

Taiwan Taoyuan International Airport Park
Master Plan Revised Edition
(Target Year 2042)

(Summary)



Taoyuan International Airport Corporation Ltd.

2019/08

Table of Contents

1	Chapter 1 Introduction	1
	1.1 Plan and Background.....	1
	1.2 Planning Scope.....	3
2	Chapter 2 Airport Current Situation	4
	2.1 Airport Facilities	4
	2.2 Air Traffic Volume	7
3	Chapter 3 Airport Traffic Forecast	10
	3.1 Global Aviation Development Trends	10
	3.2 Domestic Policy and Economic Development Trends and Other Development Impacts	11
	3.3 Air Traffic Forecast.....	13
4	Chapter 4 Future Airport Development Plans	20
	4.1 Planning Principles	20
	4.2 Layout	20
5	Chapter 5 Free Trade Zone Planning	37
	5.1 General Development Direction Analysis	37
	5.2 Planning Principles	37
6	Chapter 6 Ground Transportation System Planning	40
	6.1 Development Objectives and Principles	40
	6.2 Current Status and Traffic Bottleneck Analysis.....	41
	6.3 Transportation Improvement Suggestions	42
	6.4 Free Trade Zone	48
7	Chapter 7 Development Methods and Threshold	49
	7.1 Staged Development Plan	49
	7.2 Airport Infrastructure Development Threshold	53
8	Chapter 8 Construction Costs, Financial Planning and Economic Benefit Analysis	56
	8.1 Annual Funding Demands	56
	8.2 Financial Planning.....	58

8.3 Economic Benefit Analysis.....	62
9 Chapter 9 Conclusions and Suggestions.....	64

Figure

Figure 1-1	Airport Park Related Plans	2
Figure 1-2	Plan Land Use Scope	3
Figure 2-1	Location of the Main Airport Facilities	6
Figure 2-2	Annual Passenger Traffic	7
Figure 2-3	Transfer Passenger Traffic and Proportion.....	8
Figure 2-4	Annual Cargo Traffic	9
Figure 3-1	Air Passenger Traffic Forecast Results	15
Figure 3-2	Air Cargo Traffic Forecast Results.....	17
Figure 4-1	Overall Airport Development Principles	20
Figure 4-2	Overall Airport Layout (Target Year 2042).....	21
Figure 4-3	Third Runway Navigation Aid Equipment Location.....	22
Figure 4-4	Yuanshan Apron Planning	24
Figure 4-5	North A3 Area Development Concept.....	25
Figure 4-6	Suggested Layout of the North Satellite Concourse Area .	26
Figure 4-7	Layout of New Cargo Area	27
Figure 4-8	Layout of F&R Stations	28
Figure 4-9	Layout of MRO Area	28
Figure 4-10	Layout of GSE Maintenance Area	29
Figure 4-11	Layout of Catering Facilities	30
Figure 4-12	Planning of Airside Service Road	31
Figure 4-13	Layout of Utilities	32
Figure 4-14	Future Layout of the East Area of EC Taxiway.....	33
Figure 4-15	EC Taxiway Expansion and Existing Facilities	33
Figure 4-16	Aircraft Noise Forecast of 2042	35
Figure 4-17	OLS Layout of the Three-Runway System	36
Figure 5-1	Overall Free Trade Zone Development Principles.....	38
Figure 5-2	Overall Free Trade Zone Layout.....	38
Figure 5-3	Industrial Zoning Diagram.....	39
Figure 6-1	The Framework Diagram of Ground Transportation	

	System Planning.....	40
Figure 6-2	The Traffic Flow of Airport in 2015.....	41
Figure 6-3	GTC Configuration.....	43
Figure 6-4	The Elevation View of GTC.....	43
Figure 6-5	Traffic Flow in the Target Year.....	44
Figure 6-6	Hangzhan North and South Roads Layout.....	45
Figure 6-7	The Demand of Number of Lanes in the Target Year.....	46
Figure 6-8	Airport Access Highway System and Improvement Strategies.....	47
Figure 6-9	Transportation System of FTZ.....	48
Figure 6-10	Grade Separation Layout of FTZ.....	48
Figure 8-1	Airport Corporation Change in Debt to Equity Ratio.....	59
Figure 9-1	Staged Development Plan of Airport Constructions.....	65

Table

Table 2-1	Taiwan Taoyuan International Airport Main Facilities	5
Table 3-1	The Impact Factors and Influence Degrees of Traffic Forecast in Different Scenarios	14
Table 3-2	Air Passenger Traffic Forecast Results	16
Table 3-3	Air Cargo Traffic Forecast Results	17
Table 3-4	Air Passenger and Cargo Traffic Forecast Results.....	19
Table 4-1	Planning of Passenger Aircraft Stands (2042)	23
Table 4-2	Supply and Demand of Passenger Aircraft Stands.....	23
Table 4-3	Planning of East Area of EC Taxiway	34
Table 6-1	GTC Requirements	43
Table 7-1	Staged Development Strategies and Goals	49
Table 7-2	Staged Development Schedule	50
Table 7-2	Staged Development Schedule (Continued).....	51
Table 7-3	Internal and External Control Factors of Construction Project	52
Table 7-4	Development Threshold of the 3 rd Runway.....	53
Table 7-5	Development Threshold of T3 and T3S	54
Table 7-6	Development Threshold of the Cargo Terminal	55
Table 8-1	Suggested PPP/Outsourcing Development Models and Items for Taoyuan Airport Areas	56
Table 8-2	Overall Construction Projects Annual Funding Demands	57
Table 8-3	Summary of the Financial Plan	59
Table 8-4	Sensitivity Analysis Results and Response Actions	61
Table 8-5	Economic Benefit Analysis Results.....	62
Table 8-6	Benefits of the Development and Construction of Taoyuan Airport Park	63
Table 9-1	Staged Development Schedule in the Near Five Years (2016-2020).....	66

Chapter 1 Introduction

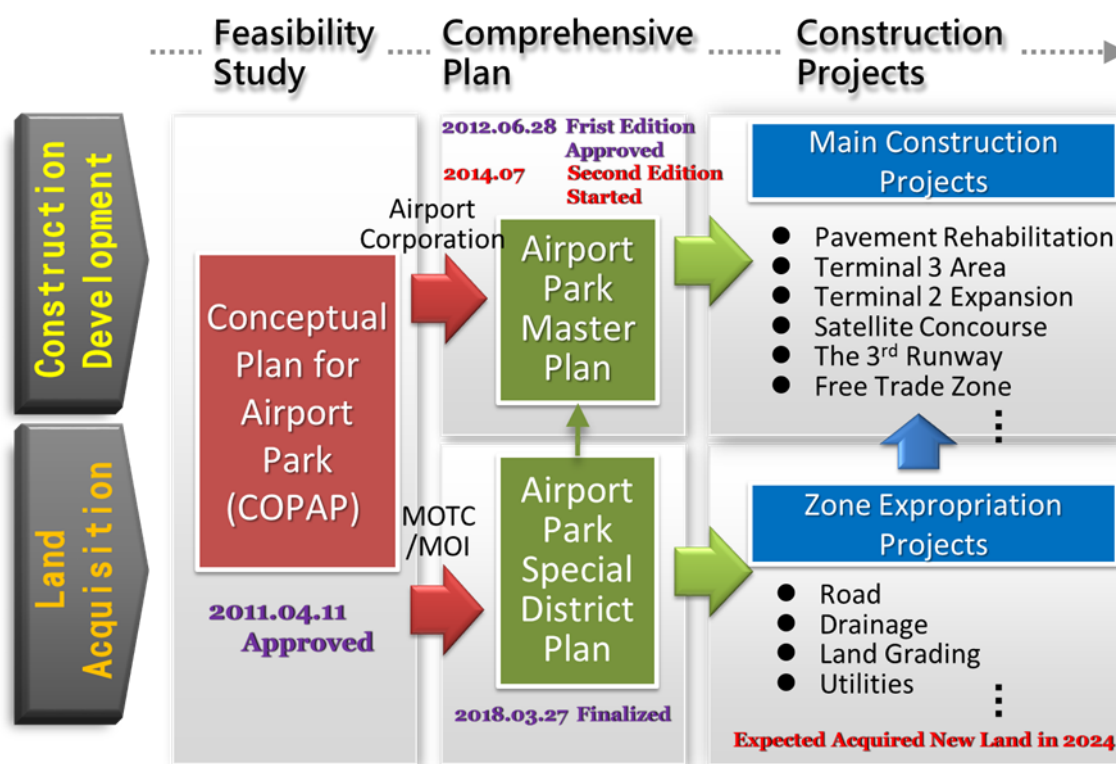
1.1 Plan and Background

In 2009, the central government of Taiwan announced the enactment of the International Airport Park Development Act, which aims to further strengthen the country's competitiveness, boost economic prosperity, and assist with the implementation of the Taoyuan Aerotropolis policy. In this context, a number of relevant plans have been planned and executed in the three stages of feasibility studies, comprehensive planning, and construction planning – as shown in Figure 1-1.

Following the authorization by the Executive Yuan of the Airport Park Conceptual Plan (hereafter referred to as the “COPAP”), the development of the Airport Park moved on to the comprehensive planning stage and divided into two parallel axial directions: construction development and land acquisition. To advance the construction development process, Taoyuan International Airport Corporation (TIAC) has initiated the Airport Park Master Plan. And with respect to land acquisition, the competent authority the Ministry of Transportation and Communications (MOTC) has requested the Ministry of the Interior (MOI, which is the central government's urban planning competent authority) to execute the Airport Park Special District Plan. After the Airport Park Master Plan and the Airport Park Special District Plan are approved, both processes then enter the construction planning stage. At this stage, all the major construction projects will be drawn up in accordance with the established development demands and then implemented after having obtained all the required administrative approvals.

Based on the overall development vision for the Airport Park and its surrounding areas, the COPAP outlines the development strategy and provides a long-term development blueprint for the next 20 to 30 years. Its conclusions serve as the basis for the formulation of the Airport Park Master Plan, which in turn focuses on the main construction projects for the next 5 to 10 years and provides detailed layout and planning to serve as a ready reference for the ongoing and

future construction operations.



Note: The second edition of Airport Park Master Plan started on 2014.7.31, and renamed as “Airport Park Master Plan Revised Edition (Target Year 2042)” based on the 2017.6.15 review meeting.

Figure 1-1 Airport Park Related Plans

As the Airport Park land expropriation work continues to move forward, planning for the newly acquired land on the north side of the Park must begin as early as possible, with the capacity and layout of the facilities continually reviewed, so as to provide an effective basis for further decisions. Therefore, this revised edition of the Airport Park Master Plan re-examines the development planning of the existing Park land and attempts to provide a blueprint and a development strategy for the planning of the newly acquired land, and offer specifics in terms of its planning layout. The basis of this effort includes the findings and conclusion of the COPAP (as approved on 2011.4.11), the Airport Park Master Plan (approved on 2012.6.28), the Airport Park Special District Plan (finalized on 2018.3.27), as well as the results of the planning for the main construction projects design.

This plan has 2042 as its target year, and seeks to continue the development direction taken by the COPAP, which has the following important components:

1. Turning the Airport Park into a key East Asia hub airport with a balanced distribution of inbound, outbound and transferring passenger and cargo flows;
2. Enhancing the Airport's capabilities in providing a superior and convenient environment for passengers and cargo operations and thus continuing to contribute to Taiwan's industrial development.

1.2 Planning Scope

The land use scope for this plan derives from the two major areas outlined in the Airport Park Special District Plan – namely the Airport Zone, and the Free Trade Zone. The Airport Park Special District Plan was finalized on July 29, 2014 (Meeting No. 832) and presented for public viewing on August 11, 2017, before finally being approved and passed on March 27, 2018 (Meeting No. 919). However, the actual scope and specific area allocated in the Plan shall be further adjusted and revised based on various practical considerations during its authorization and the site zonal expropriation demarcation and surveying.

The proposed expansion land areas of the Airport Zone and the Free Trade Zone are 610.89 hectares and 73.81 hectares respectively. The locations are shown in Figure 1-2.



Figure 1-2 Plan Land Use Scope

Chapter 2 Airport Current Situation

2.1 Airport Facilities

The main facilities of the Taiwan Taoyuan International Airport are shown in Table 2-1 and briefly described as follows.

I. Airside Movement Area

1. Runways: The airport has two runways – 05L/23R (North Runway) with 3,660 meters in length and 05R/23L (South Runway) with 3,800 meters in length, both runways are 60 meters wide with the centerline spacing of 1,506 meters. The declared runway capacity is 50 aircraft movements per hour.
2. Taxiways: The existing taxiways have a minimum width of 30 meters; details are presented in Figure 2-1.
3. Apron: There are currently 86 active aircraft stands and 30 maintenance aircraft stands, as shown in Table 2-1.

II. Passenger Terminals

1. Terminal 1: The floor area is 182,796 square meters, and the capacity is 15 million passengers per annum (MPPA).
2. Terminal 2: The floor area is 316,643 square meters, and the capacity is 17 MPPA (Following the completion of the expansion project, increased to 22 MPPA).

III. Cargo Terminals

There is a total of 4 cargo terminals, with the annual total cargo traffic capacity of 2.9 million metric tons.

IV. Utilities

1. MRO Areas: 6 maintenance hangars in 2 MRO areas.
2. Other facilities:

These include a fuel farm, a fire & rescue station, catering facilities, main substations, water storage and pump stations, wastewater treatment

plants, ground service equipment maintenance area, etc.

