui, Bai, Miao, Hani, Zhuang, Dai, Lisu, etc.

With the cooperation of the Project Implementation and Management Office of AIIB, the Ethnic and Religious Affairs Commission, the subdistrict/township government, and the village committee, the ESIA unit conducted a comprehensive fleid investigation on the condition of ethnic minorities, along with a series of public engagement events, from February 7 to February 14, 2023. The population, ethnic composition, identification of ethnic minority villages, and whether ethnic minorities live in groups in each project area were thoroughly investigated in accordance with the identification standards specified in the ESS3 of AIIB's Environmental and Social Framework - Guidelines for Ethnic Minorities.

The scope of influence of the Project involves Changshui Community in Changshui Subdistrict, Huaqing Community, Fuxing Community and Wuxi Community in Dabanqiao Subdistrict, with a total of 8407 people, including 528 ethnic minority people, accounting for 6.28% of the total population. The main ethnic groups affected are Yi, Miao, Bai and Hui, who live here mainly for marriage and work.

In addition, among the Liqi, Yunqiao, Xichong, Yiduoyun and Adi communities with more than 30% of the population being ethnic minorities in the subdistricts around the project area, Yunqiao Community is the closest to the AIIB project area and is more than 13 kilometers away. Although the proportion of ethnic minorities in this community is high, it is not categorized as an administrative region of regional autonomy of ethnic minorities due to the absence of large-scale inhabitation of ethnic minorities. The nearest minority autonomous counties to the project area are Luquan Yi and Miao Autonomous County and Xundian Hui and Yi Autonomous County, with a straight-line distance of more than 100 km.

Table 1410 List of Ethnic Minority Population in the Project Area (unit: 10,000 people)

(2022)010

Program Area		Population	Ethnic minority population	Proportion of ethnic minority population (%) (%)	Composition of ethnic minority population
Yunnan Province		4720.93	1563.6	33.12%	25 ethnic groups, including Yi, Hani, Bai, Dai, Zhuang, Miao, Hui, Lisu, Lahu, Wa, Naxi, Jingpo, Blang, Pumi, Achang, Nu, Jinuo, Deang and Dulong
Kunming City		850.20	117.67	13.84%	Yi, Hui, Bai, Miao, Lisu, Zhuang, Dai, Hani, Bouyei, etc.
Guandu District		161.09	19.91	12.36%	Yi, Miao, Hui, Dai, etc. Bai, Hani, Hui, Jingpo, Lisu, Tujia and Yi
Dabanqiao Subdistrict	Changshui Community	0.2976	0.0055	1.84%	Yi, Dai, etc.
Changshui Subdistrict	Huaqing Community	0.1508	0.0108	7.96%	Yi, Miao, Hui, etc.
	Fuxing Community	0.2155	0.0308	14.29%	Yi, Miao, Hui, Dai, etc.
	Wuxi Community	0.1768	0.0057	3.22%	Bai, Hani, Hui, Jingpo, Lisu, Tujia and Yi
	Total	0.8407	0.0528	6.28%	

Source: population data of the project area from the Statistical Communiqué of the People's Republic of China on the 2022 National Economic and Social Development.

Ethnic minorities and Han nationality in the project area enjoy the same social and public services. In terms of social welfare, rights, security, cultural customs and living habits, there is no difference between ethnic minorities and the mainstream group, Han nationality, in the project area. Ethnic minorities are the indirect beneficiaries of the Project, not the directly affected population. The proposed Project has nearly no negative impact on the ethnic minority population. See Table 14-12 for the specific identification process of ethnic minorities.

Table 14-11 Feedback on Public Participation in Ethnic Minority Survey011

S/N	Community	Ways to Participate	Participants	Public parameter result
1	Changshui	Focus group	6 ethnic	There are few ethnic minorities in

	Community	discussion. Interview on Key Information Provider Questionnaire survey	minorities, including 3 women	Changshui Community, mainly Yi and Dai, scattered in the community. Minority respondents said that their language, customs, culture, etc. are fully integrated with the Han nationality in the community.
2	Huaqing Community	Focus group discussion. Interview on Key Information Provider Questionnaire survey	10 ethnic minorities, of which 4 are women	The ethnic minorities in Huaqing Community include Yi, Miao and Hui, accounting for less than 10%. Interviewees of ethnic minorities said that there was no difference between themselves and Han residents in social security, public services, employment and work, entertainment and culture, etc.
3	Fuxing Community	Focus group discussion. Interview on Key Information Provider Questionnaire survey	19 ethnic minorities, 11 of whom are women	The ethnic minorities in Fuxing Community include Yi, Miao, Hui, Dai, etc. Ethnic minority respondents indicated that the community will pay attention to the needs of ethnic minority people in the process of public participation and encourage ethnic minorities to actively participate in community or village assembly.
4	Wuxi Community	Focus group discussion. Interview on Key Information Provider Questionnaire survey	5 ethnic minorities, including 3 women	Although the number of ethnic minorities in Wuxi Community is small, there are many kinds of ethnic minorities, including Bai, Hani, Hui, Jingpo, Lisu, Tujia and Yi. Respondents from ethnic minorities said that there was not much difference between different ethnic groups in their daily life, and various rights and interests protection were also consistent with those of the Han nationality.

14.7.2 Ethnic minorities in the project area

The ethnic minority identification survey found that: (1) In the project affected area, there are no ethnic minority group that triggers the ESS3 criterion. (2) In the project construction area, the ethnic minority population is very small, and there is no traditional territory, minority language or traditional culture, or ethnic minority that considers its people as an ethnic minority group. Therefore, the ethnic minority development plan is not required for the Project.

Table 14-12 Ethnic Minority (ESS3) Identification Matrix012

Identification criteria	Yes	No	Remarks
1. The respondents identify themselves as members of a		X	All the respondents, including ethnic minorities and Han nationality, believe that

group with unique aboriginal culture and are recognized by others.			the local ethnic minorities are indistinguishable from Han nationality and fully integrated with Han nationality.
2. The respondents have collective attachment to geographically different habitats or ancestral territories in the project area or the natural resources of those habitats and territories.		X	No
3. The respondents have customary cultural, economic, social or political systems that are different from mainstream society and culture.		X	No
4. The respondents have a unique language that is generally different from the official language of the country or region.		X	They don't have their own language and role. They speak local dialects and Standard Chinese, and are fully integrated with Han nationality.

14.8 Gender Analysis

14.8.1 Status of women survey in the project area

In order to promote gender equality and women's socio-economic status, China has formulated a complete legal framework and policy system. Based on the important instructions of General Secretary Xi Jinping on the work of women and children, and in accordance with the Constitution of the People's Republic of China, the Law of the People's Republic of China on the Protection of Rights and Interests of Women, the Labor Law, the Marriage Law, the Electoral Law, the Criminal Law and other relevant laws and regulations, the Outline for the Development of Women in China (2021-2030), the Women's Development Plan of Yunnan Province (2021-2030) and the Women's Development Plan of Kunming City (2021-2030) are aligned. According to the overall objectives and requirements of the Outline of the 14th Five-Year Plan for National Economic and Social Development and the Long-Range Objectives Through the Year 2035 of Guandu District, Kunming City, the Project will be implemented within the framework of relevant laws and policies in China, and women's federations at all levels in the project area will be coordinated to implement the specific requirements for the protection of women's rights and interests and gender development.

Table 14-13 Organizational Structure of Women's Federations at All Levels013

Level	Affected people
National organizations	All-China Federation of Industry and Commerce
Local organizations	Henan Women's Federation
	Kunming Women's Federation

	Qinzhou District Women's Federation
Primary-level organizations	Women's Federation of Airport Economic Zone
	Women's Federation of Dabanqiao Street and Changshui Street
	Women's Federation of Affected Communities in the Project Area
2.11.11 Membership fees	Women Protection Committee of Trade Union of Yunnan Airport Group
	Grassroots Trade Union Female Employees Committee of Affected Enterprises in the Project Area

According to the statistical report on the national economic and social development of the districts, by the end of 2022, Kunming had a registered population of 5,886,000 and a resident population of 8,502,000, of which 4,349,600 were male, accounting for 51.16%, and 4,152,400 were female, accounting for 48.84%. See Table 14-14 for details.

Table 14-14Basic Information of Women Population in the Project Area014

Demographic Index	Resident population by the end of the year (10,000 people)	Registered population by the end of the year (10,000 people)	Male (10,000 persons)	Female (10,000 persons)
Kunming City	850.2	588.6	434.96	415.24
Guandu District	161.09	62.18	85.87	75.22
Dianzhong New Area	82	——	40.47	41.53
Airport Economic Zone	10.65	4.99	5.26	5.39
Dabanqiao Subdistrict	4.37	2.01	2.16	2.21
Changshui Subdistrict	3.80	1.72	1.88	1.93

Source: Population data of the project area from the Statistical Communiqué of the People's Republic of China on the 2022 National Economic and Social Development.

14.8.2 Analysis of Gender Difference in the Project Area

(1) Demographic Characteristics of Survey Samples

In order to understand the development status of women in the project area, the ESIA preparation unit conducted questionnaires and interviews with women in the field survey. A total of 400 valid questionnaires were recovered, of which 197 were female, accounting for 49.25% of the survey samples.

Age-related rate According to the statistical results of the survey samples, men and women account for 50.75% and 49.25% respectively. According to the age distribution of the sample, the number of women aged 45–54 is the largest, accounting for 58.3%, followed by those aged 35–44, accounting for 39.4%, and those aged 18–24 are the least, accounting for 12.7%. See Figure 14-14 below for details.

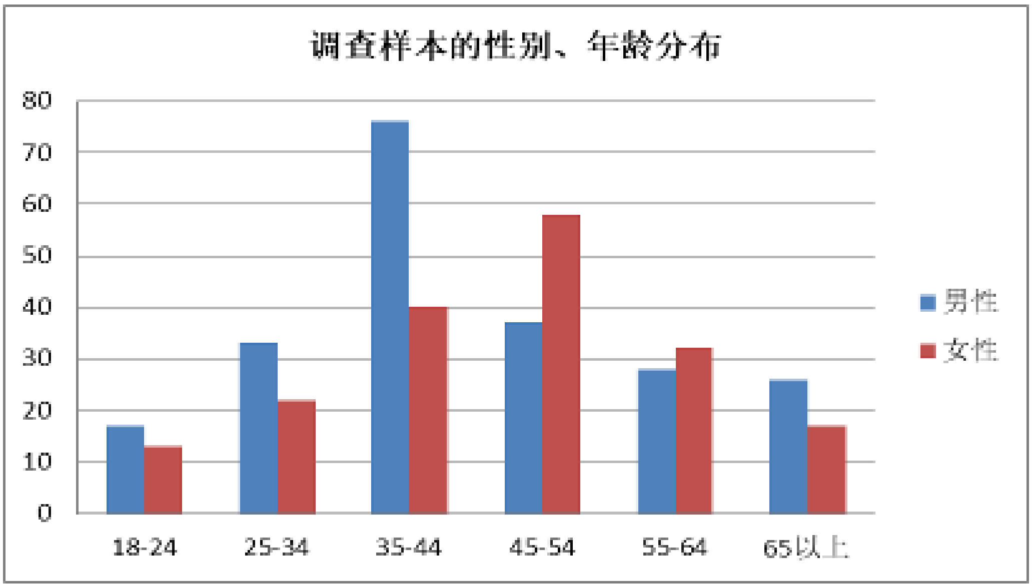


Figure 14-14 Gender and Age Distribution of Survey Samples014

Education Judging from the distribution of educational level of the survey samples, the educational level of the respondents is mainly at the junior high school level, with females and males accounting for 56.82% and 52.55% of the group respectively, and females are higher than males. High school or technical secondary school education, 18.57% of which are women, less than 25.08% of which are men. Primary school education, 11.64% for women and 3.26% for men. Both the junior high school level and the primary school level show that women are significantly higher than men, indicating that the education level of women in the project area is relatively low.