Table 2-1 Taiwan Taoyuan International Airport Main Facilities

Items	Location		Specifications in 2016	Area (m ²)	
Runway	05L/23R (North Runway)		3,660 m long, 60 m wide	—	
	05R/23L (South Runway)		3,800 m long, 60 m wide		
	Capacity (aircraft movements / hour)		50 (two runway)		
	Largest Aircraft Type		A380 and B747-8F		
Taxiway	WC, EC		30 m wide	—	
	Others (N/ L/ Q/ S/ R/ Q/ NP / NN/ NC)		30-35 m wide; NC: 30-45 m wide		
Apron	Passenger	Terminal	38	450, 524	
		Remote	23	200, 148	
	Cargo	Cargo area	15	333, 413	
		North east area	10		
	Maintenance			30	339, 469
Passenger Terminal	Annual Capacity (Peak Hour Passengers)		Terminal 1	15 MPPA (4, 000 passengers/hour)	182, 796
			Terminal 2	17 MPPA (5, 000 passengers/hour)	316, 643
			Terminal 3	45 MPPA (10, 688 passengers/hour) ¹	385, 131
Cargo Terminal	Annual Capacity	Inside Airport Zone	TACTL	980 thousand metric tons	133, 079
			EGAC	820 thousand metric tons	72, 366
		Outside Airport Zone	EVERTER	300 thousand metric tons	43, 000
		Free Trade Zone	Farglory FTZ	800 thousand metric tons	167, 042
MRO Area	CAL	Hanger 1	5E1C	43, 600	
		Hanger 2			
	EVA	Hanger 1	5E2D2C	55, 645	
		Hanger 2			
		Hanger 3			
	Hanger 4				
Utilities	Fuel Supply System	Fuel Farm		Tank Capacity 56, 000 KI	
	Water System	1 st Water Storage/Pump Station		Storage Capacity 15, 000 m ²	
		2 nd Water Storage/Pump Station		Storage Capacity 13, 200 m ²	
	Wastewater System	1 st Wastewater Treatment Plant		Throughput 11, 000 CMD	
	Power System	1 st Substation		5 set: 161Kv/11.4Kv 40 MVA Transformer	
	Waste Treatment	Incinerator		Throughput 120 metric tons per day	
	Fire & Rescue	F&R Station		CAT10 category	
	Catering Facilities	EGSC	32, 000 (Land Area 17, 000 square meters)		32, 767
CPCS		30, 000 (Land Area 25, 000 square meters)		29, 341	
TACS		— (Land Area 26, 016 square meters)		19, 825	

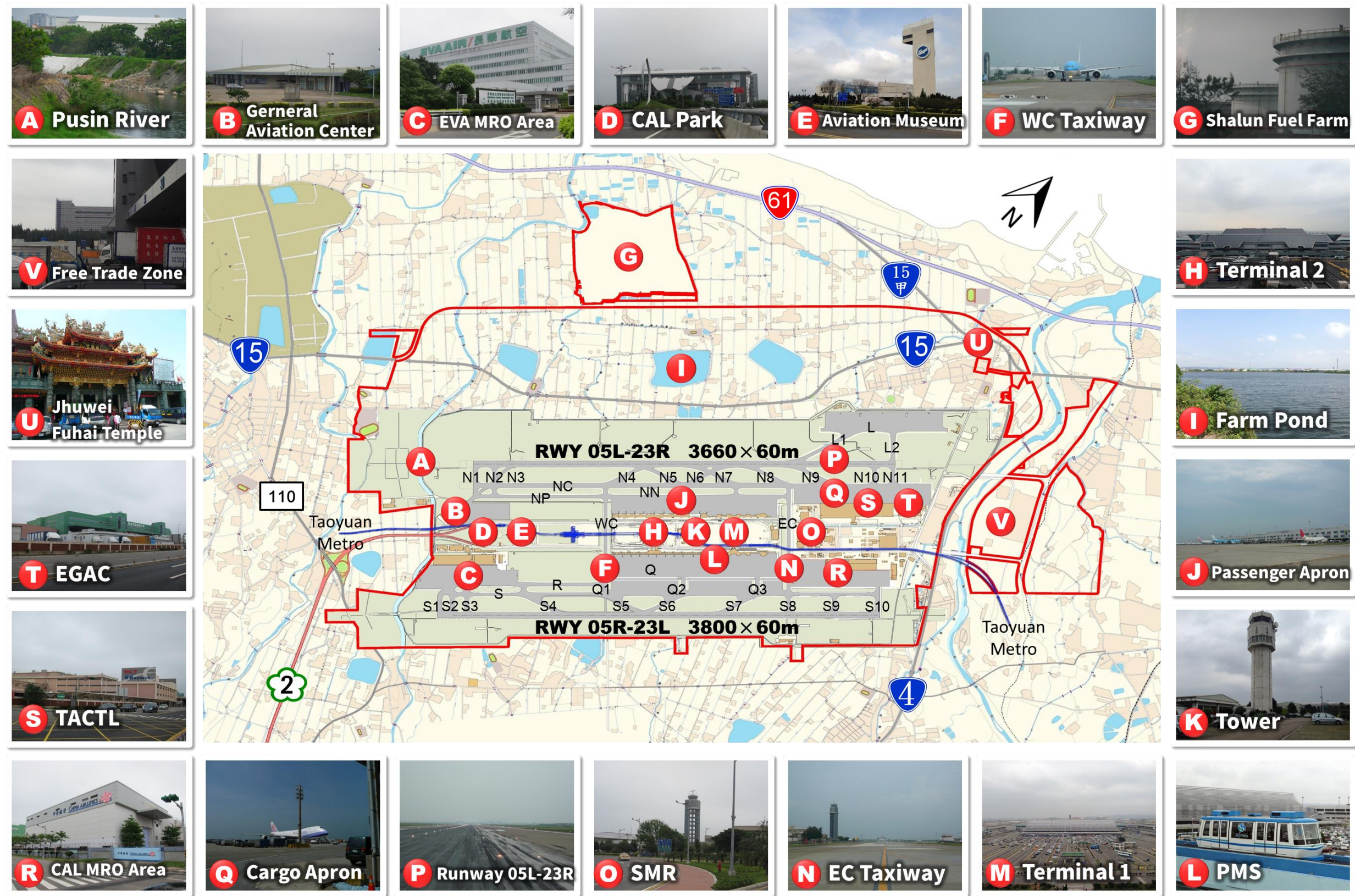
Note: "The Taoyuan International Airport Terminal 3 Area Construction Plan" (approved in March 2015)"

Source: 1. TIAC website, http://www.taoyuanairport.com.tw/company_ch/media-centre.

2. Civil Air Transportation Statistics, June 2016, CAA.

3. China Airline Website, <http://emd.china-airlines.com/lang-tc/facility.html>.

4. EVA Air Website, <http://www.egat.com.tw/ch/Facility-Tour.aspx>.



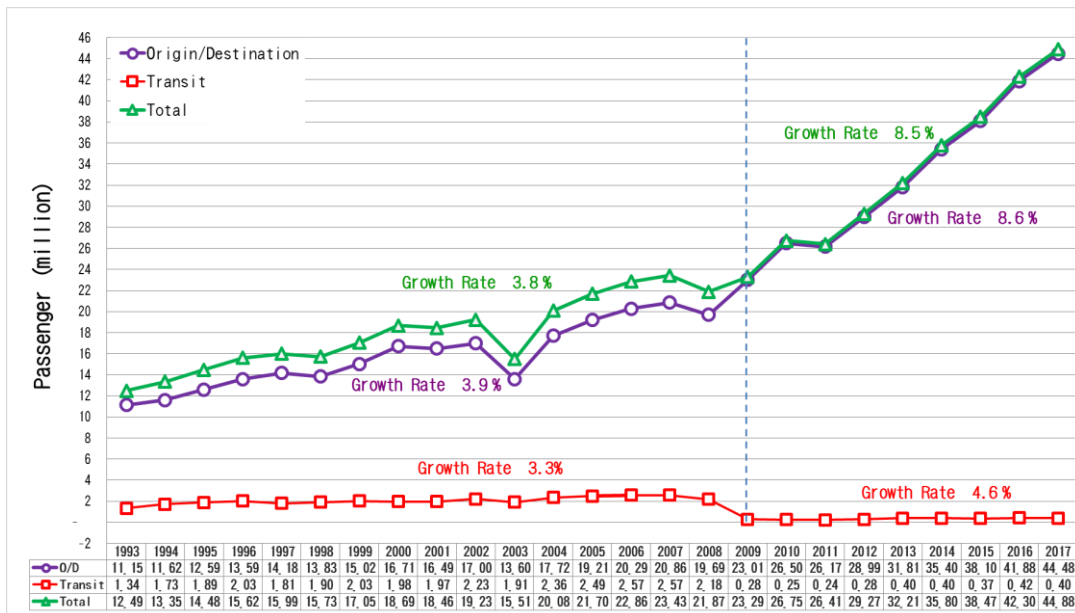
Note: Jhuwei Fuhai Temple is not in Airport Park area.

Figure 2-1 Location of the Main Airport Facilities

2.2 Air Traffic Volume

I. Passenger Traffic

Figure 2-2 presents the main international passenger traffic trends at Taiwan Taoyuan International Airport for the past decades. Arrivals and departures have generally been in an uptrend interrupted by the SARS incident in 2003, and the negative growth caused by the global financial crisis of 2008-2009. In 2008, Taiwan and China agreed to allow weekend and weekday cross-strait charter flights, whereas prior to that charter flights were only allowed during the Spring Festival. The end of 2008 also saw the establishment of direct cross-strait flights between the two countries. A number of positive factors, such as Chinese tourists being allowed to visit Taiwan, increasing numbers of Taiwanese passengers traveling abroad, the general flourishing of the Asian aviation market, an increase in airlines’ air routes and numbers of aircraft, as well as the emergence of low-cost airlines, and strong globalization trends, all led to a significant growth in air traffic since 2009. The average annual growth rate for the years from 2009 to 2017 was about 8.6%, and by 2017 the passenger traffic volume increased to 44.88 million passengers.

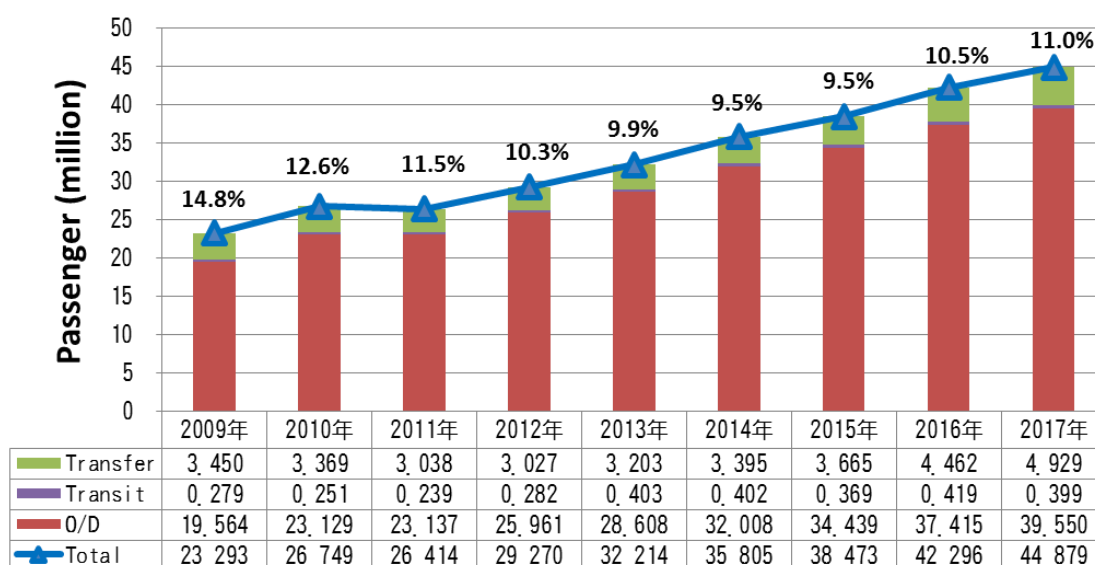


Source: 1. Civil Air Transportation Statistics, June 2016, CAA.
 2. After 2009, the transfer passengers are counted twice.

Figure 2-2 Annual Passenger Traffic

II. Transfer Passenger Traffic

The Taoyuan International Airport transfer passenger traffic and proportion data for the period between 2009 and 2017 is shown in Figure 2-3. As can be seen, with the exception of 2011 and 2012 the volume grew year by year and reached 4.929 million passengers in 2017. At the same time, the proportion of transfer passengers to the total passenger number of passengers increased to 11% in 2017. The main reason for this is the strong growth of the aviation market in the Asia-Pacific region. In fact, the largest portion of transfer passengers at Taoyuan International Airport are those traveling from the Southeast Asian countries, such as Vietnam and the Philippines, to the United States. The rapid economic growth of the Southeast Asian countries in recent years has naturally boosted the demand for air travel and led to a significant increase in the number of passengers transferring at Taoyuan International Airport.

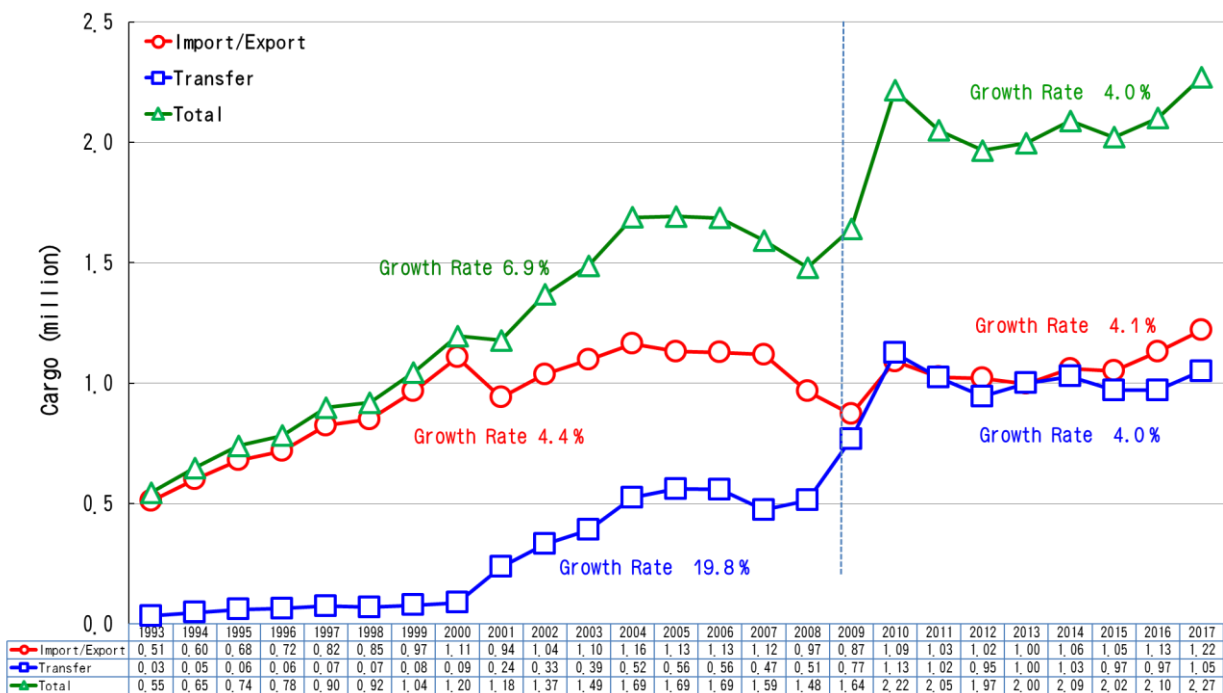


Source: 1. Statistics of the Taoyuan International Airport Corporation (TIAC)
2. The percentage is the proportion of transfer passenger (counted twice) to total passengers.

Figure 2-3 Transfer Passenger Traffic and Proportion

III. Cargo Traffic

The key metrics for the Airport’s international cargo traffic (excluding baggage) are presented in Figure 2-4. The cargo traffic grew significantly prior to 2004, with something of stagnation after 2004. The growth in cargo volumes from import and export operations remained flat from 2000 onwards, but the transfer cargo volume grew significantly between 2001 and 2010. The average growth rate of transfer cargo traffic from 1993 to 2008 was about 19.8%, which led to the growth in the overall cargo traffic. However, the growth of cargo traffic became negative from 2007 to 2009 due to the global financial crisis. In 2016, the trend changed into positive growth due to the booming export of consumer electronics and the flourishing of e-commerce and cross-border e-commerce shopping.



Source: 1. Civil Air Transportation Statistics, June 2016, CAA.
 2. Cargo transfer volume after 2009 is calculated as the sum of goods entering and leaving warehouses and goods directly transited between flights.

Figure 2-4 Annual Cargo Traffic

Chapter 3 Airport Traffic Forecast

3.1 Global Aviation Development Trends

I. The Growth of the Asia Pacific Aviation Market

The global passenger traffic is forecast to grow at a rate of 4.7% (according to Airbus) or 5.0% (according to Boeing) between 2013 to 2033; taken alone, the Asia-Pacific region (including China) is projected to grow at a rate of 5.7% (Airbus).