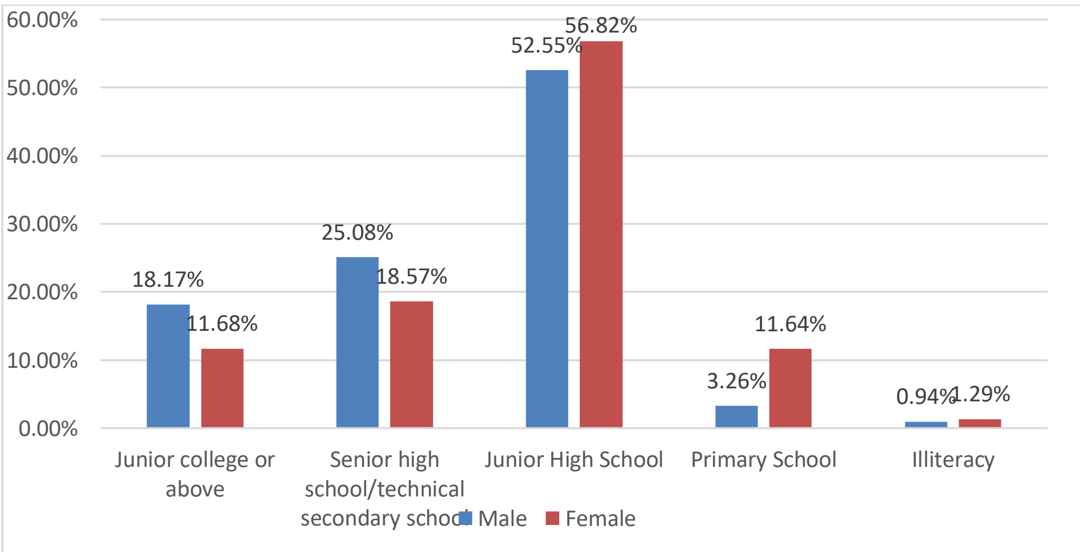


Figure 14-15 Educational Attainment of Survey Samples015

Type of professions According to the overall distribution of the survey samples, more than 1/3 of men and women in the gender occupational composition are government personnel, personnel in enterprises and public institutions, and enterprise personnel, and the employment ratio of men is higher than that of women. Among other and freelancers, women outnumber men in terms of occupational composition. This statement suggests that men and women are relatively balanced in terms of employment in the labor market. According to the interviews, urban young men and women mainly work nearby, while older women mostly stay at home and rarely go out to work. There is still a clear division of roles between the sexes, with men playing mainly external roles, while women play more prominent roles in housekeeping. Most survey respondents indicate that women are primarily responsible for managing household chores and taking care of the elderly and children at home.

Table14-15 Gender and Occupational Distribution of Survey Samples015

Occupation	Male		Female		Total	
	Persons	Percentage	Persons	Percentage	Persons	Percentage
Government employees	17	8.37%	11	5.58%	28	7.00%
Employees of public institutions	36	17.73%	26	13.20%	62	15.50%
Corporate staff	35	17.24%	24	12.18%	59	14.75%
Self-employed	39	19.21%	30	15.23%	69	17.25%
Freelancer	31	15.27%	48	24.37%	79	19.75%
Students	8	3.94%	17	8.63%	25	6.25%
Retired	11	5.42%	17	8.63%	28	7.00%
Peasant	14	6.90%	9	4.57%	23	5.75%
Others	12	5.91%	15	7.61%	27	6.75%
Total	203	100.00%	197	100.00%	400	100.00%

(2) Gender differences in the project area (baseline)

AIIB projects have always focused on gender equality and women's development, and ESS1 clearly states that any adverse gender-based risks and impacts should be identified and mitigation measures should be developed to reduce these risks and impacts; equal opportunities and women's socio-economic empowerment should be promoted by optimizing project design. By referring to the analysis dimensions of gender differences by international financial institutions such as the World Bank and the Asian Development Bank (ADB), and in combination with the actual situation of the project, three dimensions of participation in decision-making, economic participation and development capacity are selected to analyze gender differences.

The proportion of women participating in the mobilization, consultation and decision-making of the Project is lower than that of men. Female participation (37.9%) was lower than male participation (49%) in consultation meetings related to the project. Among the respondents, the proportion of women (39.3%) who believe that they have a better understanding of policies such as land acquisition compensation and noise pollution control implementation standards is also lower than that of men (45.8%). In the interviews, it was found that the recognition and participation rate of women in the project showed a positive trend.

> Visit Record 14-9: Ms. Liu, aged 35, from Huaqing Community
> "I usually stay at home taking care of my children, cooking and doing housework. Sometimes when there are meetings in the community or paperwork to be signed, it's my husband who handles these. Actually, I believe that women are capable of handling some of these matters, but we are not given the opportunity. We also want to attend meetings and provide suggestions. We hope the government can give us women more opportunities in the future."

Female households in the project area are of lower economic status than male households. The income of households in the project area is still mainly supported by men. The survey results show that men's income accounts for 62.7% and women's income only accounts for 24.3%. In the interview, it was found that the decision-making power of the family was mainly in the hands of men, and women were limited by lower educational level, physiological ability difference, heavy household chores and restrictions on taking care of the elderly and children, which limited women to work outside due to many objective factors, resulting in that women's contribution to family economic activities was significantly lower than that of men, and their family economic status was lower than that of men.

> Visit Record 14-10: Ms. Sun, aged 42, among others from Wuxi Community
> "I'm currently working as a farmer and doing odd jobs. Whenever there is a job, I'll take it on. If there is nothing to do, I'll rest at home. If there is an opportunity, I would like to rent out my land and find an easier job. It doesn't have to pay much but must be stable."
> "I am currently working in a company near the airport, but I am not satisfied with the pay. The benefits of the factory sure cannot compare with those of other factories in the vicinity of the airport. Recently, I have been thinking about changing jobs and hoping to find a better-paying one."

Women have less access to employment information and skills training than men. Rural women in the project area suffer from higher employment difficulties in the employment market than men, such as significantly lower access to employment information (24.7 per cent) than men (70.2 per cent), thus reducing their opportunities to participate in income-generating activities (e.g. creation of microenterprises or participation in cooperative organizations). In addition, the heavy household chores and the task of taking care of the elderly and children also make women lack time to participate in various employment skills training activities.

Table 14-16 Analysis of Gender Differences016

S/N	Specific Options	Male	Female	Gender non-discrimination/ co-participation	Gap analysis	Remarks	Dimension
1	Who participates in the mobilization and consultation meeting of the airport reconstruction and expansion project held in the community?	49%	37.9%	13.1%	The proportion of female participants is much lower than that of male participants	Strong willingness of female respondents to participate	Details of the participated decision-making and consultation work
2	Who is more familiar with policies such as compensation for land acquisition and noise pollution control?	45.8%	39.3%	14.9%	Women are less familiar with policies than men	Need to improve women's familiarity with policies related to the project	
3	Which of the men and women get more information about employment opportunities (business and skills)?	70.2%	24.7%	5.1%	Men are significantly more likely to have access to employment information than women	Business information and skills training for women should be increased	
4	Which of the men and women in the family earns more?	62.7%	24.3%	12.0%	Men earn more than women in the household	Increasing women's income	Economic participation
5	Whether it is difficult for women in the family to find a job	35.1%	64.9%	/	Female employment is more difficult	Prioritize employment opportunities for women	

14.8.3 Impacts on women

(1) Positive impacts

Provide non-agricultural employment opportunities for women and increase economic income. During the construction of the Project, a certain number of temporary posts will be provided for women, such as labor workers, cleaners, traffic maintenance personnel, and cooks who cook for construction teams with low technical requirements during construction. These nearby temporary posts can be provided for young and middle-aged women and low-income groups so that local women and low-income groups can increase non-agricultural economic income. After the completion of the project, certain non-technical posts will be provided, such as cleaners, patrols, and security personnel. After the completion of the project, priority will be given to the affected households in the project area and women with work needs to ensure that low-income people increase their economic income. In addition, the implementation of the Project will also promote the export of local agricultural products and the development of tourism in Yunnan Province, which will positively promote the income increase of women's families in the project area.

Encourage the participation of women and promote their own development. AIIB projects have always encouraged women's participation and paid attention to the protection of women's rights and interests. In the process of project construction and implementation, existing community and village committees can be used to promote women's participation in relevant public affairs and encourage women to participate in project discussions and suggestions consultation forums. More women are informed of and involved in the project, giving them a full voice, addressing their own needs and seeking more opportunities for development. At the same time, the provision of safety awareness training and employment training for women is conducive to raising their awareness of participation, improving their comprehensive quality, and promoting their long-term development. The field survey found that women are also more willing to participate in public activities, and community public participation campaigns can give priority to the participation of women.

Provide a more comfortable and convenient travel environment for women. On the one hand, the implementation of the Project can increase the tourist throughput of Kunming Airport and bring a more comfortable travel environment for women. On the other hand, the implementation of the project will also promote the improvement and supporting of public infrastructure such as airport buses, subways, high-speed railways, catering, accommodation, and cross-border trade centers, reduce women's travel and time for travel, shopping, and work in the project area, and improve the transfer and accommodation experience.

(2) Negative impacts

According to the results of the field survey, it was found that the implementation of the project would benefit women. However, in the process of project design, implementation, and management, if there is a lack of gender sensitivity and women's project needs and suggestions are ignored, the project benefits will be reduced and risks will be brought to women. The details are as follows:

The corresponding needs of women are easily overlooked. In the project area, due to the influence of social traditional culture, economic dominance, and other factors, the social status of women is still lower than that of men. In major family affairs, most of the decisions are made by men, and most of the people involved in public affairs are men. Since then, it is easy to ignore the specific needs and relevant suggestions of women in the design, implementation, operation, and management stages of the project, resulting in insufficient care for the needs of women in the project community, which is easy to ignore the related needs of women.

Potential gender-based violence risk. Gender-based violence is any harmful behavior against the will of individuals based on gender differences between people due to social attribution. It includes acts causing physical, sexual, or mental harm or suffering, threats to such acts, coercion, and other deprivation of liberty. These behaviors may occur in public or in private. During the implementation and operation of the Project, the proportion of male workers is higher than that of female workers, and male workers are more likely to be skilled workers. In case of improper management, harmful behaviors such as gender-based violence, sexual exploitation and abuse, and sexual harassment may occur, which may have a negative impact on the physical and mental health of female workers on the construction site.

14.8.4 Gender Action Plan

To sum up, the social assessment team sorted out some centralized needs of female groups in the project area based on the questionnaire survey of sample samples in the project area, women's symposiums, in-depth interviews and field surveys. In response to these needs, the following recommendations for action are made.

Table 14-17 Gender Action Plan017

Specific measures or actions		Monitoring index	Implementation subject	Target population
A. Increasing employment opportunities for women	a.During the construction and operation of the project, priority will be given to providing unskilled jobs for women in villages and groups involved in the project area.	A.1Priority will be given to providing project employment opportunities for women (baseline value of proportion of women workers	AIIB Project Office, Contractor	Female employees of communities/villages around the project area and AIIB PMO

	b. For jobs with low physical requirements, the employment age range should be appropriately relaxed, and women aged 40 to 50 who are difficult to find non-agricultural employment opportunities should be preferred, such as cleaning, cooking, management and care.	during construction period is about 8%, target value is 15%).		
B. Empowering women for development	a. Improve women's skills, knowledge and opportunities in employment and entrepreneurship through employment knowledge lectures, skills knowledge training courses and employment and entrepreneurship seminars. b. In the capacity building training for green airports and sustainable information disclosure, appropriate skills training contents shall be provided in combination with women's physical, psychological quality, education level, personal needs and other factors, and appropriate training time shall be set up to	B.1 Proportion of women participating in various trainings, including noise control, women's rights and interests publicity and education, employment skills training, etc. (baseline 20%, target 30%). B.2 Improve training for YAG women in project information disclosure and management (baseline 25%, target 50%).	Women's federations at all levels, human resources and social security bureaus, agricultural and rural bureaus, etc.	All women in the project area

	further ensure that women have the same opportunity to improve their skills as men.			
C. Increasing women's participation in decision-making	a.Increase the proportion of women in decision-making on matters related to the community; b. Increase the proportion of women signing or "signing by both husband and wife" in signing compensation agreements for land acquisition or demolition.	C.1 Proportion of women participating in project mobilization, information disclosure, policy advocacy and consultation for women (baseline 20%, target 30%). C.2 Proportion of women signing compensation agreements for land acquisition or demolition (baseline 0%, target 100%).	Community/village group, AIIB Project Office, Land Acquisition and Demolition Office, Contractor	Female and female employees in communities/villages around the project area
D. Reducing the risk of gender-based violence	a. Strengthen the protection of female laborers' rights and interests, and provide mental health consultation and training on the protection of female laborers' rights and interests for female laborers regularly; b. Strengthen the supervision of the construction site to avoid gender-based violence, sexual exploitation, sexual abuse,	D.1 Female workers have received 100% training on labor rights protection. D.2 Ensure that 100% of female workers and male workers are paid equal for equal work, and no gender-based violence occurs. D.3 Establishment of appeal and complaint channels and	AIIB Project Office, Women's Federation, Contractor	All women in the project area

	sexual harassment and other harmful behaviors; c. Establish clear channels for grievances and complaints, set up a grievance and complaint team (including two female members at least) on the construction site, and ensure the safety of the team members to protect them against prejudice and retaliation.	the number of female members.		

15 Climate Change

15.1 Purpose of the Climate Risk Assessment

This climate risk assessment (CRA) is conducted for the proposed Yunnan Kunming Changshui Green Airport Development Project (hereafter "the Project"). Although climate change and its uncertainties pose a challenge to climate change risk management, this is still an effective way of reducing wrong decisions. The climate change risk assessment for this project is aimed at (i) using the best science and evidence to understand the range of possible climate changes and what effect they might have on the project; (ii) understanding better vulnerability to current climate, (iii) assessing—using a risk-based approach-what we can put in place now, and plan for in the future, to increase the resilience of the project; and (iv) minimizing the risk of significant climate change impacts.

15.2 Methodology

The methodology of the CRA has been based on literature review for historical and anticipated climate change at the Kunming city level. Based on the historical trends and projections, the main risks and the measures that should be taken to minimize these threats have been identified.

The study area for the climate risk assessment is defined as the project area and its physical, environmental, and social receptors. For example, physical assets such as runways, utility infrastructure, and ancillary structures may be receptors that create the study area for the assessment. Social receptors include the staff, passengers, and local communities that will be present at the airport or travel to and from it. The environmental receptors are those nearby environments that could be affected by the combined impacts of changing climate and other impacts caused by the Project;

The climate baseline has been constructed using a range of appropriate climate data Bank Climate Change Knowledge Portal (containing the climate data from the IPCC WG1 AR6 report). A precautionary approach is used to understand the future climate in a scenario where greenhouse emissions continue to be unmitigated. Therefore, the scenarios used in this assessment will be: SSP5-8.5 for the near future (2040s), mid-future (2060s) and far-future (2080s)

Each climate hazard has been analyzed using expert knowledge and desk-based review to identify risks to the Project that may arise due to each climate hazard within the baseline. For example, a hazard of extremely high temperatures increases the risk of staff and passengers overheating and illness and of thermal expansion and damage of metallic receptors.

15.3 Limitations and Assumptions

Due to the nature of climate change projections, there is unavoidable uncertainty within global climate projection models, and they cannot be treated as accurate predictions of exact future conditions.

The climate change projections used are based on the most pessimistic available climate change projections, considering the worst-case scenario that is available, referred to as representative concentration pathway 8.5 (RCP8.5).

15.4 Climate Change Anlysis in Project Site

15.4.1 Climatology in Poject Site

The project site is in Kunming City, Yunnan Province of China. Kunming is located in southwest China and in the middle of Yunnan-Guizhou Plateau, between 102°10' to 103°40' east longitude and 24°23' to 26°22' north latitude. Kunming is located in the low northern latitudes of subtropical and has plateau mountain monsoon climate. Kunming has no severe cold in winter, no heat in summer, and four seasons like spring.

15.4.2 Observed Climate Change Trends

The historical climate trends analysis is sourced from the published literature:

(i) Blue Book on Climate Change in China 2021, Climate Change Center of China Meteorological Administration;

(ii) Climate Change in recent 65 years in Kunming and sponge city technology analysis, Wu Liang etal., Construction Technology, 2017 volume 46;

(iii) Climate Trends and Prediction of Kunming during 1951-2019, Yang SY etal., Jiangxi Science, 2022 volume 38; and

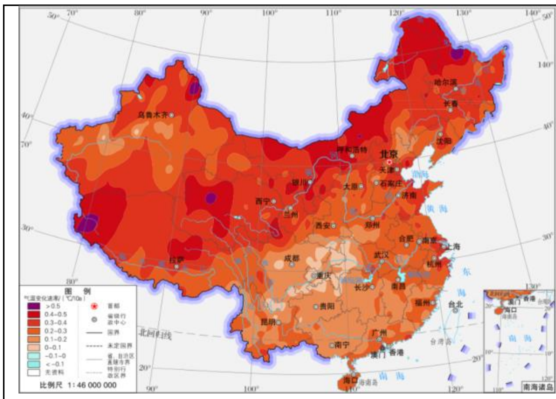
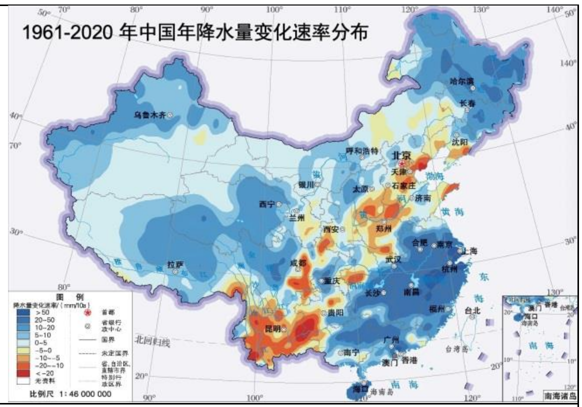
(iv) Extreme Temperature and Precipitation Change in Kunming during 1951-2016, Wu LH etal., Journal of Yunnan University: Natural Sciences Edition, 2019 volume 41.

The original data is from Kunming Meteorological Station.

Temperature. The annual mean temperature and the temperature of the four seasons showed a significant increasing trend in Kunming City. According to the interannual variation curve of average annual temperature in Kunming in recent 65 years (1951-2016), average annual temperature in Kunming has increased by more than 1. 5℃, the temperature increase is about 0. 27℃/10a, higher than the national average annual temperature increase of 0.04℃ every 10 years.

Precipitation. From 1951 to 2016, the annual precipitation growth rate of Kunming was 0.51mm/a, but the smaller scale data in different years show different conclusions about the trend of annual precipitation: precipitation increased significantly from 1951 to 1967, with an increase of about 8. 86mm/a, while the annual precipitation decreased significantly after the 1970s, and the decrease rate was about 6.58mm/ a in 1967-1983. From 1983 to 1999 the precipitation decreased 16. 08mm/a. The precipitation reduction rate from 1999 to 2016 was about 18. 05mm/ a. Overall, the annual precipitation in Kunming decreased obviously from 1983 to 2016, and the precipitation decreased at the same time as the temperature increased.

Extreme temperature and precipitation. The extreme cold events index showed a significant decreasing trends and extreme warm events showed a significant upward trend since late 1980s. The extreme precipitation index, including heavy precipitation, extremely heavy precipitation, continuous dry period, continuous wet period, 1-day maximum precipitation, 5-day maximum precipitation and precipitation intensity, all showed an increasing trend. The number of precipitation days, the number of moderate precipitation days, the number of heavy precipitation days and the total annual precipitation showed a decreasing trend.

	
Rate of temperature change of Kunming (1961-2020): increasing 0.1 to 0.2 10°C/a.	Rate of precipitation change of Kunming (1961-2020): decreasing 5-10 mm/10a.

Source: Blue Book on Climate Change in China. 2021, Climate Change Centre of China Meteorological Administration.

Figure 0-1Historical temperature and precipitation change in China (1961-2020）

15.4.3 Future Climate Projections

Runways constructed along the locally prevailing wind direction may experience more cross-winds due to deviations from that prevailing direction, or an airport may start to experience crosswinds but have no crosswind runway. This may entail the need for a change in procedures and airspace redesign which, in turn, may incur an additional environmental risk due to the redistribution of noise impact around airports.

The average altitude of the Kunming urban area is 1,897 m, while Kunming Airport is about 2,100 m above sea level. The highest point of the airport is about 2,200 m in the west and northwest, and 2,500 m in the east and southeast. Kunming Airport is the entrance of cold air. When a large area of cold air comes slowly from the northwest and crosses the high point to the northwest of the airport, foggy days will occur as the cold air rises halfway up the mountain. On 3 January 2013, Kunming Airport, which had been in operation for more than six months, was hit by fog, resulting in the cancellation of 440 flights and the detention of some 7,500 passengers. However, there is no report on foggy event since then. It was told by the YAG that with the urban development surrounding the airport area, there is less foggy days due to urban heat island effect to block the cold air.

Although the wind direction and fog are important climate vectors for the airport operation, it is impossible to project into the future because of biases in the GCMs therefore, this CRA did not consider the impacts of change of wind direction and fog.

This section describes the results of downscaled climate change projects of Yunnan Province.

Based on an expected operational lifetime of 25+ years and the expansion work will finish in 2030, the short-term (2040), mid-term (2060) and long term (2100) under SSP5-8.5 (Shared Socioeconomic Pathway 5) is presented in Table 3-2 using a precautionary principle and in line with Equator Principles IV. The reference value and the final value (sum of the reference value and projected anomaly) are presented for clarity.

This data is drawn from the Climate Risk Country Profile: China (2021), made available from the World Bank Climate Change Knowledge Portal (CCKP)[3] and published in 2021. This data is more recent, using the latest climate science, and is also available at the subnational level (specific to Yunnan) but has not been dynamically downscaled to improve accuracy and bias for local climate systems. The highest emissions scenario available from this dataset is SSP5-8.5.