The continued growth of the global and Asia-Pacific markets is mainly influenced by the growth of new economy markets in such regions as Latin America, Africa, and Asia-Pacific, as well as the rise of airlines with low-cost air transport services.

II. The Development of Strategic Alliances

At present, the world aviation industry is showing a trend towards the development of strategic alliances between the industry actors. Participation in the alliances helps the member airlines improve service quality and operating efficiency. The three major aviation alliances currently are Star Alliance, Sky Team and One World.

III. The Rise of Low-Cost Airlines

Low-cost airlines' development strategy is mostly focused on short-haul routes. They have gradually expanded their global market share and adjusted their business methods, venturing into long-haul routes and cooperating with other airlines, including traditional ones.

IV. The Development of New Aircraft

Key global aircraft manufacturers Airbus and Boeing continue to develop and launch new aircraft in response to the evolving market demands. For instance, Airbus has launched Airbus A380 with the concept of a very large aircraft, increasing the traffic per flight to reduce flight frequency. On the other hand, Boeing has introduced the B787 aircraft, which is characterized by higher energy and fuel savings.

V. International Jet Fuel Price Trends

The cost of jet fuel accounts for about 40% of the aviation industry operating costs. Therefore, fluctuations in jet fuel prices have a considerable impact on the profitability of airlines and aviation company stock prices. According to Airbus' long-term oil price trend forecast, due to the limited crude oil resources and the increase in mining costs, oil prices will continue to increase, so the airlines will have to continue raising their fares.

3.2 Domestic Policy and Economic Development Trends and Other Development Impacts

I. General Domestic Economic Development Trends

Air passenger and cargo traffic numbers are closely related to a country's overall economic development, and their growth trends tend to be reflected in its GDP (gross domestic product) growth. According to the "2015 Taiwan's Overall Economic Forecast" released by the Taiwan Institute of Economic Research in November 2014, a number of issues will have a significant impact on Taiwan's future overall economic development, among them are: the timing and magnitude of the US Federal Reserve's interest rate changes, international energy price trends, geopolitical conflicts, Ebola epidemic, China-Korea Free Trade Agreement (FTA) and the emergence of China's so-called "Red Supply Chains".

II. The Development of Cross-Strait Exchanges

Cross-strait flights between Taiwan and China have been opened to scheduled passenger and cargo flights since 2008, with the number of destinations and flights expected to increase further. It is estimated that the traffic will increase year by year, but the growth rate will slow down. The number of Chinese tourists (both individual and group tourists) permitted to visit Taiwan is regulated by China through the use of quotas, with the demand outstripping the number of permits issued. Similarly, the numbers of transfer passengers from China is subject to the relevant government controls, which is more unfavorable to the domestic industry. The authorities have a deep understanding of this issue and continue to negotiate

with their counterparts.

III. Relevant Trade Agreements

In recent years, trade and economic cooperation between countries all over the world have been liberalized under the multilateral structure of the WTO. At the same time, countries develop regional economic integration through various trade agreements. Due to the tensions between Taiwan and China, Taiwan's international presence has been suppressed and excluded from the Asia-Pacific economic integration structure, which will have a certain impact on Taiwan's economy and trade. At present, the government has proposed individual action plans for individual countries/regions, and has signed four FTAs with five countries. Other notable arrangements include the Cross-Straits Economic Cooperation Framework Agreement (ECFA), the Agreement between New Zealand and the Separate Customs Territory of Taiwan, Penghu, Kinmen, and Matsu on Economic Cooperation (ANZTEC) and the Agreement between Singapore and the Separate Customs Territory of Taiwan, Penghu, Kinmen and Matsu on Economic Partnership (ASTEP).

IV. Bilateral Air Transport Agreements

In recent years, Taiwan has made concrete progress in the negotiation and revision of bilateral air transport agreements, advancement in the Open Skies, and the construction of aviation networks. At the end of 2015, there were 55 countries/regions that signed bilateral air transport agreements with Taiwan. Regarding the development of the air transport agreement in the surrounding areas, it is expected that the air traffic control in the Asian region will continue to be relaxed, and the air transport market will move towards a more open direction in response to the rapid growth of air transport demand in the region.

V. The “Ten Million Tourists” Plan

The government of Taiwan has actively promoted the policy of attracting China's tourists, relaxing visa regulations, simplifying the procedures of arrival and departure, and expanding international routes, all of which has greatly improved the convenience of international passengers coming to Taiwan. In 2015,

the number of visitors to Taiwan exceeded 10 million. In order to continuously promote the transformation and upgrading of the tourism industry, the government has identified four major directions for future development, among which are: actively exploring emerging markets in Southeast Asia and Muslim countries, actively participating in the international cruise market, strengthening exhibitions and incentive travel, and increasing the number of free travelers from China to enhance the quality of tourism.

VI. The Impact of Other Developments

Other air traffic development factors include the implementation of the Taoyuan Aerotropolis Project, construction of the airport access transportation system and other projects (including roads and railways). A number of related development forecasts are drawn constantly up to reflect all the developments in this respect (economic growth forecast, population forecast, industrial development trend, etc.).

3.3 Air Traffic Forecast

I. Development Scenarios Analysis

Taiwan's aviation market is affected by a host of internal and external factors, which can be summarized under the categories of "global aviation development," "domestic policy and economic development," and "other development impacts." The analysis of the possible development trends and the impact on Taiwan's aviation market is shown in Table 3-1. The analysis produces three future development scenarios for the air passenger and cargo traffic at Taoyuan International Airport – conservative, moderate and optimistic.

Table 3-1 The Impact Factors and Influence Degrees of Traffic Forecast in Different Scenarios

Impact Factors			Level of Influence			Scenarios		
Item	Trends and Relevance	Negative Effects	Minor Effects	Positive Effects	Conservative Scenario	Moderate Scenario	Optimistic Scenario	
Global Aviation Development	The Growth of the Asia Pacific Aviation Market	Asia-Pacific aviation market growth drives demand growth.			★★★	✓	✓	✓
	The Development of Strategic Alliance	More flexible airline operations have a positive impact on the market.			★★	✓	✓	✓
	The Rise of Low-cost Airlines	The rise of LCC will help the development of air traffic and transfer market in Taoyuan airport.			★★★	✓	✓✓	✓✓✓
	The Trend of International Jet Fuel Price	Jet fuel prices will continue to grow in the long run, with low market sensitivity.	★★			✓	✓	✓
Domestic Policy and Economic Development	Domestic Overall Economic Development Trend	Economic growth drives demand.			★★★★	✓	✓✓	✓✓✓
	The Development of Cross-Strait Exchanges	The opening of flight transfer through Taiwan drives the market demand.			★★★★		✓	✓✓
	The Relevant Trade Agreement	Trade agreement signing helps economic growth and drive demand.			★★		✓✓	✓✓✓
	Bilateral Air Transport Agreement	Countries have signed air transport agreements, market liberalization, and increased competition.			★★	✓	✓	✓
	The Development of Tourism Market	The overall tourism demand continues to increase, and the four directions enhance quality.			★★★	✓	✓	✓
Other Development Impacts	The Trend of Population Growth	The population growth has slowed down, but the average passengers of travel abroad have increased. The impact of population is slight.		+		✓	✓	✓
	The Trend of Industrial Development	The population growth has slowed down and the impact is slight, but the average passengers of travel abroad have increased.			★★★	✓	✓✓	✓✓✓
	New Southbound Policy	The relaxation of tourist visas in Southeast Asia, air transport agreements and industrial investment development make a positive impact on traffic.			★★★	✓	✓✓	✓✓✓

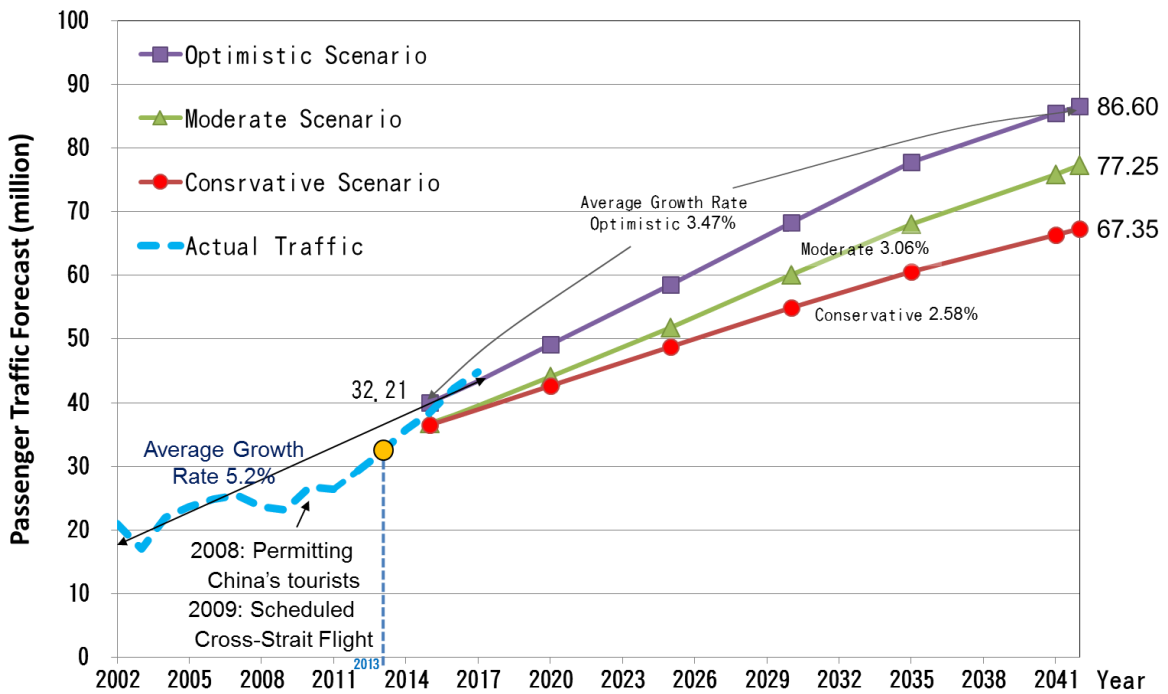
Note:1. 「★★」, 「+」, 「★★★★」 indicate the degree of influence.

2. 「✓」 indicate the degrees in different scenarios.

II. Air Traffic Forecast Results

1. Passenger Traffic

The results for the international air passenger traffic forecast under various scenarios are presented in Figure 3-1 and Table 3-2. In the 2042 target year, the Taoyuan International Airport passenger traffic is projected to reach between 67.35 and 86.6 million passengers depending on the scenario, with the average annual growth rate between 2013 to 2042 of 2.58% to 3.47%.



Note: 1. This plan builds a forecast model with the traffic data before 2013, and the optimistic development is similar to the actual development trend in recent year.
 2. After 2009, the transfer passengers are counted twice.

Figure 3-1 Air Passenger Traffic Forecast Results

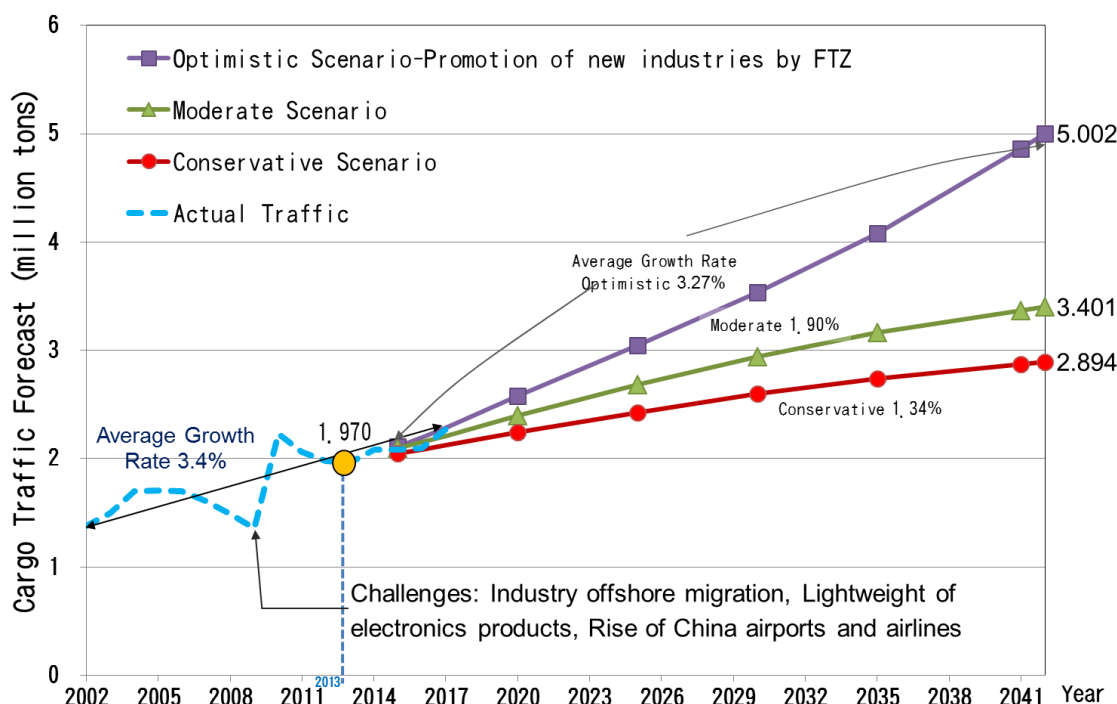
Table 3-2 Air Passenger Traffic Forecast Results

Unit: Million Passenger

Scenarios	Category	Year				
		2020	2025	2030	2035	2042
Passenger-Conservative Scenario	Local Tourist	19.47	21.52	23.73	25.60	28.35
	Foreign Tourist	18.46	21.67	24.79	27.71	30.69
	O/D Traffic	37.93	43.19	48.51	53.31	59.04
	Transfer (counted twice)	4.74	5.54	6.40	7.23	8.31
	Total	42.67	48.73	54.91	60.53	67.35
	Proportion of Transfer	11%	11%	12%	12%	12%
Passenger-Moderate Scenario	Local Tourist	20.33	23.29	26.55	29.42	32.58
	Foreign Tourist	18.46	21.67	24.79	27.75	30.74
	O/D Traffic	38.80	44.95	51.33	57.17	63.32
	Transfer (counted twice)	5.31	6.86	8.72	10.82	13.93
	Total	44.11	51.81	60.05	67.98	77.25
	Proportion of Transfer	12%	13%	15%	16%	18%
Passenger-Optimistic Scenario	Local Tourist	21.97	25.79	29.57	32.81	35.89
	Foreign Tourist	19.97	23.23	26.39	29.38	32.09
	O/D Traffic	41.95	49.02	55.96	62.19	67.98
	Transfer (counted twice)	7.26	9.57	12.36	15.55	18.62
	Total	49.21	58.59	68.32	77.74	86.60
	Proportion of Transfer	15%	16%	18%	20%	22%

2. Cargo Traffic

The main factor affecting the air cargo traffic volumes is the GDP. With the forecasted expansion of GDP under different scenarios, the estimated import and export cargo traffic volumes of Taoyuan International Airport are shown in Figure 3-2 and Table 3-3. Overall, the import and export air cargo traffic is expected to grow to a scale of 1.59 to 2 million metric tons in the target year; the total amount, which includes the transfer amount, is expected to be between 2.89 and 5 million metric tons.



- Note:
1. This plan presents a forecast model with the traffic data before 2013, and the optimistic development trend is similar to the actual development in recent years.
 2. After 2009, the cargo transfer volume is counted twice.