Table 0-1 SSP5-8.5Future climate projection under SSP-5-8.5 in Yunnan

Indicator	Reference Value (1995- 2014)	Short term (2040)	Mid-term (2060)	Long term (2100)
Tmean °C	17.02[a] (16.56[b]-17.57[c])	18.10 (17.20-18.85)	19.22 (18.26-20.21)	21.81 (20.01-23.95)
Tmax °C	22.37 (21.75-23.08)	23.45 (22.31-24.44)	24.55 (23.29-25.73)	27.01 (24.98-29.35)
Tmin °C	11.78（13.36-12.23）	12.79 (12.07-13.52)	14.27 (13.35-15.25)	16.43 (14.87-18.41)
Number of hot days (Tmax >35°C)	3.03 (0.18-10.45)	6.55 (0.38-22.22)	11.96 (1.04-31.88)	32.10 (5.60-70.78)
Annual precipitation (mm)	1572.00 (1031.32-2151.82)	1592.84 (972.14-2329.93)	1706.55 (994.44-2470.76)	1914.04 (1091.55-2705.18)
Average largest 5-day cumulative	131.01 (87.54-213.87)	135.85 (81.98-231.54)	147.82 (84.27-259.72)	175.85 (90.49-317.20)
Days with precipitation> 50mm	0.51	0.54	1.00	2.25

Note: a=50th percentile or median; b=10th percentile; c=90th percentile.

Temperature. The maximum temperature, minimum temperature, mean temperature and number of hot days show a significant increasing trend. The annual mean temperature in the project areas is likely to increase between 1.08°C by 2040, 2.18°C by 2060, 4.79°C by 2100 under SSP5-8.5 comparing with 1995-2014. There will be more hot days, increased from 0.03 days (1995-2014) to 32.10 days by 2100. The hot days are mainly in April to June.

Precipitation. The project precipitation shows a very slight increasing trend. The most significant change is an increase in days of heavy storm (days with precipitation>50mm). The heavy storm mainly happens in June to August in long term.

[3] https://climateknowledgeportal.worldbank.org/

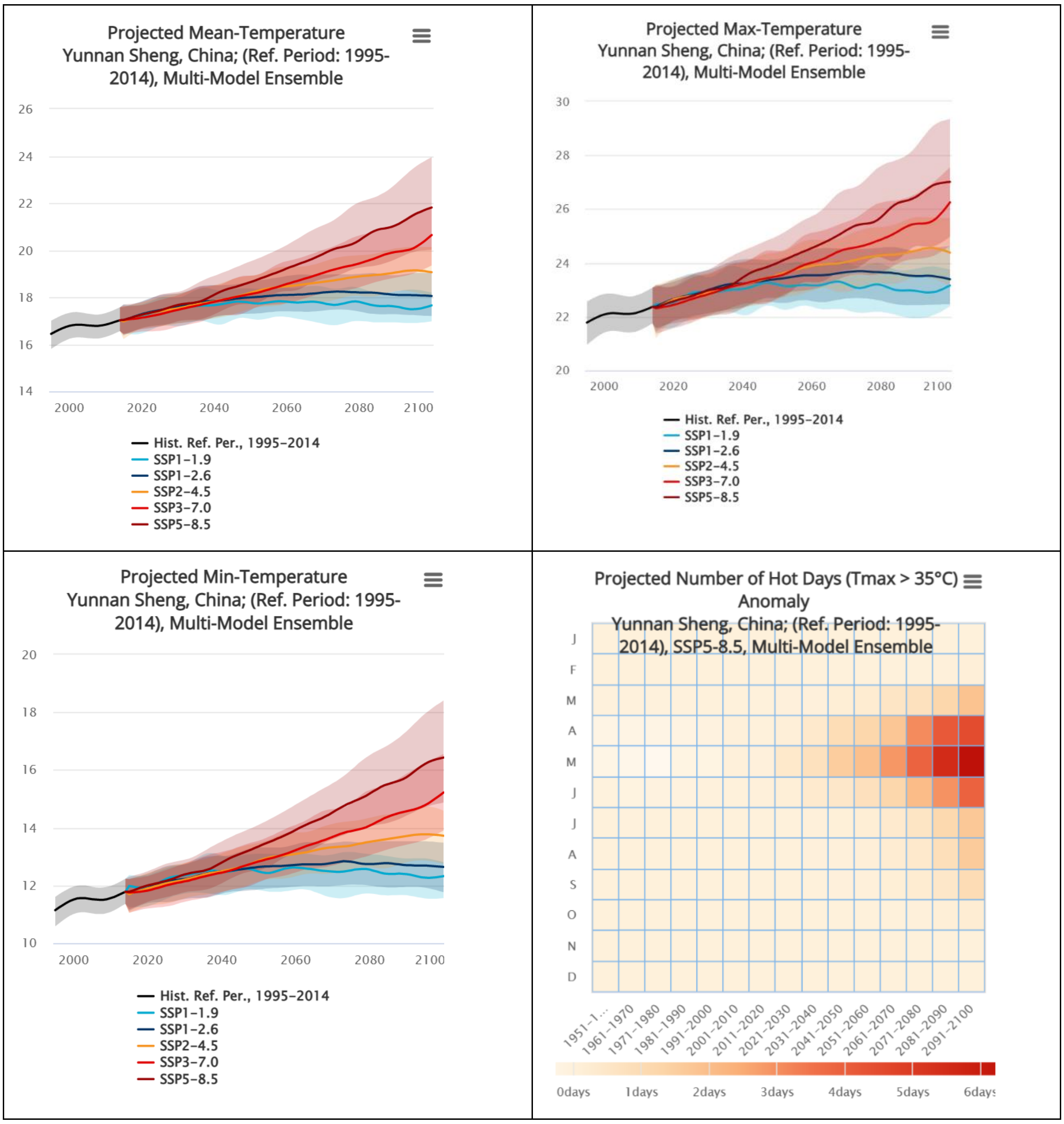


Figure 0-2 Changes of regional temperature in Yunnan in different periods relative to 1995-2014 projected by CMIP6

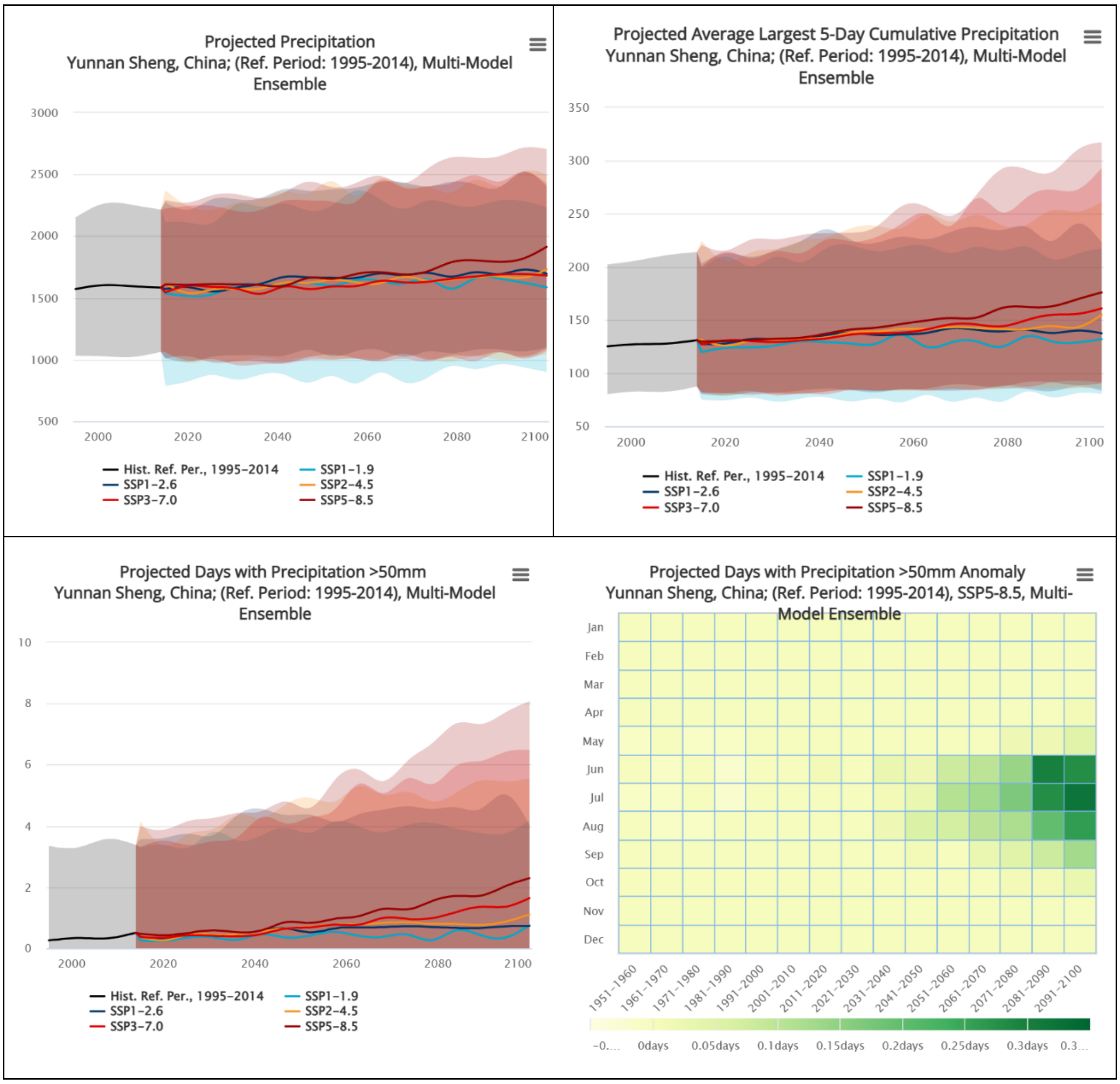


Figure 0-3Changes of regional precipitation in Yunnan in different periods relative to 1995-2014 projected by CMIP6

Assumptions and limitations. Climate projections are inherently uncertain due to uncertainties around the extent of future greenhouse gas emissions or success in reducing emissions and how climate systems will respond. As such, the projections presented in this baseline cannot be treated as factual or exact. They are based on models that simulate future scenarios based on assumptions.

15.5 Climate Risk Assessment and Adapatation

Since construction will take place over the short term and the impacts of climate change occur over a longer timescale, typically over 20–30-year timeframes, climate change is not expected to affect the Project's construction phase. As such, the Project's construction phase is scoped out of the climate change risk assessment. The area of influence of climate risk mainly focus on the project facilities. The risks climate change posed to the project are elaborated below. The total climate adaptation investment in estimated at 541.8258 million Chinese Yuan.

The maximum temperature will increase from 22.37 ℃ to 27.01 ℃ by 2100 under the SSP5-8.5 scenarios. This change did not affect the airfield surface design. However, the airfield infrastructure (runway base, runway surface and associated structures) is one of the most important components of an airport and a key facility for ensuring the safety of aircraft taxiing, landing and parking. Heat damages to tarmac surfaces of runways and apron in terms of deformation, with consequence on carrying capacity and durability. This will degrade the service performance of the runway to varying degrees, and lead to the partial or total failure to meet the requirements of safe take-off and landing of aircraft, endangering the safety of airport transportation. The smart runway, with real-time and high-precision holographic monitoring of ground environment, perception of runway structure information, perception of runway operation safety and other information integrated intelligent monitoring and warning system, can ensure the structure and performance of runway and other facilities, meet the airport safety, efficient and intelligent development needs, and improve flight area safety and management efficiency.

Due to climate change, sudden heavy rain may increase, and the hardening of the airport site and the increase of impervious areas may increase the risk of surface runoff and surface water pollution. The Project will include the construction of a rainwater drainage system and sewage collection system, in which rainwater and sewage flow are separated. The project includes construction of four underground pass ways. Drainage facilities that do not have adequate drainage capacity can be flooded during extreme rainfall events.

Kunming has a subtropical monsoon climate, and birds migrating southwards have a habitat close to the airport. Changing migration patterns could affect aircraft operations and increase the potential for bird strikes. The smart runway system has a bird intrusion detection module. Bird intrusion behavior can be detected in real time within the runway and airspace area. The detection system can be connected to the bird intrusion subsystem: According to the airspace coverage of the jurisdiction, a number of comprehensive panoramic scanning monitoring points are designed at the airport. The supporting thermal imaging camera is used to scan the airspace in a specific area of 360 degrees, and the background software is used for real-time monitoring and detection. In the event of an intruding bird, the location of the bird can be provided and the dispersal gun system can be triggered for real-time removal.

Table 0-2 Summary of climate risk and vulnerability assessment

Climate change projections	Primary impacts	Exposed project facilities	Measures to reduce risks and	Climate adaptation cost (10,000

			vulnerabilities	CNY)
Increase of annual and maximum temperature (including heatwaves)	• Heat damages to tarmac surfaces of runways and apron in terms of deformation, with consequence on carrying capacity and durability. • Reduction of aircraft engine thrust which in turn affects runway length requirements for take-offs and lead to more noise, increased fuel use and greenhouse gas emissions. • Increased cooling requirements and pressure on local utilities for cooling. • Extreme heat will increase the risk of wildfires in the area.	E2 runway and taxiway; and aprons.	Smart runway with monitoring and decision system. Long life runway pavement.	1385 45933
Heavy precipitations events	• Risks of runway and taxiway flooding; • Reduction in airport throughput; • Inundation of ground transport access for passengers and staff. • Underground infrastructure, such as electrical equipment, may be threatened by heavy rain inundation.	Drainage pipelines; E2 runway and taxiway; Road and bridge in air side, and underpass.	Underground pass way with stormwater pump system; Drainage system with adequate capacity.	6027 10% of the investment budget for flood protection and drainage, works (10% reflects that these investments large target development objectives rather than climate change objectives).
Climate change may cause changes to wildlife migration patterns.	• Kunming has a subtropical monsoon climate, and birds migrating	Airfield.	The Smart Runway is equipped with a bird intrusion	Included in the total cost of smart runway.

	southwards have a habitat close to the airport. Changing migration patterns could affect aircraft operations and increase the potential for bird strikes.		detection system.	
	• Although fog is unpredictable, the project site experiences approximately 5% low visibility weather per year.	Airfield.	A Class I ILS system was installed on runway E2 to improve the adaptability of the aircraft in such low visibility conditions.	837.58
Total				54182.58

15.6 Climate Mitigation Measures and Greenhous Gas Emission Reduction

The climate mitigation finance is caculated following the Common Principles for Climate Mitigation Finance Tracking for multilateral development banks. The total climate mitigation cost is estimated at 372.71 million Chinese Yuan, for reduction of greenhouse gas emissions of 25022 tCO_2e/year, comprising avoid emission from aircraft auxiliary power unit (APU) and fossile fuel vehicles.

Table 15-3 Cost Estimates for Mitigation Measures

Mitigation Activity	Estimated GHG Emissions Reduction (tCO_2e/year)[a]	Estimated Mitigation Costs (10,000 CNY)	Mitigation Finance Justification
Using ground air conditioning other than aircraft APUs and 400 HZ power unit	23935	13555	Aircraft APUs consume aircraft fuel and produce large amounts of carbon dioxide, hydrocarbons and other gases during operation. To reduce the high energy consumption and emissions of aircraft APUs, aircraft ground air conditioning systems are replacing aircraft APUs.
Electric vehicle	1087	16585	Using electricity instead of fossil fuel.
Electricity charging system for electric vehicles	Calculated under the electricity charging system	7131	Using electricity instead of fossil fuel.
Consulting service for green airport road map.	NA	To be determined	Develop road map for the Kunming airport to achieve the target of green airport.
Total	25022	37,271	

Note: The main aircraft types are Type C and Type D. The East 2 runway takes off 347 times a day, with each stop for one-hour, consuming 155kg of jet fuel per hour. Ground power unit consumes 192 kwh/h. The grid greenhouse gas emission factor is 0.6101 tCO_2/MWh. Assume that vehicles travel an average of 50 kilometers per vehicle per day.

16 Public Consultation and Information Disclosure

16.1 Purpose of Public Consultation

The purpose of public participation in environmental and social impact assessment is to improve the quality of environmental and social impact assessment, provide more information and suggestions, make the environmental and social impact assessment of construction projects more democratic and public, allow the public directly or indirectly related to the project to participate in the environmental and social impact assessment, ensure the transparency and credibility of evaluation decisions, and put forward their own opinions and views to achieve the purpose of making the evaluation more complete and fair.

Public participation is an important part of environmental and social impact assessment and an effective way to improve scientific decision-making. Public participation in construction projects is an important means to enhance two-way communication and communication between project construction units, environmental impact assessment units and the public, so that the public directly or indirectly affected by project construction can fully understand the possible environmental impact, social impact, Adopt mitigation measures and economic and social benefits brought by project construction, and at the same time feedback various opinions and suggestions, actively provide suggestions for project construction, and jointly find solutions to problems, so as to minimize the impact of project construction on the environment and society, avoid environmental and social impact disputes in the process of project construction and operation, and better coordinate development and environmental protection. Its main objectives are:

(1) Comprehensively analyze public opinions, implement them in environmental protection and social supervision measures, and use public opinions as work action guidelines in the future construction of the project.

(2) Communicate the two-way opinions of the public and the construction unit, introduce the project overview, pollution situation, treatment measures, environmental and social impact assessment and prediction results to the public in detail, and feedback the public's opinions and suggestions to the construction unit to make modification plans, and play the role of a bridge for mutual understanding between the public and the construction unit.

(3) Through public participation, various views and opinions of the public on the project can be obtained, so as to find a basis for safeguarding the vital interests of the public, fully adopt feasible suggestions in the process of environmental impact assessment and editorial assessment, reduce the public's concerns due to the lack of connection between the two, minimize the adverse impact on the public interest, and make them receive necessary compensation.

(4) In the evaluation work after environmental and social impact assessment, mainly relying on the role of public supervision, the active participation of the public is an important part of the environmental and social management mechanism, which is conducive to protecting the ecological environment, improving the environmental and socio-economic benefits of the project, improving the environmental quality, and ensuring the implementation of the sustainable development strategy.

16.2 Relevant laws, regulations, policies and stakeholder identification

(1) This evaluation will comply with the public consultation and information disclosure requirements of the AIIB Environmental and Social Framework, as well as the stakeholder participation plan requirements, and carry out its work in accordance with the domestic requirements on public participation. Specific domestic policy requirements are detailed in Chapter 2 of this report - Policy, Legal and Administrative Framework;

(2) Stakeholder identification and demand analysis (see Stakeholder Identification in Stakeholder Participation Plan for details).

16.3 Completed Public Consultation to Date

The main methods of public consultation and information disclosure of this project are online publicity, newspaper publicity, posting announcements, on-site publicity boards, questionnaire surveys, symposiums, in-depth interviews and interviews with key information personnel.

In accordance with the Environmental Impact Assessment Law of the People's Republic of China, the Interim Measures for Public Participation in Environmental Impact Assessment issued by the Ministry of Environmental Protection of the People's Republic of China, the requirements of the AIIB's Environmental and Social Framework (revised in 2021), and the requirements of the AIIB's Environmental and Social Framework (ESF) in 2021, the ESIA preparer conducted public consultation and information disclosure during the evaluation process. Since the preparation and operation of the AIIB project in 2021, the AIIB Project Office and relevant units have coordinated with relevant functional departments at all levels to organize a series of information disclosure and public consultation work. At the same time, in the preliminary preparation stage of the project, the AIIB project office, construction unit, feasibility study unit, environmental society report consulting unit, etc., carried out project information publicity and notification, as well as full informed consultation and public participation activities for the relevant information of the project.

The Environmental and Social Impact Assessment Investigation Team (including the EIA Investigation Team and the Social Investigation Team) has conducted the EIIB Project Office, the Central Yunnan New Area Administrative Committee's Housing and Urban-Rural Development Bureau, Emergency Response Bureau, Agriculture and Rural Affairs Bureau, Housing Expropriation Affairs Center, relevant neighborhood offices, property owners, communities/ In close cooperation with village groups and individuals, a public survey was conducted from February 7 to 15, 2023 in four communities within the scope of the project and related project sites around the airport.

Table 16-1 List of public participation to date

Type of engagement	Date	Venue	Engage Content	Participants
Notification and publicity of project-related	August 2022	Relevant affected villages	Information Disclosure	Sub-district offices, project offices, feasibility study preparation units,

information				relevant townships, communities/villages, and villagers
				A round of publicity
	December 2022	Relevant affected villages	Disclose project information during on-site inspections, and listen to their willingness, attitude and opinions on project construction	Project office, owner unit, technical consulting expert, relevant county and district government, village head, villager,
	December 2022	Related Websites	The latest progress and dynamics of the project	Project office, project area masses
	February 2023	Relevant public media websites	Project information network publicity	Owner unit, environmental consulting unit
				Second round of publicity
	February 2023	Relevant affected villages, communities	Project information posting announcements	Owner unit, environmental consulting unit
	February 2023	Mainstream newspapers and periodicals in the province, Kunming Daily	Network publicity and posting of project information	Owner unit, environmental consulting unit
Field surveys	February 7-14, 2023	Relevant affected villages	Conduct socio-economic sample surveys	The project affects villages, project offices, owner units, and resettlement plan preparation units
	February 7-14, 2023	Relevant affected villages	Through on-site investigations, questionnaires, interviews, etc., to understand the opinions and suggestions of residents in the project area on the implementation of the project	The project affects the village and neighborhood offices, project offices, owner units, and social impact assessment and editorial investigation team
	February 7-14, 2023	Proposed project site	The proposed project site was investigated on the spot, community residents were visited and communicated, communication and consultation were conducted on the	Social Impact Assessment Team

			preliminary preparation of the project, and suggestions were put forward for project optimization	
Questionnaires	February 2023	Relevant communities/villages and residents' homes in the project area	A total of 400 questionnaires were distributed and 400 valid questionnaires were recovered, with an effective recovery rate of 100%, of which 50.75% were men and 49.25% were women.	The project was implemented by the villagers, the social impact assessment and the social impact assessment preparation and evaluation investigation team
Focus group symposiums	February 2023	Relevant communities/villages in the project area	A total of 14 residents' focus group discussions were held, with a total of 193 participants. Among them, 93 were women, accounting for 48.19 per cent, 78 were elderly people, accounting for 17.22 per cent, and 241 were representatives of neighborhood committees and villagers, accounting for 53.2 per cent.	Affected residents in the project area, neighborhood committees/village committees and villager representatives, and the social impact assessment editorial survey team
	February 2023	Project construction impact area: community/village	A total of 10 symposiums were held in this round of environmental impact science popularization, involving 13 villages and communities, with a total of 175 people participating.	Community committees, village committees, neighborhood offices, villagers and environmental investigation teams

Key informant interviews	February 2023	Relevant institutions, communities/villages	A total of 42 people were interviewed in depth with the relevant persons in charge of the project office, the heads of the Administrative Committee and relevant departments of Central Yunnan New Area, the relevant responsible persons of Changshui Street and Dabanqiao Street, the village directors and village branch secretaries of the affected villages, the affected households, women and villagers in the affected villages, etc., to understand the progress of the project, the impact of the project, the needs and problems of the villagers for the project, etc.	Heads of relevant government departments, neighborhood committees/village committees and villager representatives, employees of enterprises and institutions, and the social impact assessment editorial survey team

16.4 Results of Public Participation in Project Preparation

(1) Since August 2022, when the Civil Aviation Airport Planning and Design Institute (Research and Preparation Unit) conducted the field survey, the AIIB Project Office has started to communicate with residents in the project area about the construction content, necessity and social benefits of the Kunming Changshui Green Airport Development Project, and to inform them about the project. It has listened to their attitudes and opinions on the project construction.
(2) Since November 2022, under the guidance of technical assistance and consulting experts, Yunnan Airport Group Co., Ltd. and other relevant departments and project design units have conducted a series of socio-economic surveys and public opinion consultations (including the participation of about 30% of women). In addition, the project has been promoted by holding villagers/residents' congresses, party members' congresses and household heads' congresses in the streets, communities

and schools affected by the project, and by publicising the project in the communities/villages through project notices, publicity brochures, hanging banners, outdoor wall slogans and WeChat public accounts, etc. The project's construction content, site selection and public transport safety knowledge were published and publicised, and residents' needs and wishes were investigated.