Figure 3-2 Air Cargo Traffic Forecast Results

Table 3-3 Air Cargo Traffic Forecast Results

Unit: million metric tons

Scenarios	Category	Year				
		2020	2025	2030	2035	2042
Cargo-Conservative Development	Import	0.548	0.603	0.654	0.700	0.751
	Export	0.619	0.678	0.734	0.784	0.839
	Transfer	1.075	1.147	1.209	1.257	1.304
	Total	2.242	2.428	2.597	2.741	2.894
	Proportion of Transfer	48 %	47 %	47 %	46 %	45 %
Cargo-Moderate Development	Import	0.587	0.667	0.743	0.811	0.886
	Export	0.661	0.747	0.829	0.901	0.983
	Transfer	1.148	1.267	1.369	1.451	1.532
	Total	2.396	2.681	2.941	3.163	3.401
	Proportion of Transfer	48 %	47 %	47 %	46 %	45 %
Cargo-Optimistic Development	Import	0.587	0.667	0.744	0.824	0.950
	Export	0.661	0.747	0.829	0.916	1.051
	Transfer	1.330	1.630	1.959	2.341	3.001
	Total	2.578	3.045	3.532	4.081	5.002
	Proportion of Transfer	52 %	54 %	55 %	57 %	60 %

Note: The cargo transfer volume is counted twice.

III. Brief summary

According to the forecast results of the air passenger traffic, by the target year (2042), the total passenger traffic of Taoyuan International Airport will have reached 77.25 million under the moderate scenario. In the optimistic scenario, it will reach 86.6 million passengers. With the goal of becoming a key East Asia hub airport, all facilities should retain the flexibility to meet the maximum demand and adopt a staged development approach to reduce the risk of uncertainty. Therefore, we suggest using the optimistic scenario forecast results as the design basis, as shown in Table 3-4.

For Taoyuan International Airport to develop into an East Asia hub airport, the transfer ratio is set at 22%. It is expected that China's controls of passenger transfers will gradually liberalize, and with the growth of the Southeast Asian economies, the transfer numbers for passengers from Southeast Asia, North America, and Northeast Asia will increase. It is also expected that cross-strait routes, low-cost airline flights, and long-haul flights will gradually increase. In the future, Code C and Code E aircraft will be the prevalent categories, with the average number of seats being 274, and the carrying capacity of 70%. The passenger aircraft movement is estimated to reach 451,000 flights and 40,000 flights for cargo aircraft.

Table 3-4 Air Passenger and Cargo Traffic Forecast Results

Scenario	Item	Year (Actual Value)			Year (Estimated Value)					Annual Average Growth Rate (%)
		2013	2014	2015	2020	2025	2030	2035	2042	
Passenger- Optimistic Scenario	O/D Traffic (Million Passenger)	28.61	32.00	34.44	41.95	49.02	55.96	62.19	67.98	3.47
	Transfer Traffic (Million Passenger)	3.60	3.80	4.03	7.26	9.57	12.36	15.55	18.62	
	Total (Million Passenger)	32.21	35.80	38.47	49.21	58.59	68.32	77.74	86.60	
Cargo- Promotion of FTZ	O/D Traffic (Million Metric Ton)	1.010	1.040	1.051	1.248	1.414	1.573	1.740	2.001	3.27
	Transfer Traffic (Million Metric Ton)	0.960	1.030	0.970	1.330	1.630	1.959	2.341	3.001	
	Total (Million Metric Ton)	1.970	2.070	2.021	2.578	3.045	3.532	4.081	5.002	
Annual Aircraft Movement	Passenger Flights (Thousand Flights)	-	182.44	199.82	246.03	292.94	346.78	404.91	451.06	3.25
	Cargo Flights (Thousand Flights)	-	24.15	25.33	28.87	31.66	34.61	37.54	40.02	
	Total (Thousand Flights)	-	208.86	225.15	274.90	324.60	381.39	442.45	491.08	

Note: The estimated value is calculated based on the actual traffic in 2013 and the period from 2013 to the target year.

Chapter 4 Future Airport Development Plans

4.1 Planning Principles

Considering the functions of various airport infrastructures, they can be divided into core, sub-core, and others based on their importance for future development and layout planning. The locations of each type is demonstrated in Figure 4-1.

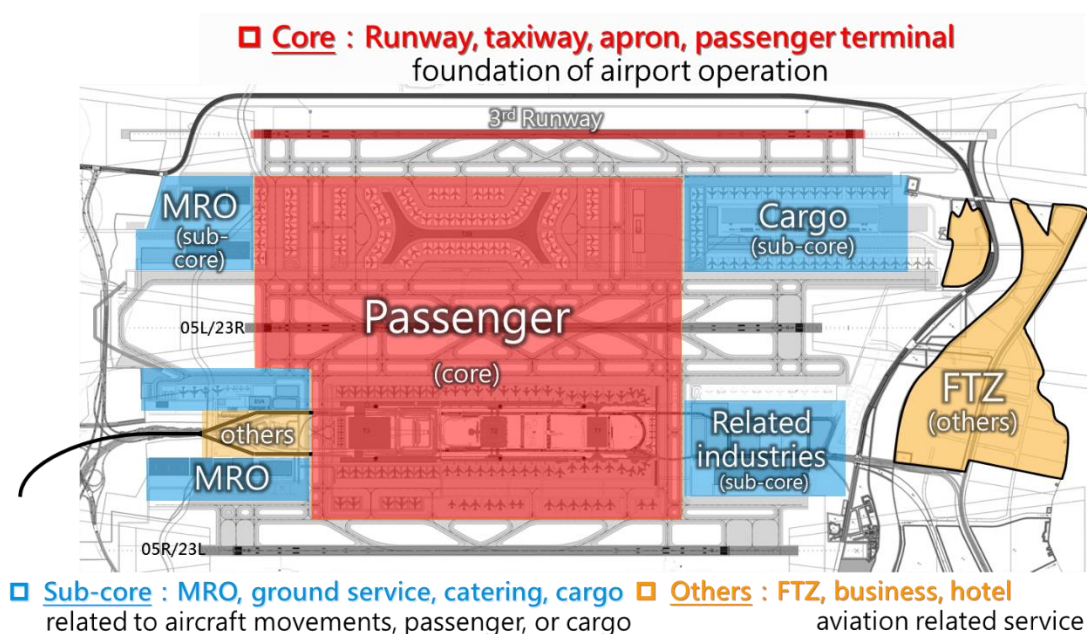


Figure 4-1 Overall Airport Development Principles

4.2 Layout

Under the framework developed in the COPAP, we propose the overall airport layout (Figure 4-2) to meet the traffic demand set for the target year in this plan.

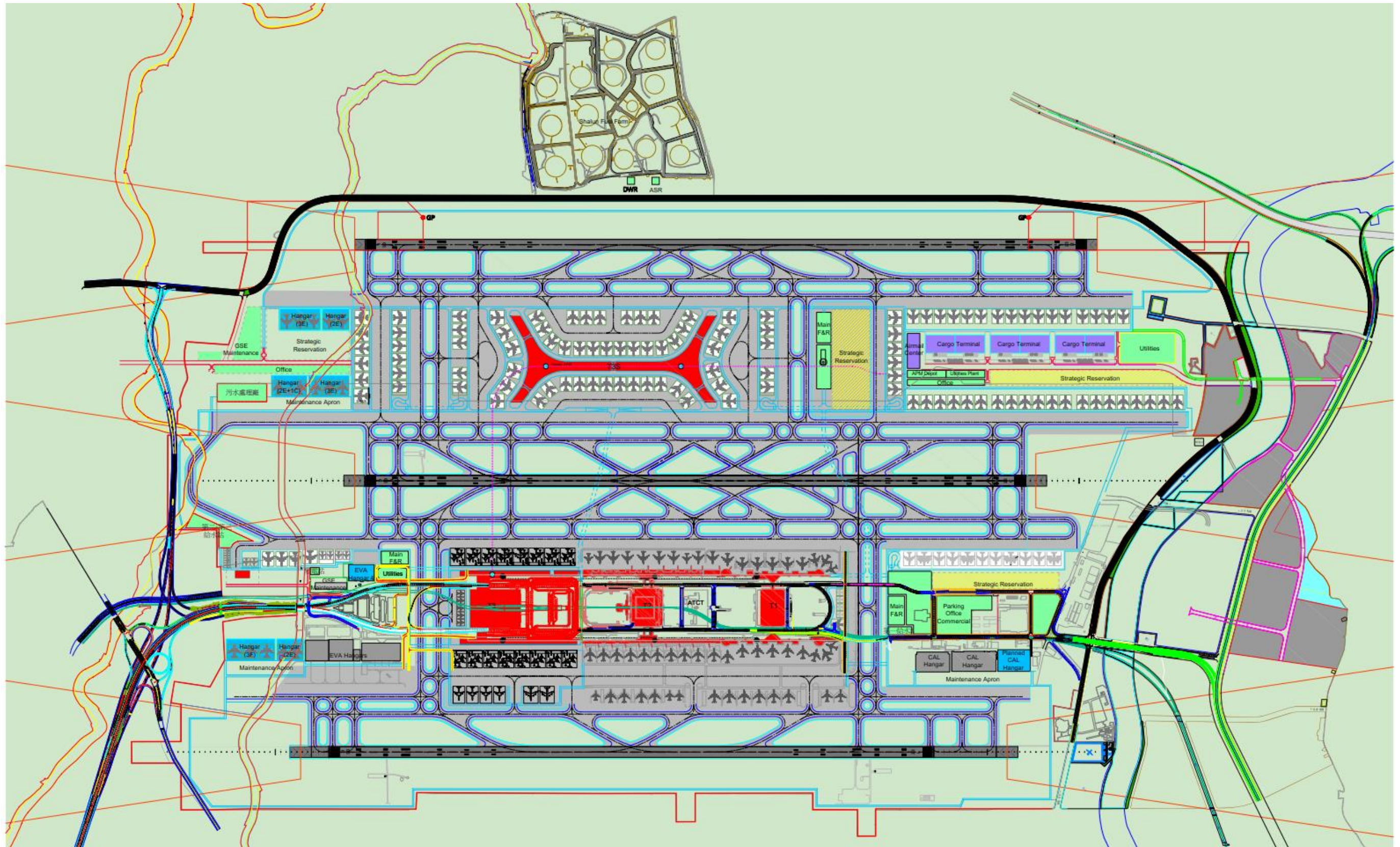


Figure 4-2 Overall Airport Layout (Target Year 2042)

I. Runway and Taxiway

The third runway will be 4,000 m long, constructed in the north area, at least 1,295 m away from the north runway. The location of the navigational aid equipment is shown in Figure 4-3.

Concerning the taxiway layout, there will be two vertical taxiways respectively to the east and west of the satellite concourse. In the existing airport area, we propose several taxiway constructions, including: WC taxiway relocation and expansion, NP taxiway extension, parallel taxiway on the north side of the North Runway, 05L end-around taxiway, and EC taxiway expansion.

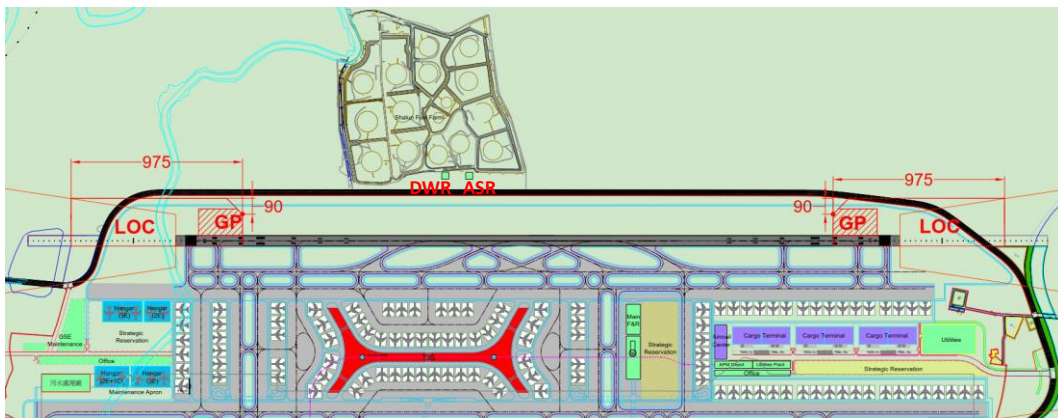


Figure 4-3 Third Runway Navigation Aid Equipment Location

II. Aircraft Stand

After reviewing air traffic growth and civil aircraft market trends, we propose the layout of the aircraft stands in 2042 as outlined below. If Code F aircraft stands can be flexibly allocated to Code C or Code E aircraft, the number of aircraft stands in the target year can meet the demand of 177 passenger aircraft stands, which fully meet the demand of each type of aircraft, as shown in Table 4-1.

Table 4-1 Planning of Passenger Aircraft Stands (2042)

Aircraft Type	T1+T2	T3+T3S
Code C	7	43
Code E	42	59
Code F	10	16
Total	59	118

The gap between demand and supply in specific years is reviewed, as per Table 4-2. From 2018 to 2020, the demand for passenger aircraft stands is higher than the supply. The gap in 2019 is the most significant. After 2019, construction of T3 aircraft stands will be completed one after another. Demand and supply of active aircraft stands will turn from negative to positive in 2021. Completion in the long term of the north satellite concourse passenger aircraft stands will provide 38 new active stands and 34 over-night stands allowing to meet the future projected demand.

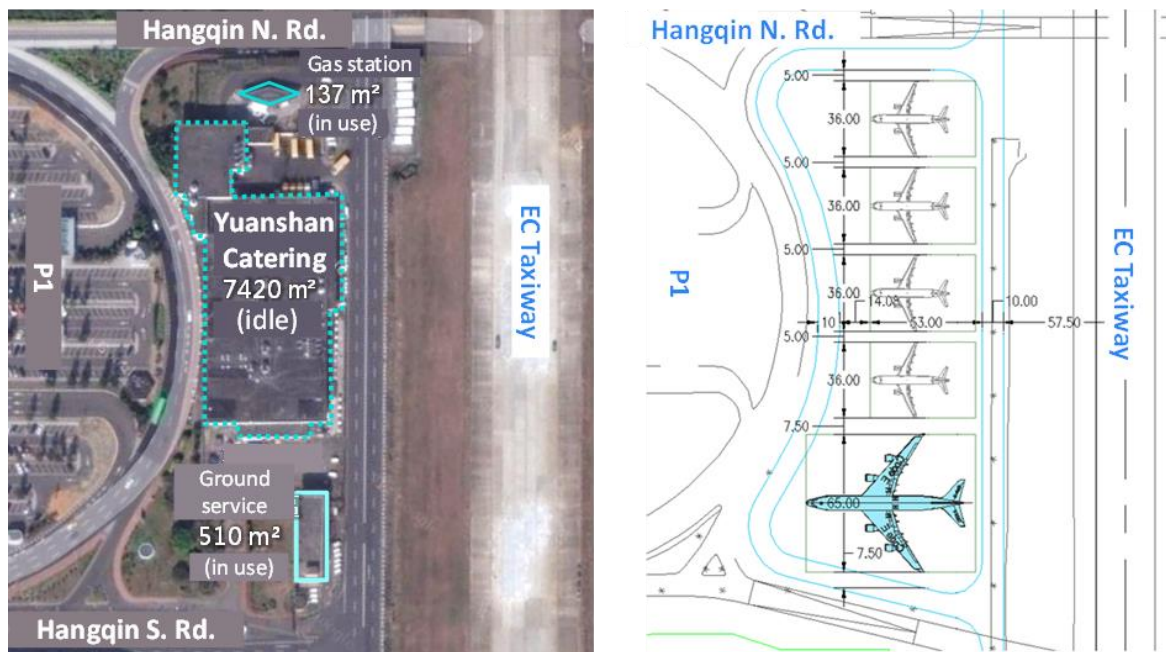
Table 4-2 Supply and Demand of Passenger Aircraft Stands

Type of Stand	Supply / Demand	2017	2018	2019	2020	2021	2025
Active	Demand	60	68	71	74	77	88
	Supply	63	61	61	69	84	95
	Gap	3	-7	-10	-5	7	7
Active + Over-night	Demand	73	81	84	87	91	103
	Supply	63	61	61	69	84	95
	Gap	-10	-20	-23	-18	-7	-8
Events of Increasing Aircraft Stands	<ul style="list-style-type: none"> - Turn Cargo stands into passenger stands(+2) - Turn 801-808 into active stands 			<ul style="list-style-type: none"> - T3 apron (+2F6E) - Yuanshan apron (+4C1E)) 	<ul style="list-style-type: none"> - T3 apron (+2F6E) 	<ul style="list-style-type: none"> - T3 apron (+2F4E5C) - T1 air bridge replacement (+2) - End of APM and underground service road construction (+2) 	<ul style="list-style-type: none"> - A3 north apron (+1F3E4C) - End of airside facilities reinforcement (+3)
Events of Decreasing Aircraft Stands			<ul style="list-style-type: none"> - T1's air bridge replacement (-2) 	<ul style="list-style-type: none"> - 801-808 demolition (-8) - Airside facilities reinforcement (-3) - APM and underground service road construction (-2) 			

We suggest to implement the following apron construction projects in the near future:

1. Yuanshan Apron Construction

To fully utilize the available airport land resources, mitigate the shortage of aircraft stands in the terminal area, and address the shortage of remote apron nearby A1 to A9 stands, we suggest to build 5 new aircraft stands in the area which previously housed the Yuanshan Catering Area, including 1 Code E and 4 Code C stands, as shown in Figure 4-4 (B).



(A) Current Land-use (B) Proposed Apron Layout

Figure 4-4 Yuanshan Apron Planning

2. North A3 Area development

Considering the shortage of aircraft stands, we suggest to change the previous General Aviation Center into apron. The NP taxiway needs to be extended to the west. The new apron can increase 1 Code F stand, 3 Code E stands, and 4 Code C stands, as shown in Figure 4-5.

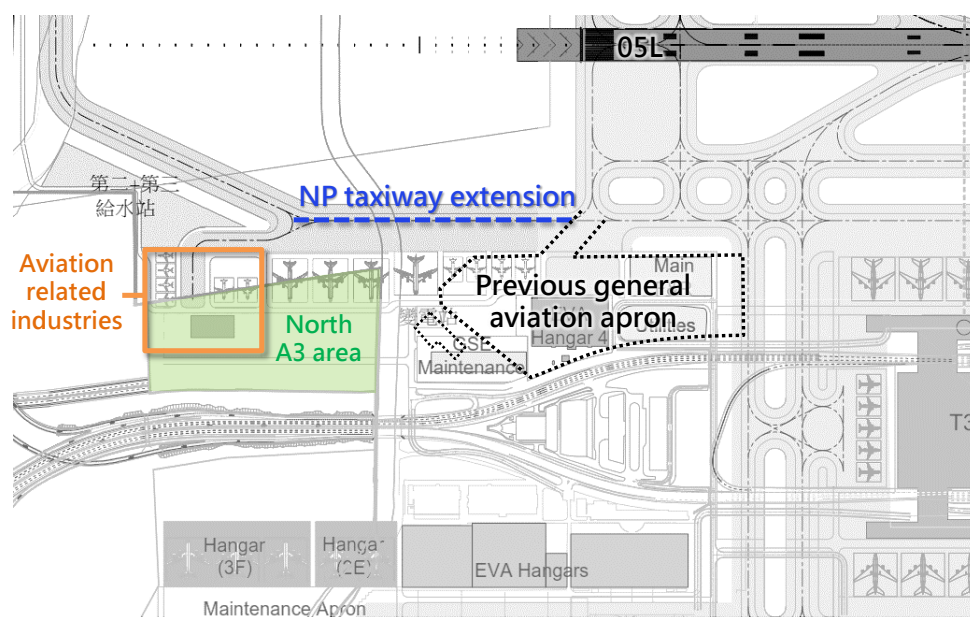


Figure 4-5 North A3 Area Development Concept

III. Passenger Terminal Planning (Introducing Smart Facilities)

Terminal 1 expansion was completed in 2013 and has allowed increasing its capacity to 15 MPPA (million passengers per annum). After T2 expansion (to be completed in 2019), T2 capacity has been increased to 22 MPPA. When T3 construction is completed, the new terminal will be able to serve 45 million passengers. The layout of the north satellite concourse is shown in Figure 4-6.

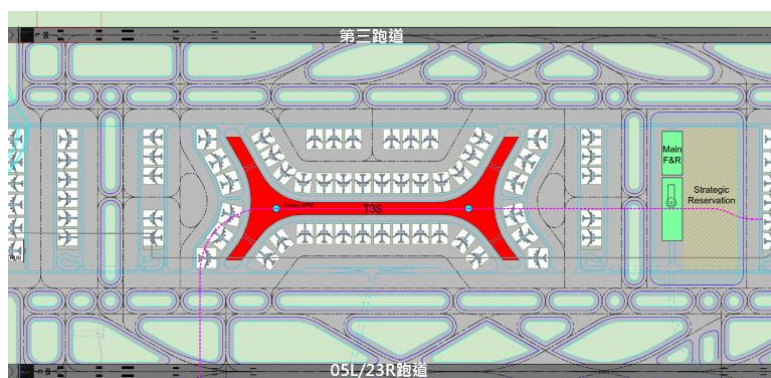


Figure 4-6 Suggested Layout of the North Satellite Concourse Area

In 2017, IATA has launched the Fast Travel Program. Additionally, IATA and ACI have recently started promoting the NEXTT (New Experience in Travel and Technologies) initiative. Introducing smart facilities to airports has become a worldwide trend. With smart mobile devices, passengers can now go through the check-in, security, and boarding procedures on their own. Smart facilities not only enhance operational efficiency and reduce required human resources, but also make the layout of an airport simpler and more intuitive, so the benefits of terminals and satellite concourses with limited space can be maximized.

During the planning and design stage of the terminal facilities, the Airport Corporation will continue to review and introduce various new passenger processing procedures to meet the passengers' needs and fully utilize the terminal space to maximize efficiency and capacity.

IV. New Cargo Area

The proposed layout of the new cargo area is presented in Figure 4-7. There shall be at least 42 cargo aircraft stands to meet the long term demand. Other facilities in the new cargo area include cargo terminals, a mail center, utilities, and an administrative office.

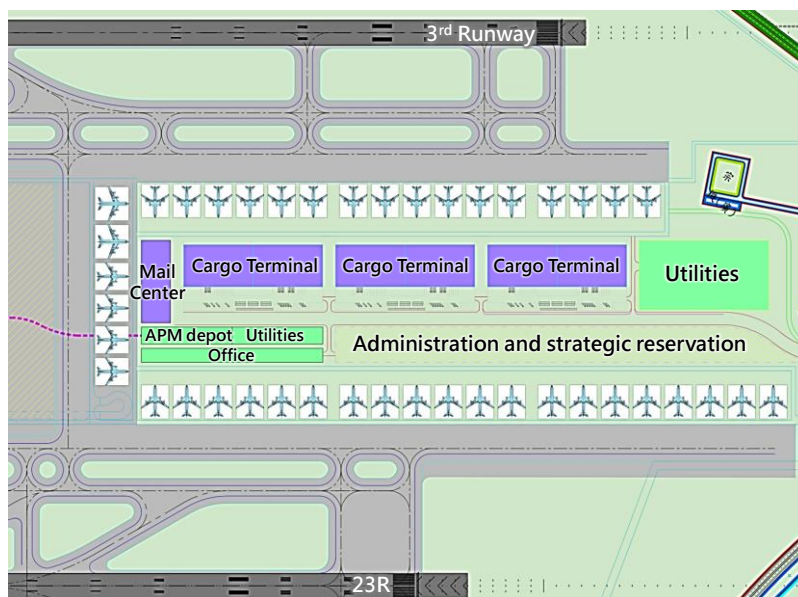


Figure 4-7 Layout of New Cargo Area

V. Fire & Rescue Station

According to ICAO Annex 14, the location of the F&R station shall be determined by the minimum reaction time. The existing South F&R station is on the south side of the south runway, so the F&R vehicles need to cross the runway. We suggest to re-locate the South F&R station to the east side of EC taxiway and integrate the South station with the existing North F&R station. Besides, we recommend integrating the existing West and East F&R stations on the west side of WC taxiway and constructing a new F&R station on the east side of the satellite concourse (for the third runway), as shown in Figure 4-8.

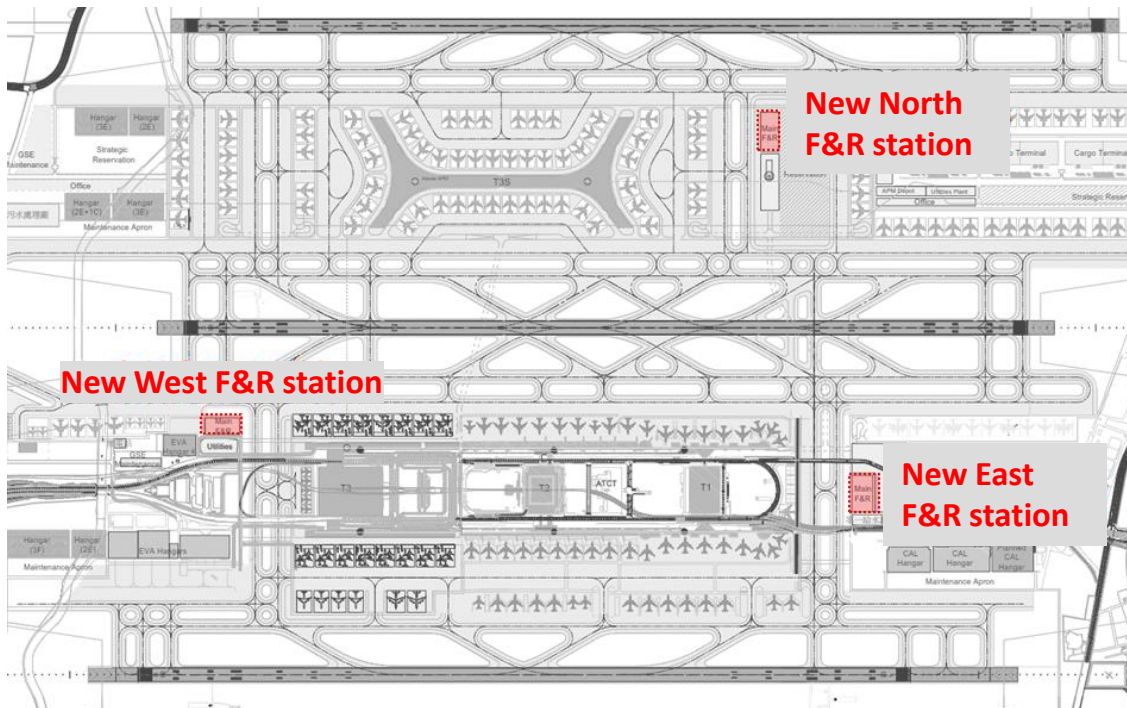


Figure 4-8 Layout of F&R Stations

VI. MRO Area

The existing MRO hangars are respectively on the east and the west side of the airport. We suggest the MRO companies to build hangars in the North West MRO area and the south A3 area, as shown in Figure 4-9.

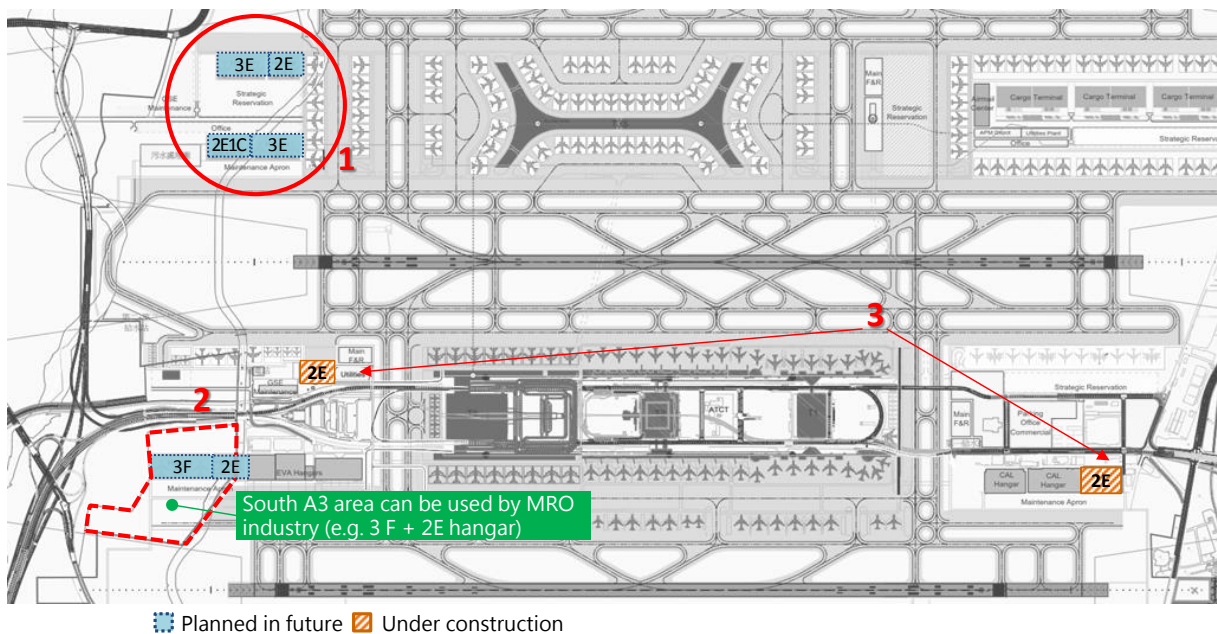


Figure 4-9 Layout of MRO Area

VII. Ground Service Equipment (GSE) Maintenance Area

The existing GSE maintenance areas are respectively on the east side of EC taxiway, close to China Airlines hangar (TIAS), and on the west side, close to EVA hangar (EGAS). Considering the future requirements, we suggest reserving the west side of the new satellite concourse area for GSE maintenance area, as shown in Figure 4-10.