(3) In February 2023, the editorial evaluation team conducted field research on each sub-project one by one, visited all streets, townships/villages that might be affected by the project construction, and conducted questionnaires, symposiums, institutional interviews and in-depth personal interviews. A detailed understanding was gained of the production and living conditions, socio-economic status, transport facilities around the airport, project impacts and construction intentions of the affected residents within the scope of the project. A socio-economic sample survey was conducted to understand the potential impact of each project on the affected people. The needs and wishes of the people in the project area, as well as their opinions and suggestions on the implementation of the project, were consulted in detail and truthfully recorded and feedback given. In addition, the negotiation results of the land expropriation and resettlement compensation policies and restoration measures have been incorporated into the finalized Resettlement Action Plan (RAP&RPF).

At the same time, the National Development and Reform Commission, China Civil Airports Association, Yunnan Airport Group Co., LTD, AIIB Project Office and Central Yunnan New Area Administrative Committee have published the latest developments of the project on their websites at various times since June 2021.

16.5 Plan for public participation at each stage of the project

Public information and participation is carried out throughout the project cycle.

A public participation plan has been developed for each stage of the project according to the stakeholder identification and project content. See Stakeholder Engagement Plan (SEP) for details.

17 GRM

During project preparation, construction and operation, in order to learn and address impacts and issues for stakeholders timely, and ensure proper information disclosure and extensive public consultation, project-level GRMs will be established. All grievances and solutions will be recorded through the semiannual E&S monitoring mechanism and reported to AIIB.

There are two main GRMs under the Project:

- The GRM for the APs, available to affected residents, NGOs, enterprises, public institutions, etc.
- The GRM for project workers, including direct and contracted workers.

17.1 GRM Arrangements

1) GRM for the APs

This GRM addresses disturbances brought by the Project, such as construction dust, noise, waste disposal, and safety measures for the public and construction workers. Currently, residents in Kunming City file grievances through the mayor hotline "12345" and the environmental hotline "12369" mainly. The improved GRM under the Project complies with the regulatory standard of the PRC, which protects citizen rights from E&S impacts related to construction. The Regulations on Complaint Letters and Visits (No.431) issued by the State Council in 2005 stipulate complaint handling mechanisms for government agencies at all levels, and protect complainants from retaliation. On this basis, the former Ministry of Environmental Protection issued the Measures for Environmental Letters and Visits (Order No.15) in December 2010.

Currently, the staff of relevant agencies of the Project, such as the PIO and PIU, is responsible for the operation of this GRM. When a grievance is received, the head of the PIO will first judge if it relates to the Project. If yes, the head should handle it. If not, the head will submit it to the competent authority. All grievances should be recorded and the whole handling process notified to the griever. The basic procedure and timeframe of this GRM are as follows:

- Stage 1 (5 days): If an AP is dissatisfied with the compensation and resettlement program, or any safety or environmental aspect at construction or operation stage, he/she may file a written or oral grievance to the community committee or contractor. In case of an oral grievance, the community committee or contractor should keep a written record. The community committee or contractor will: 1) stop the relevant activity (e.g., construction with noise impact on nearby residents) immediately; 2) not restore such activity before the grievance is closed; 3) notify the PIU of the grievance received and the proposed solution; 4) give a definite reply to the AP within two days; and 5) close the grievance within 5 days after receipt where possible.
- Stage 2 (15 days): If the AP is dissatisfied with the disposition of Stage 1, he/she may file a grievance to the sub-district office or PIU orally, by telephone or in writing, which will call the original grievance record, hold a meeting with the main stakeholders (including the respondent and AP) to develop a solution accepted by all, including key steps. The respondent should implement such solution

immediately, and close the grievance within 15 days. All measures and results should be recorded.

- Stage 3 (15 days): If the AP is dissatisfied with the disposition of Stage 2, he/she may file a grievance to the DZNA Management Committee or YAG (PIA) orally, by telephone or in writing, which will hold a stakeholder consultation meeting within two weeks (including the AP, respondent, local natural resources bureau, Kunming Airport Headquarters DZNA Branch, labor and social security bureau, women's federation, agriculture and rural affairs bureau, etc.) to develop a solution accepted by all, including key steps. The respondent should implement such solution immediately, and close the grievance within 15 days. All measures and results should be recorded. At the end of Stage 3, the PIA will notify the outcome to AIIB.
- Stage 4: If the griever is still dissatisfied with the disposition of Stage 3, he/she may file a suit to a civil court in accordance with the Civil Procedure Law of the PRC.

2) GRM for workers

YAG will establish an independent complaint handling center to handle construction workers' grievances about the contractor, involving salaries, overtime pay, timely payment, accommodation, drinking water, sanitation conditions, medical services, etc.

In GBV management, under the direction of the PIO, DZNA Management Committee women's federation, sub-district office and community women's federation, the PIU and contractor should sign labor contracts with female workers, ensure equal pay for equal work, and take effective measures (e.g., appointing an officer responsible for the protection of female workers' rights and interests) to prevent harassment in accordance with the Law of the PRC on the Protection of Women's Rights and Interests, Special Regulations on the Labor Protection of Female Workers, Regulations on the Occupational Health of Female Workers, Special Workplace Labor Protection System for Female Workers, System for Eliminating Workplace Sexual Harassment, and other applicable laws and regulations.

In addition, a quick response mechanism for GBV grievances or suggestions of female workers and local women should be established, where any victim of sexual harassment or other personal safety threat may file a grievance to the employer, which should handle such grievance timely, and protect the victim's personal privacy according to law.

A project-affected people's mechanism (PPM) has been established by AIIB to provide an opportunity for an independent and impartial review of submissions from project-affected people who believe they have been or are likely to be adversely affected by AIIB's failure to implement its ESF when their concerns cannot be addressed satisfactorily through the project-level GRM or AIIB's management mechanism. For more information on the PPM, visit: https://www.aiib.org/en/policies-strategies/operational-policies/policy-on-the-project-affected-mechanism.html.

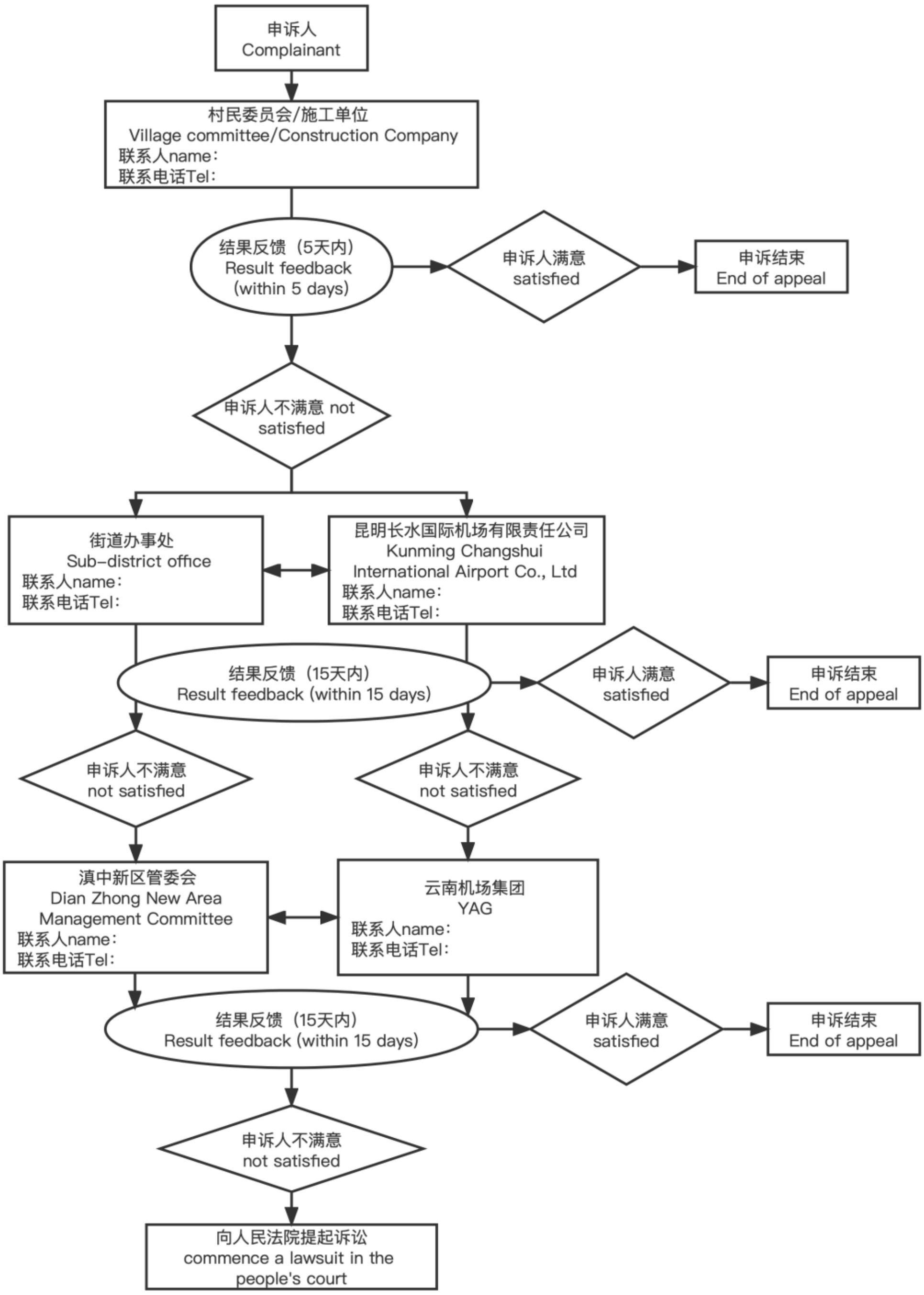


Figure 17-1 Grievance Redress Flowchart

17.2 Recording and Tracking of Grievances

During the implementation of the ESMP, all entry points of the GRMs should register and manage grievance redress information, and submit such information to Kunming Changshui International Airport Co., Ltd. and YAG monthly, which will inspect the registration of grievance redress information regularly, and agree on grievance redress progress and information with the DZNA Management Committee timely.

To record grievances and their handlings, the PIO has prepared a registration form, as shown in Table 17-1.

Table 17-1 Grievance Registration Form

Griever	Time	Location	Feedback of accepting agency	YAG	DZNA Management Committee	External M&E agency's advice	Progress
Grievance							
Expected solution							
Proposed solution							
Actual handling							
Person responsible (signature)							

17.3 Contact Information for Grievance Redress

The PIU will assign dedicated staff members to collect and accept grievances and appeals from the APs. See Table 17-2. After bidding, the contractor and supervising agency will appoint E&S heads as contacts for grievance redress.

Table 17-2 Contact Information for Grievance Redress

Agency	Contact	Address	Tel
YAG (PIA)	Attendant	Wujiaba, Chuncheng Road, Guandu District, Kunming	0871-67097335
Kunming Changshui International Airport Co., Ltd. (PIU)	Attendant	Kunming Changshui International Airport, Guandu District, Kunming	0871-96566
PIO	Dai Ying	Kunming Changshui International Airport Construction Headquarters	0871-67097208
DZNA Management Committee	Li Guangsheng	1# Building, Airport Business Plaza, No.1 Dianxing Street, KAEZ, Guandu District, Kunming	13759118170
Changshui Sub-district Office	Yao Baocun	Yincheng Garden, Kunming International Printing and Packaging Industry Base (Phase 1), Dabanqiao Sub-district, Guandu District, Kunming	15877968026
Dabanqiao Sub-district Office	Yu Xintong	Yincheng Garden, Kunming International Printing and Packaging Industry Base (Phase 1), Dabanqiao Sub-district, Guandu District, Kunming	13987605269
Wuxi Community	Ding Yongxing	West of the crossing of Xiaogaopo and Wuxi Highways, Guandu District, Kunming	15911728825
Huaqing Community	Weng Baohua	West of Lichang Highway, Huaqing Group of Huaqing Community, Dabanqiao Sub-district, Guandu District, Kunming	13669720969
Fuxing Community	Jiang Jianbiao	South of the crossing of Yangxiao Road and Jinhun Avenue, Guandu	13577083321

		District, Kunming	
Changshui Community	Liu Suojin	South of the crossing of Yunqiao Road and National Highway 320, Guandu District, Kunming	13888833122

Appendix A Current Situation of Villages, Schools, and Hospitals around Kunming Changshui International Airport

	
Ganhaizi	Ganluochong
	
Adi Village	Hongshapo
	
Shagou Village	Heibo Village

Yunnan Vocational College of Agriculture

Xiaoshao Middle School, Guandu District

Baihanchang Central School

Changshui Central School

Yunnan Vocational College of Judicial Police

Lizhi Primary School

Xiaozhaoyang Kindergarten

Banqiao Middle School

Xingjie Primary School

Shagou Central School (sound insulation measures have been taken)

Xiaoshao Township Hospital (sound insulation measures)

Kunming Guanghua School (sound insulation measures)

Huaqing Village

Changpo Village

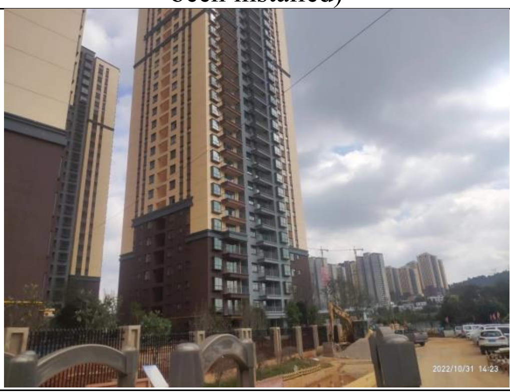
Fuxing Primary School

Dacunzi

	
Xiaokanglangda Village	Fuxing Village
	
Xinqiao Village	Xichong Village
	
Xialiqi	Yijia
	
Wujia	Dadongchong

	
Gaoshitou	Caojiachong
	
Xiaokanglangxiao Village	Yunqiao Village
	
Getenggou	Baihanchang
	
Yangguanzhuang	Qinglong School

	
Xichong No.2 Kindergarten	Aibeier Kindergarten
	
Morningstar Kindergarten	Xichong Kindergarten
	
Xichong Primary School	Kunming Airport No.1 Primary School (sound insulation measures have been installed)
	
Mingzhu School	No.4 Primary School of Kunming Economic and Technological Development Zone

	
Airport Experimental School of Kunming No.3 Middle School	Changshui Chenxing Kindergarten
	
Kunming Airport Economic Zone No.1 Kindergarten (sound insulation measures have been installed)	Kunming No. 17 Middle School (sound insulation measures installed)
	
Kunming Airport Economic Zone No.2 Kindergarten (sound insulation measures have been installed)	Resettlement Area in Xichong Area
	

Ayi Jiayuan	Yunxiangyuan
	
Chance-Way Airport Town	

Appendix B: Summary of Social Impact Analysis

Item	Affected townships/subdistricts along the line	Affected population (10,000 people)/female (10,000 people)-proportion	Stakeholder demands	Social Benefits	Social risks
Yunnan Kunming Changshui Green Airport Development Project Financed by Asian Infrastructure Investment Bank	Airport Economic Zone Dabanqiao Subdistrict Changshui Subdistrict	Directly affected population 8.18/4.14 -50.61% Indirectly affected population 161.09/75.22 -46.69% Radiation affected population 10350.2/5055.24 -48.84%	(1) Tourists' Demand for Reconstruction and Expansion Project of Changshui Airport (2) Residents' demand for reducing noise pollution (3) Residents' Demand for Increasing Income Opportunities and Employment Opportunities (4) Needs of Stakeholder Groups for Project Information Awareness (5) Stakeholders' needs for participating in the project development	(1) Expand airport throughput and improve tourist comfort The long-term overloading at Changshui Airport has negatively impacted the tourist experience and significantly delayed travel. The expansion of Terminal 2 will significantly increase the throughput of Changshui Airport to 95 million person-times at full capacity. This will ease Terminal 1's overcapacity issue, reduce boarding time for tourists, and enhance their travel experience. (2) Boosting industrial development and facilitating rural revitalization The implementation of the Project will promote the development of introduced industries, including the modern agricultural industry, processing and manufacturing industry, and service and cultural tourism. The implementation of the Project will drive industrial development and help rural revitalization. Specifically, it	(1) Possible impact of land acquisition caused by project construction (2) Possible natural and social environmental impacts during the construction and operation of the project Noise pollution risk is divided into the noise in the construction period and operation period, including mechanical construction, paving, construction, earth excavation, measurement and transportation, explosives, aircraft take-off, and landing, etc. Air pollution risk is divided into the implementation period and operation period, including large-scale excavation, construction of access roads and rolling of motor vehicles during construction operations, an increase of outside vehicles, aircraft exhaust emission, etc. Water pollution risk, which mainly refers to the pollution of regional

will promote the expansion of industrial scale, optimization of industrial structure, and expansion of product sales scope.

(3) Increase employment opportunities and increase residents' income

Creating jobs Including construction period and operation period.

Improve the opportunity to increase income. The implementation of the Project will also promote the appreciation of idle self-owned assets of residents in the project area, and effectively promote the revitalization and utilization of idle houses and land assets.

(4) Accelerate the change of mindset and push forward rural modernization.

Villagers will integrate their own resources according to the needs of people near the airport, and actively get rich by opening restaurants, homestays, supermarkets, express stations, maintenance shops, parking lots, car washes, etc.

Some residents will learn driving skills and purchase vehicles to provide pick-up and drop-off services for homestay residents, thus improving the number of vehicles and the employment skills and abilities of the masses.

The increasing number of tourists has

surface water, especially drinking water in residential areas, during the construction of the Project.

(3) Possible impact of the increase of migrant population during the construction and operation period of the Project

There is a risk of increasing conflicts and disputes. When migrants come to the surroundings of Changshui Airport, they may have different languages from the locals and do not recognize the local village regulations and customs, resulting in problems in social communication and intensifying social conflicts.

The risk of limited environmental carrying capacity, the increase in water and electricity pressure, and the increase of domestic garbage and wastewater pose certain challenges to the local environment.

Traffic safety risks: On the one hand, the increase in vehicles will cause potential traffic safety hazards; on the other hand, the number of vehicle owners' violations will increase.

(4) Possible health and hygiene risks during the construction and operation period of the Project

Migrant workers will move and

		brought about a more modern lifestyle, which has implicitly guided the changes of the local people.	consume in residential communities and relevant streets and shops near the construction site, thus causing certain social and health risks.

Appendix C: List of Symposiums for Residents in the Project Area

Date	Visited communities/institutions	Symposium participants	Details of participants in the symposium	Contents
February 8, 2023, morning 9:30–11:30	Kunming Changshui International Airport Co., Ltd.	9 females and 7 males, 16 in total.	1) 10 persons from Airport Group; 2) 6 members of the investigation team.	1) The investigation team shall contact the Hub Headquarters of Kunming Airport Group Co., Ltd., further clarify the work plan and schedule of resettlement and social impact assessment investigation in combination with the project situation (arrangements such as review and supplementary collection of the data list, social and economic investigation arrangement, institutional symposium, the symposium with resettlement representatives, etc.), and determine the time schedule of physical quantity investigation of resettlement impact; provide a series of forms for physical quantity survey, review the physical quantity affected by resettlement, and provide a list of policy data; 2) Determine the specific arrangement of questionnaire survey and field reconnaissance in each project area, and select the survey community and

				sampling quantity.
14:30–17:30, February 8, 2023	Management Committee of Yunnan Dianzhong New Area	8 females and 8 males, 16 in total.	1) 3 persons from the Natural Resources and Planning Bureau; 2) 1 person from the Women's Federation; 3) 1 person from the Bureau of Statistics; 4) 1 person from the Human Resources and Social Security Bureau; 5) 1 person from the Rural Revitalization Bureau; 6) 3 persons from Airport Group; 7) 6 members of the investigation team;	During the discussion here, the investigation team learned about the project construction and operation, the impact of resettlement, the impact of the project on local women and vulnerable groups, social and economic development, and other aspects, as well as the public participation and complaint mechanism and records of the project.
February 9, 2023, morning 9:30–11:30	Yunxiangyuan and Ayijiayuan Community	9 females, 12 males, 21 in total. 1) 14 members of residents' committees and residents' representatives of Yunxiangyuan Community; 2) 1 representative of the Airport Group; 3) 6 members of the investigation team.	1) Residents' Committee and Resident Symposium of Yunxiangyuan Community: 9 females and 12 males, 21 people in total; 2) Women's symposium: 5 young (under 30 years old), 2 middle-aged (30–55 years old), 2 elderly (over 55 years old), 9 people in total; 3) Symposium	1) Members of the investigation team entered Yunxiangyuan Community and Ayi Home to carry out discussions, interviews, and questionnaires and completed 50 questionnaires. 2) Learn about the awareness and participation of residents in the project area, discussion on project impact, main concerns and impacts of residents, employment

			for vulnerable groups: 1 female and 3 male, 4 people in total.	development information, construction, operation safety impacts, etc.
14:30–17:30, February 9, 2023	Huaqing Community Guanyin Temple Site	10 females, 12 males, 22 in total. 1) 12 members of residents' committees and residents' representatives of Huaqing Community; 2) 3 representatives from Dabanqiao Sub-district; 3) 1 representative of the Airport Group; 4) 6 members of the investigation team.	1) Huaqing Community Residents' Committee and Resident Symposium, 10 women and 13 men, 22 people in total; 2) Women's symposium: 5 young (under 30 years old), 2 middle-aged (30-55 years old), 3 elderly (over 55 years old), 10 people in total; 3) Symposium for vulnerable groups: 1 female and 2 male, 3 people in total.	1) Members of the investigation team entered Huaqing Community to carry out discussions, interviews, and questionnaires and completed 50 questionnaires. 2) Learn about the awareness and participation of residents in the project area, discussion on project impact, main concerns and impacts of residents, implementation of public participation, employment development information, construction and operation safety impacts, etc. 3) Visit the site of Guanyin Temple in Huaqing Community.
February 10, 2023, morning 9:30–11:30	Hub Headquarters of Kunming Changshui Airport Group Co., Ltd.	12 females and 6 males, 18 in total.	1) 4 persons from Airport Group; 2) 6 AIIB expert consultants; 3) 1 interpreter; 4) 1 environmental team member; 5) 6 members of the investigation team.	Members of the investigation team participate in the environmental and social work progress meeting held by AIIB at the hub headquarters.
14:30–17:30, February	Changpo Village	10 females, 12 males, 22 in total.	1) Changpo Village Committee	1) Members of the investigation team entered Changpo