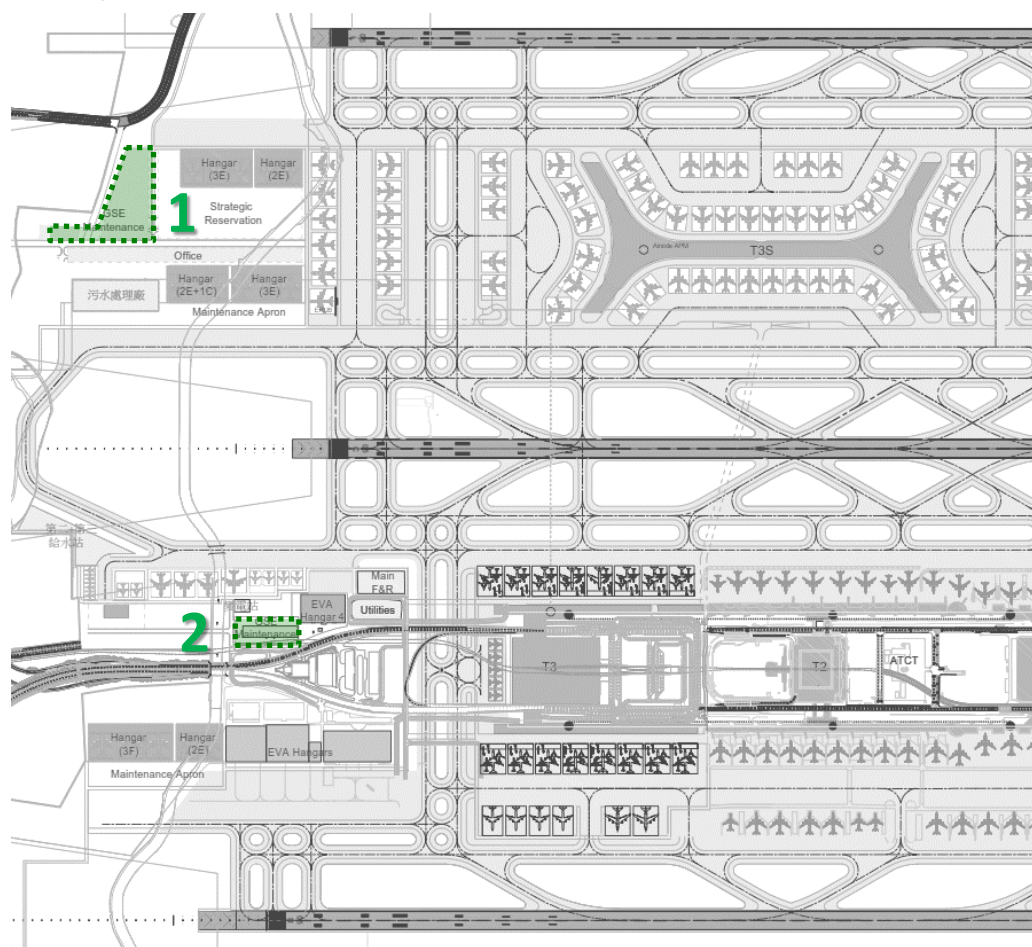


Figure 4-10 Layout of GSE Maintenance Area

VIII. Catering Facilities

To increase convenience of the ground operations and enhance overall efficiency, we suggest locating the catering facilities (which are closely connected to the ground operations) in the airside area. Referring to the Airport Park Master Plan (First Edition), the catering facilities will be located between the Hangqin North Road and the Hanqin South Road, as shown in Figure 4-11. The area can be flexibly allocated to the ground service facilities.

Other catering facilities (those not essential to the core area), such as food factory, can be located outside of the area.

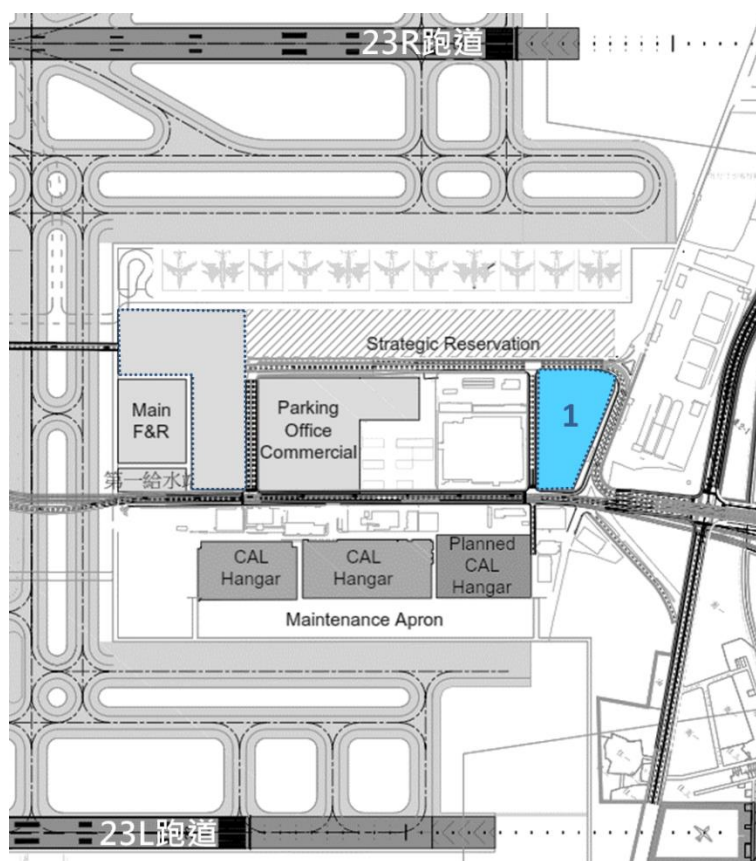


Figure 4-11 Layout of Catering Facilities

IX. Service Road

According to IATA suggestion, to meet the requirements of ground vehicles especially for luggage and cargo, the minimum lane width is 5 m. The main airside service road in this study is 10 m wide, and the underground section is recommended to be at least 18 m wide. The peripheral road is 7 m wide, the same as the existing peripheral road.

Service roads are all 2-way, and mainly 2-way 2-lane, except for the 4-lane service road in front of the contact apron to separate the traffic. The outer lane is for slow traffic flow, and the inner lane is for passing traffic. Figure 4-12 shows the layout of the airside service road.

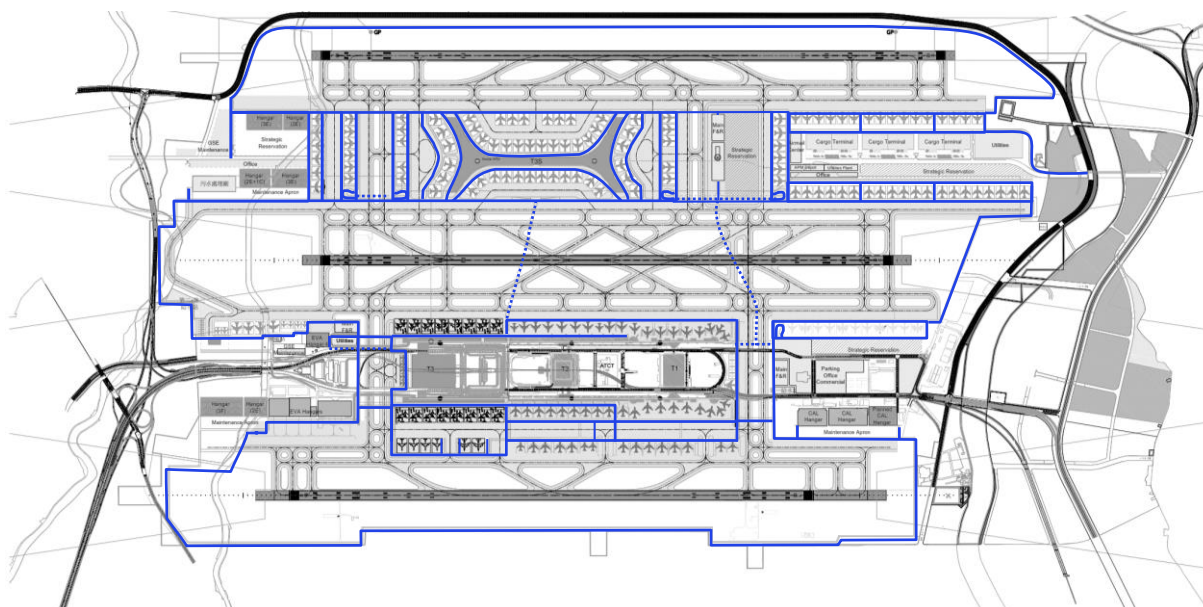


Figure 4-12 Planning of Airside Service Road

X. Utilities

Considering the future requirements, we recommend reserving the area for an energy center, water storage and pump stations, wastewater treatment plants, substations, fuel farm, administrative office, and warehouses, as shown in Figure 4-13.

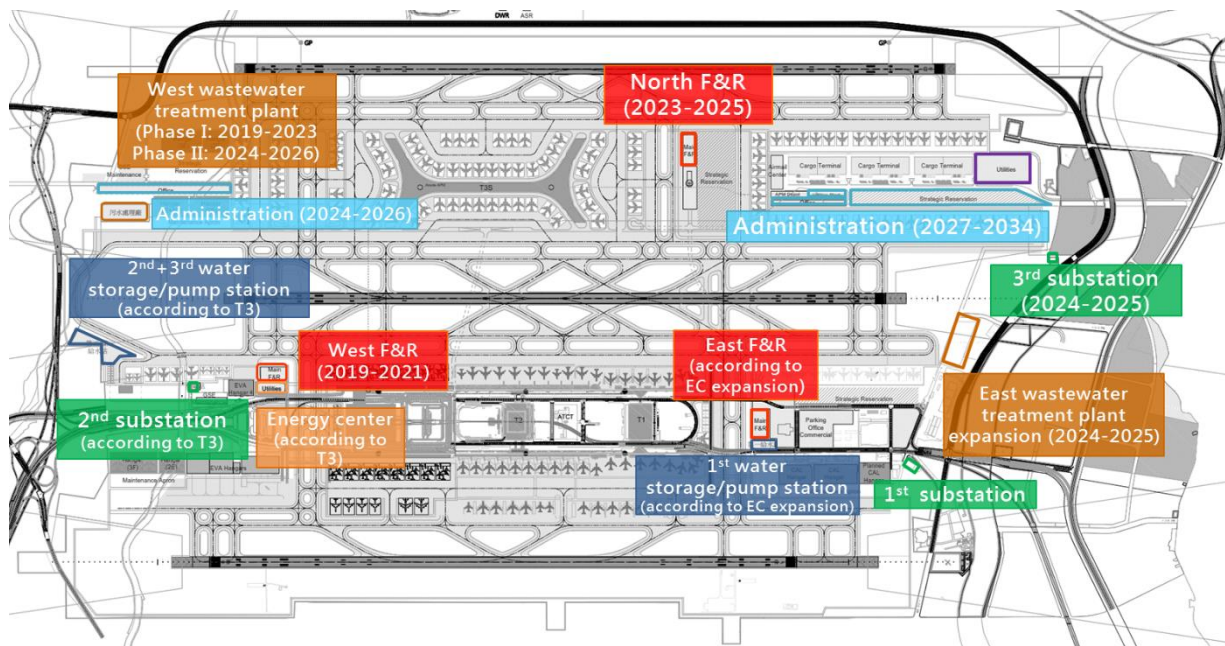


Figure 4-13 Layout of Utilities

Considering the long term development, the layout of the future utilities in the area on the east side of EC taxiway is shown in Figure 4-14. Figure 4-15 shows the existing facilities which need to be relocated. The Airport Corporation will further communicate and negotiate with relevant units on the future planning and design stage. Table 4-3 shows the existing facilities and future plans.