10, 2023		1) 15 representatives of Changpo Village Committee and villagers; 2) 1 representative of the Airport Group; 3) 6 members of the investigation team.	and villagers' symposium, 10 women and 13 men, 22 people in total; 2) Women's symposium: 5 young (under 30 years old), 2 middle-aged (30-55 years old), 3 elderly (over 55 years old), 10 people in total; 3) Symposium for vulnerable groups: 1 female and 2 male, 3 people in total.	Village to carry out a questionnaire survey and interview and completed 50 questionnaires. 2) Learn about the awareness and participation of residents in the project area, discussion on project impact, main concerns and impacts of residents, implementation of public participation, employment development information, construction and operation safety impacts, etc. 3) Reconnaissance of the address of Terminal 2, the site of Taxiway E2 Road, and the relocation and new address of Guanyin Temple and Shiquan Temple in Changpo Village.
February 11, 2023	Changshui Hangcheng Yunlingyuan, Fang Wang Forest Farm, Garden Farm, Garden Base	1) The investigation team entered the Yunlingyuan Community of Changshui Hangcheng to carry out a social assessment questionnaire survey and interview and completed 50 questionnaires to understand the awareness and participation of residents in the project area, project impact discussion, main concerns and impacts of residents, implementation of public participation, employment development information, construction, and operation safety impacts, etc. 2) Survey Fang Wang Forest Farm, Garden Farm, and Garden Base, and conduct on-site interviews with key informants to pay attention to the social and environmental impacts of the Project on the project area.		
February 11, 2023, morning 9:30–11:30	Changshui Hangcheng Yunlingyuan Community	1) Members of the investigation team conducted questionnaires and interviews in Yunlingyuan Community and completed 50 questionnaires. 2) Learn about the awareness and participation of residents in the project area, discussion on project impact, main concerns and impacts of residents, implementation of public participation, employment development information, construction safety impact,		

		etc.		
14:30–17:30, February 11, 2023	Fang Wang Forest Farm, Garden Farm, Garden Base	Members of the investigation team went to Fangwang Forest Farm, Garden Farm, and Garden Base to conduct interviews with key informants to understand the introduction and operation of the forest farm.		
February 12, 2023, morning 9:30–11:30	Huaxin Dongjun Cement Plant	8 females and 9 males, 17 in total.	1) 11 employees of the cement plant 5) 6 members of the investigation team.	1) The members of the investigation team conducted questionnaires and interviews at Huaxin Dongjun Cement Plant and completed 20 questionnaires. 2) The investigation team entered Huaxin Dongjun Cement Plant to hold a symposium, conducted a social evaluation questionnaire survey and interview, completed 20 questionnaires, and learned about the awareness and satisfaction of residents, employment development information, public participation, etc. of the project;
14:30–17:30, February 12, 2023	Shops near Dabanqiao Subdistrict	1) The members of the investigation team entered Changpo Village to carry out a questionnaire survey and interview and completed 30 questionnaires. 2) Learn about the awareness and participation of residents in the project area, discussion on project impact, main concerns and impacts of residents, employment development information, construction, operation safety impacts, etc.		
February 13, 2023, morning 9:30–11:30	Fuxing Community, Fuxing Primary School,	8 females and 10 males, 18 in total. 1) 12 members of residents' committees and residents' representatives of Fuxing Community; 2) 6 members of the investigation	1) Fuxing Community Neighborhood Committee and Resident Symposium, 8 women and 10 men, 18 people in total; 2) Women's symposium: 5 young (under	1) Members of the investigation team entered Fuxing Community and Fuxing Primary School to carry out a questionnaire survey and interview, and completed 50 questionnaires; 2) Learn about the awareness and satisfaction of

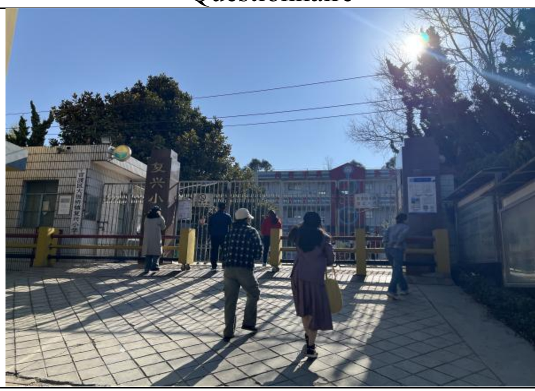
		team.	30 years old), 2 middle-aged (30-55 years old), 1 elderly (over 55 years old), 8 people in total; 3) Symposium for vulnerable groups: 1 female and 1 male, 2 people in total.	residents, employment development information, public participation, etc. of the project; enter Fuxing Primary School for interviews to understand the awareness and satisfaction of teachers and students, life, study, work, and rest, travel mode and other information in the project area.
14:30–17:30, February 13, 2023	Airport Group Director Yang Key Information Symposium	7 females and 3 males, 10 in total.	1) 4 persons from Airport Group; 2) 6 members of the investigation team.	The members of the investigation team held a symposium on resettlement and social impact in Airport Group Co., Ltd. The investigation team conducted an in-depth discussion with Director Yang on resettlement and social impacts in the airport group.
February 14, 2023, morning 9:30–11:30	Changshui Community	10 females, 6 males, 16 in total. 1) 10 members of residents' committees and residents' representatives of Changshui Community; 2) 6 members of the investigation team.	1) Changshui Community Neighborhood Committee and Resident Symposium, 10 women and 6 men, 16 people in total; 2) Women's symposium: 5 young (under 30 years old), 3 middle-aged (30-55 years old), 2 elderly (over 55 years old), 10 people in total; 3) Symposium	1) Members of the investigation team entered the Changshui Community to carry out a questionnaire survey and interview, and completed 50 questionnaires; 2) Learn about the awareness and participation of residents in the project area, project impact discussion, main concerns and impacts of residents, employment development information, public participation and

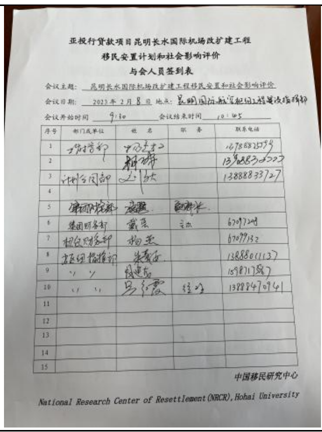
			for vulnerable groups: 2 females and 1 male, 3 people in total.	implementation, construction and operation safety impact, etc.
14:30–17:30, February 14, 2023	Wuxi Community	11 females, 6 males, 17 in total. 1) 10 members of residents' committees and residents' representatives of Wuxi Community; 2) 1 person from Airport Group; 3) 6 members of the investigation team.	1) There are 11 women and 6 men in the Residents' Committee and Resident Symposium of Wuxi Community, totaling 17 people; 2) Women's symposium: 5 young (under 30 years old), 4 middle-aged (30-55 years old), and 2 elderly (over 55 years old), totaling 11 people; 3) Symposium for vulnerable groups: 2 females and 2 males, 4 people in total.	1) Members of the investigation team entered the Wuxi Community to carry out a questionnaire survey and interview, and completed 50 questionnaires; 2) Learn about the awareness and participation of residents in the project area, project impact discussion, main concerns and impacts of residents, employment development information, public participation and implementation, construction and operation safety impact, etc. 3) Reconnaissance of the forest land and grave area affected by the construction of Terminal 2.

Appendix D: Interview Transcript

Time	February 9, 2023
Location	Changshui Sub-district Office
Organizer	AIIB Special Work Office
Participants	Relevant persons in charge of the resettlement investigation team and Changshui Sub-district Office, and relevant personnel of Yunnan Airport Group Co., Ltd.
Topics	Social and economic conditions of the affected communities, attitude towards the Project, land acquisition and resettlement plan, residents' needs, information disclosure, complaints, etc.
Main Content and Result	1. The surrounding residents are less engaged in agricultural production, and there are few households with pure agricultural income. There are many residents working near the airport, mainly engaged in cleaning, security, and other work, and few people engaged in technical posts. Some residents set up catering or engaged in taxi driving around the village. 2. Residents learned that the Project is mainly through traditional media (news), new media (Douyin, WeChat Official Accounts), villagers' congress, household surveys, and other forms. Residents believe that the construction of the Project can drive the development of the surrounding economy, change the opportunities for residents to increase their income, and have a greater impact on their lives than harm. 3. The needs of residents include the following aspects: 1) Start land acquisition as soon as possible. Compensation for residential land and compensation for young crops and other ground attachments can be distributed according to the standard and reduction process; 2) The employment opportunities generated by the Project can be given priority to the villagers. 4. In order to avoid disputes in the process of land acquisition and demolition, the sub-district has specially set up a stability maintenance team to solve the problems related to land acquisition and demolition in a timely manner and set up a legal advisory team to provide consultation channels for residents' transfer of ownership and other issues.
Site photos	

Appendix E: Photos of Site Investigation

	
Yunnan Airport Group Co., Ltd. Symposium	Symposium of Management Committee of Yunnan Dianzhong New Area
	
Changshui Subdistrict Symposium	Huaqing Community Residents Fill in Questionnaire
	
Symposium of Natural Resources Planning Bureau and Land Acquisition and Demolition Headquarters	Visit to Fuxing Primary School



亚投行贷款项目昆明长水国际机场改扩建工程
移民安置计划和社会影响评价
与会人员签到表

会议主题：昆明长水国际机场改扩建工程移民安置和社会影响评价

会议日期：2023 年 2 月 8 日 地点：昆明国际航空枢纽工程建设指挥部

会议开始时间 9:30 会议结束时间 10:45

序号	部门或单位	姓名	职务	联系电话
1	[illegible]	[illegible]		[illegible]
2		[illegible]		[illegible]
3	[illegible]	[illegible]		[illegible]
4				
5	[illegible]	[illegible]	[illegible]	
6	集团财务部	[illegible]		67097208
7	[illegible]	[illegible]		67097132
8	[illegible]	[illegible]		[illegible]
9	〃 〃	[illegible]		[illegible]
10	〃 〃	[illegible]	[illegible]	[illegible]
11				
12				
13				
14				
15				

中国移民研究中心

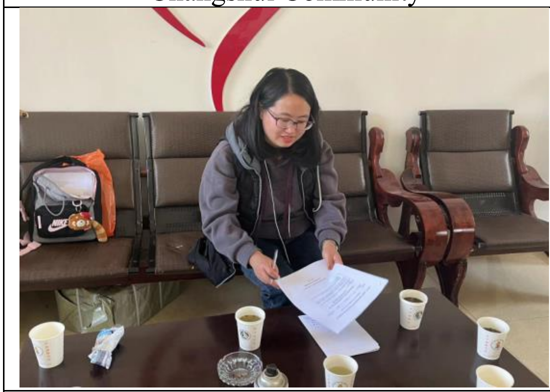
National Research Center of Resettlement (NRCR), Hohai University

Meeting Attendance Sheet (Partial)

Interview with Land Department of Yunnan Airport Group Co., Ltd.

Get information from the director of Changshui Community

Visit to Fuxing Community



Wusazhuang residents fill in the questionnaire

Visit to Banqiao Subdistrict

Interview with residents of Changshui New

Interview with the residents' committee of

Village	Wuxi Community
	
Learn about the information disclosure of Wusazhuang	Field Exploration of Wusazhuang Woodland
	
Construction site	Field visit to Runway E2 site
	
Visit to Wusazhuang	Members of the investigation team guide residents to fill in the questionnaire