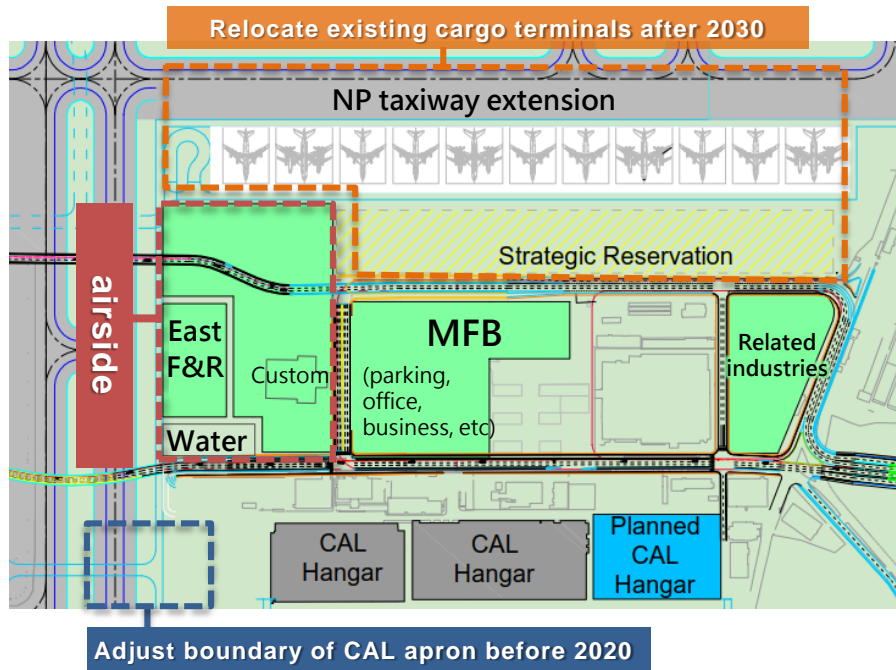


Figure 4-14 Future Layout of the East Area of EC Taxiway

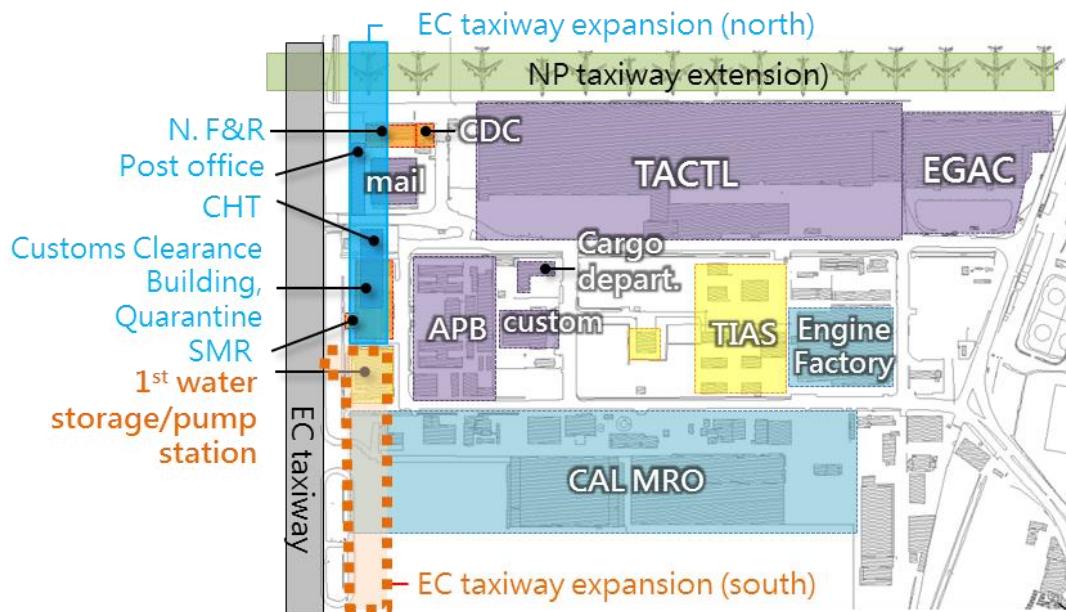


Figure 4-15 EC Taxiway Expansion and Existing Facilities

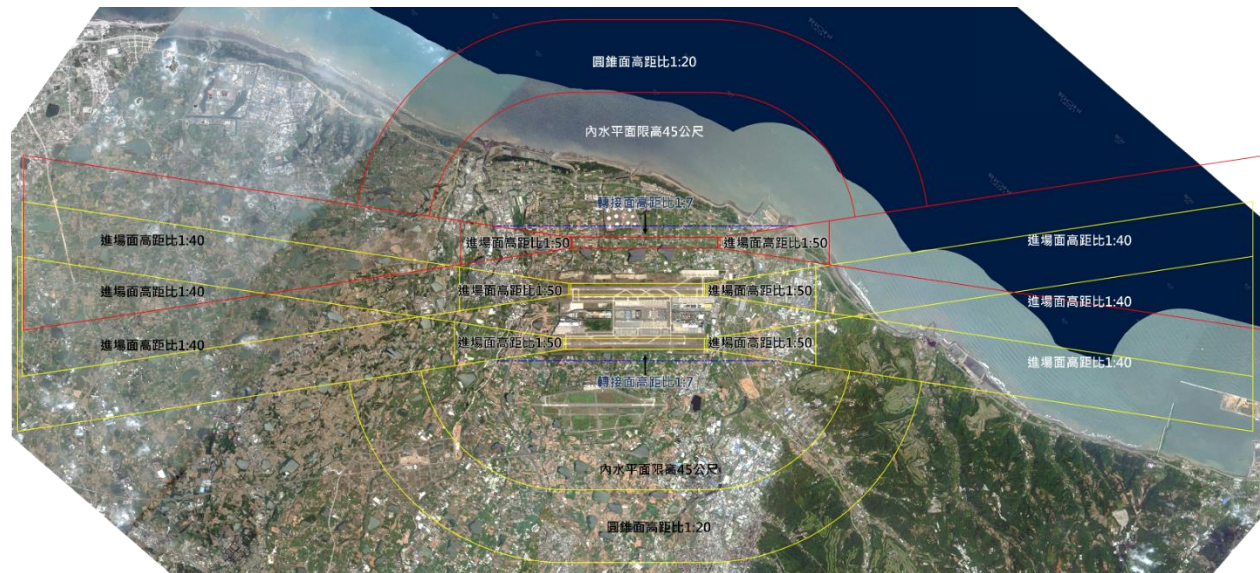
Table 4-3 Planning of East Area of EC Taxiway

Existing Facilities	Future Plan	Suggested Location	Relocation Year
Cargo Department	Ground Service	T2 Expanded Area (North)	2018
1 st Water Storage/Pump Station	EC Taxiway Expansion (South Section)	South side of Aviation Police Bureau	2020
CAL Hangar		Adjust Apron Boundary, Dangerous Goods to Suitable Location	Before 2020
South of Aviation Police Bureau Court/Warehouse	1 st Water Storage/Pump Station	Nearby Cargo Area Parking Lot	2020
Aviation Police Bureau	New East F&R Station	New Cargo Area; Administrative Area or Others	2025
North F&R Station	EC Taxiway Expansion (North Section)	New East F&R Station	2026
Mail Center		New Cargo Area Mail Center	2025
Post Office			2025
Chunghwa Telecom		New Cargo Area Administrative Area or Others	Before 2025
Customs Clearance Building			
Quarantine Bureau			
SMR			
Centers for Disease Control		Remote Apron	T2 Expanded Area (South)
Cargo Warehouse	New Cargo Area		From 2028

XII. Obstacle Limitation Surfaces

The boundary and the height of the obstacle limitation surfaces around Taoyuan International Airport are compliant with the “Measures to height control of buildings and other obstacles around the navigation aids of airfield” by MOTC and the “Civil Aerodrome Design and Operation Standards” by CAA. The goal is mainly to ensure the aircraft landing, departure, and the airport operations are not influenced by the development in the restricted area.

Considering the current regulations, the OLS area of the existing south and north runway, and the results of the “The 3rd runway preliminary plan (approved in July 2018)”, we propose the OLS layout of the 3-runway system shown in Figure 4-17.



Source: “The 3rd runway preliminary plan (approved in July 2018)”

Figure 4-17 OLS Layout of the Three-Runway System

Chapter 5 Free Trade Zone Planning

5.1 General Development Direction Analysis

Taoyuan International Airport Free Trade Zone (FTZ) development strategy is aimed at the following strategic objectives: being logistics oriented; providing simple value-added processing; and boosting the development of associated services. We propose making the Zone an “Asia-Pacific Value Creation Hub” as the overall development goal, with the following principles for the function positioning:

I. **Export Taiwan's advanced technology services:**

Focus on the strategy of manufacturing servitization, and the use of Taiwanese manufacturers' advantages, such as key technology/parts manufacturing, integration with management function and after-sales service (including maintenance and repair), and creation of additional value for the customer service.

II. **Promotion of industrial development model innovation:**

Allow global logistics related industries to enter the Free Trade Zone to boost the industrial development innovation.

III. **Connect with the emerging supply chain:**

The export value of the emerging industries in Taiwan is growing rapidly. The advantages of the industry technology and the regional logistics platform strengthen the role of Taiwan in the global emerging supply chain.

5.2 Planning Principles

I. **Layout**

The future development and layout planning of Free Trade Zone are shown in Figure 5-1 and Figure 5-2. It is recommended to set up exclusive roads in the restricted area and three sentry posts to control access. Initially, two warehouses are established to deal with the cargo import and storage registration, customs

management, and logistics and warehousing. The future layout of warehouses will depend on the demand of the resident company, resulting in different spatial development.

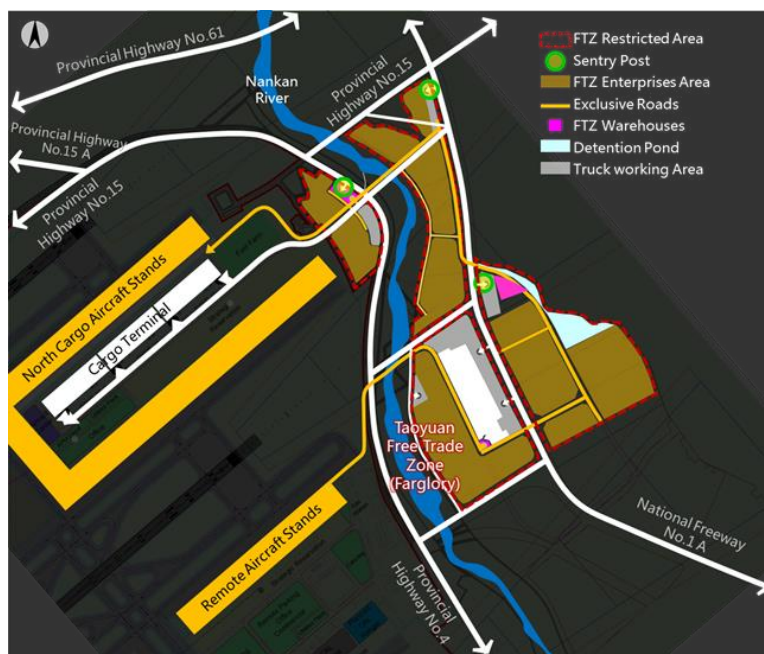


Figure 5-1 Overall Free Trade Zone Development Principles

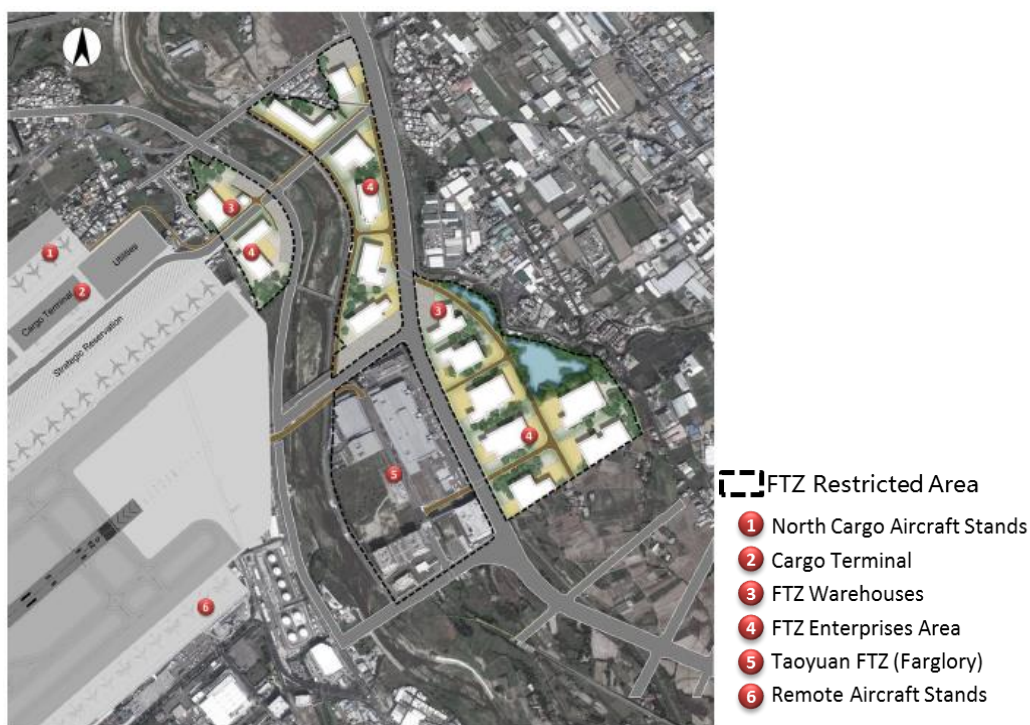


Figure 5-2 Overall Free Trade Zone Layout

II. Industrial Zoning

The six major industries in the project are located in the Free Trade Zone Enterprises Area, as shown in Figure 5-3. The layout of detail industrial blocks can be adjusted according to actual demands and tender considerations. The initial proposal for industrial development is as follows:

1. The west portion of the Nankan River has the location advantage of being close to the New Cargo Area, so it is recommended to introduce the supply chain management of aerospace and the maintenance area of medical equipment, which has a smaller size. The space function is mainly value-added.
2. The warehousing logistics and smart logistics are the main development industries. So, it is recommended to locate them in the east portion of the Nankan River, which is a relatively complete area. On the one hand, it is adjacent to the warehouse, and on the other hand, it can establish the core area in the Free Trade Zone.
3. The easternmost block to the east block of Nankan River is planned for international flower and art treasures auction area, and its space functions are mainly logistics and warehousing.



Figure 5-3 Industrial Zoning Diagram

Chapter 6 Ground Transportation System Planning

6.1 Development Objectives and Principles

Taoyuan International Airport is the main airdrome in Taiwan, and the generated passenger and cargo ground traffic flows are quite heavy. For the traffic characteristics and the location of passenger and cargo transportation, the planning principles are as follows (the framework diagram is shown in Figure 6-1).

- I. Separation of passengers and cargo flows and exclusive planning.
- II. Passenger transportation service achieves the goal of timeliness, safety, comfort, and convenience.
- III. Cargo transportation services enhance industrial competitiveness and achieve the goals of timeliness, safety, and stability.
- IV. The airport transportation system and the surrounding Aerotropolis achieve convenient and smooth connection.
- V. With the goals of green, sustainable and smart development, the smart, low-carbon and energy-saving transportation systems are introduced to the airport.

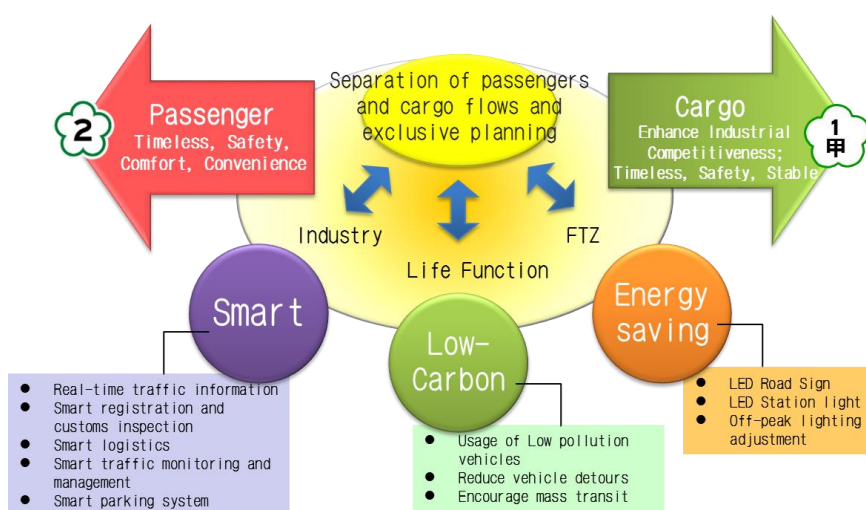


Figure 6-1 The Framework Diagram of Ground Transportation System Planning

6.2 Current Status and Traffic Bottleneck Analysis

The current traffic flow of Taoyuan International Airport is shown in Figure 6-2. The internal flow is a single counter-clockwise cycle. It is connected to the Provincial Highway No. 4 through the underground road below the EC taxiway.



Figure 6-2 The Traffic Flow of Airport in 2015

As the airport traffic grows, the internal and external ground traffic will also increase. For the external ground traffic system, the residential and employed population growth due to Aerotropolis will also increase the loading. The analysis of the future traffic system and bottleneck are as follows:

- I. In the future, the capacity of National Freeway No. 2 will become overloaded, and National Freeway No. 1 A will be required to provide some of its service capacity.
- II. The traffic of the U-turn lane is quite heavy and is in need of a relief strategy.
- III. Due to the limited land area available for the Airport Park, the parking lot land usage needs to be diversified. The parking lot space is insufficient to meet the demand, so it is necessary to encourage the use of mass transportation and off-site parking.

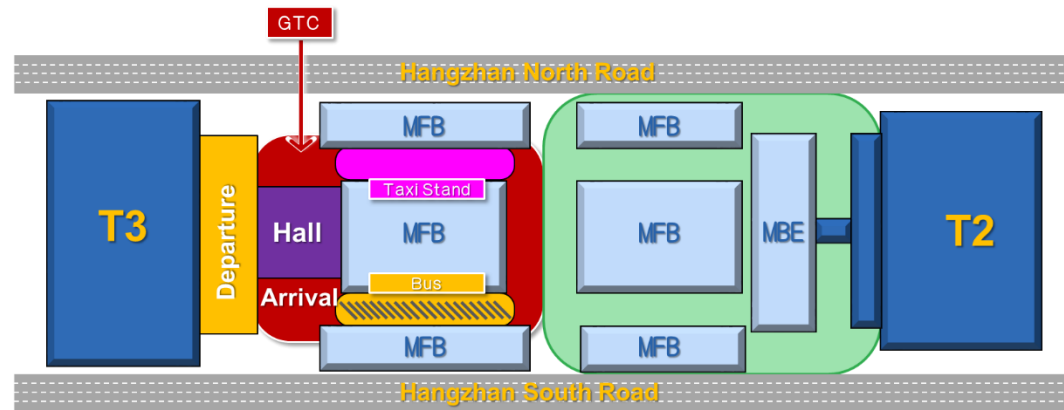
6.3 Transportation Improvement Suggestions

I. Ground Transportation Center (GTC)

Through the establishment of a GTC, integration of multi-transportation mode will allow achieving the purpose of concentrating mass transportation and scheduling facilities. During preliminary planning, the location is between T3 and T2 (the current P4 area), and the structure will be integrated with the Multi-Function Building (MFB). Facilities requirements and configuration are shown in Tables 6-1 and Figure 6-3. The concept of traffic flow is based on the concept of diversion of people and vehicles, coordinated with the floor plan of the T2 and T3 terminal, as shown in Figure 6-4.

Table 6-1 GTC Requirements

Type	Boarding Stand	Waiting Stand
Freeway Schedule Bus	11	11
Tour Bus	16	4
Taxi/Rental Car	16	350



Note: The Red Area is GTC and the elevation view is shown in Figure 6-4.

Figure 6-3 GTC Configuration

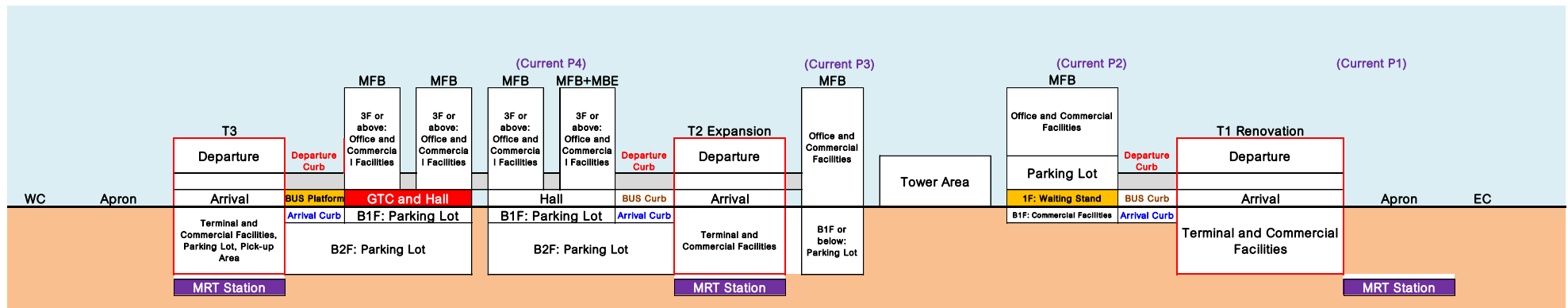


Figure 6-4 The Elevation View of GTC

II. Overall Transportation System

With the operation of the Airport MRT and T3, it is recommended to construct the underpass between the Hangzhan South Road and the Hangqin South Road to introduce anti-clockwise circular access to the airport, as shown in Figure 6-5.

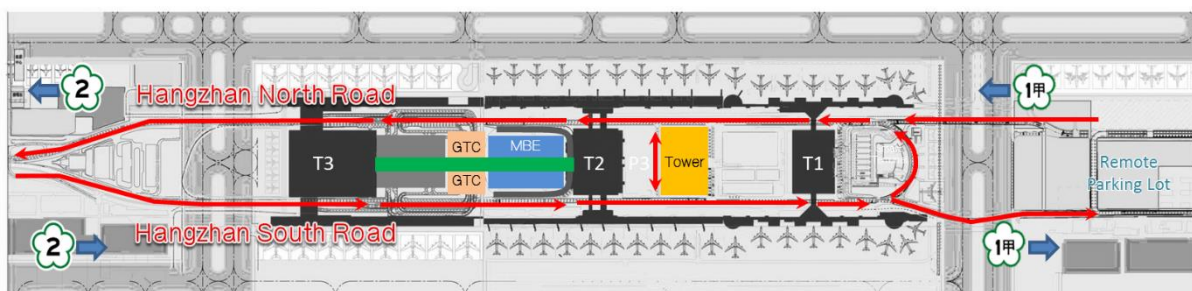


Figure 6-5 Traffic Flow in the Target Year

The traffic of the existing cargo area is predicted to be nearly 3,500 pcu/h from the east side of the morning peak after the completion of the National Freeway No.1 A in 2027. The underpass of the North and South Roads should have six lanes in two-ways. The existing Hangzhan North Road has three lanes. It is suggested that the newly planned South Road underpass will be laid in three lanes. The layout of the target year is shown in Figure 6-6.

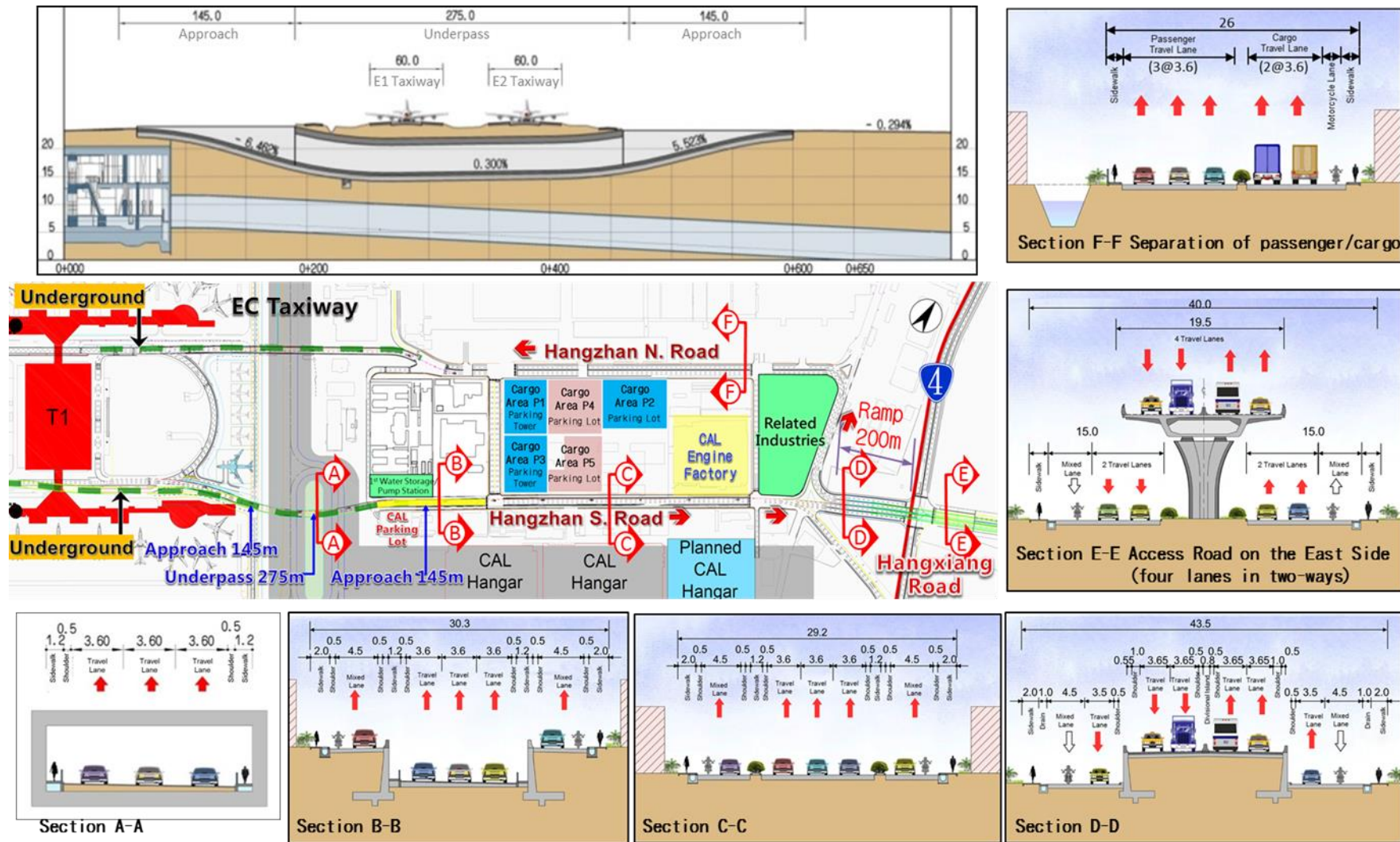


Figure 6-6 Hangzhan North and South Roads Layout

The estimated passenger and employee-derived traffic for the target year (2042) are used to determine the number of lanes, as shown in Figure 6-7.

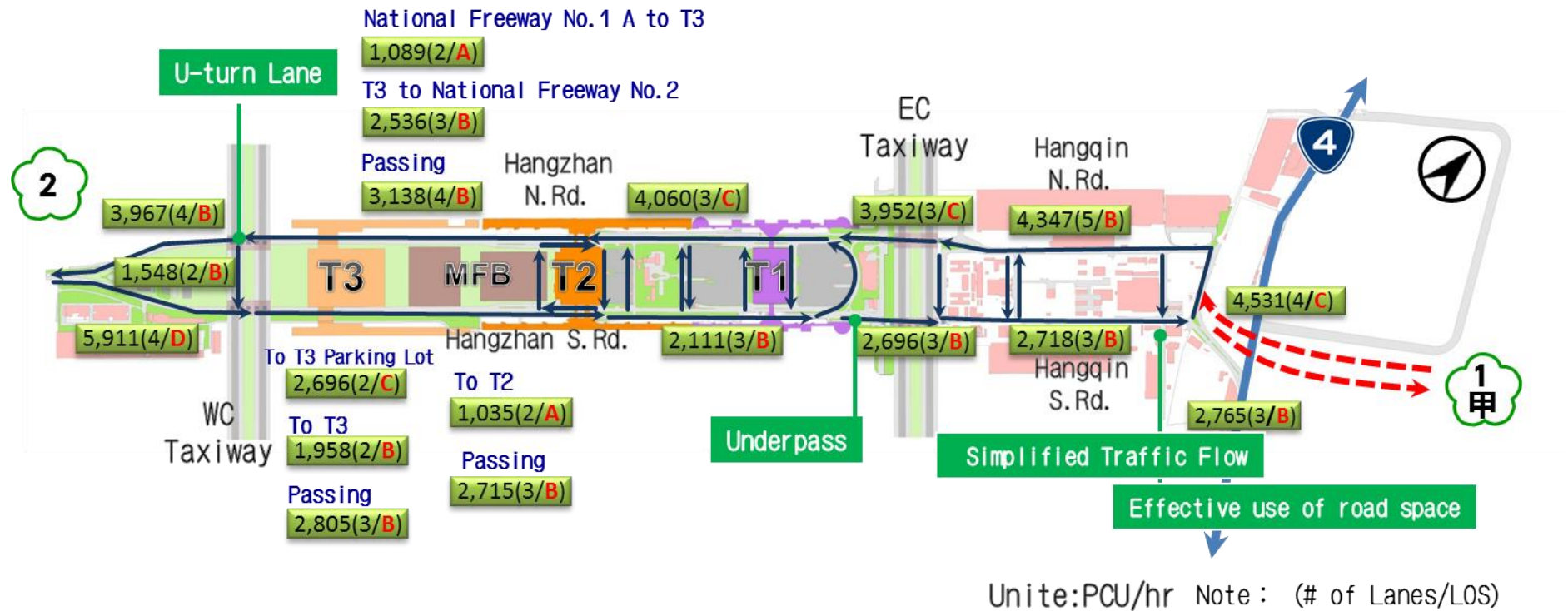


Figure 6-7 The Demand of Number of Lanes in the Target Year

III. Airport Access Transportation System

The future access transportation system of Taoyuan International Airport is shown in Figure 6-8. It will connect the National Freeway No.2, National Freeway No.2 A, National Freeway No.1 A, Provincial Highway No.15 and Provincial Highway No.61.

Besides, with the traffic demand of New Cargo Area and North West MRO Area, and the insufficient capacity of Dayuan Interchange, the proposed improvement strategies are as follows:

1. It is recommended to have a direct road from National Freeway No.1 A to the existing cargo terminal area.
2. Adding an access road of the New Cargo Area.
3. Adding an access road of the North West MRO Area to directly connect with the Provincial Highway No.15.
4. Widening the Dayuan Interchange to three lanes (currently conducted by Freeway Bureau, MOTC)

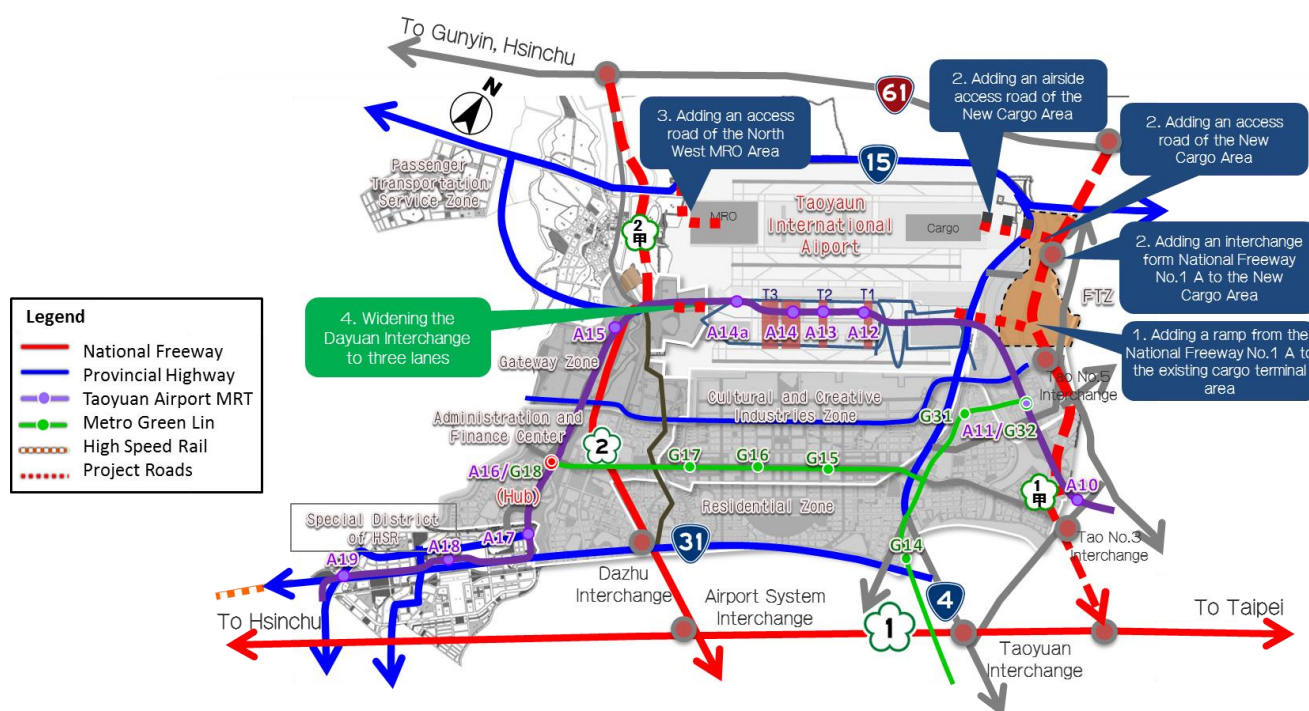


Figure 6-8 Airport Access Highway System and Improvement Strategies

6.4 Free Trade Zone

The transportation planning of the Free Trade Zone is divided into two systems, within and outside the restricted area, as shown in Figure 6-9. The exclusive roads within the restricted area shall be an isolated system. Therefore, it is recommended to plan an underpass to connect with the National Freeway No.1 A, and viaducts to cross the Nankan River, as shown in Figure 6-10.

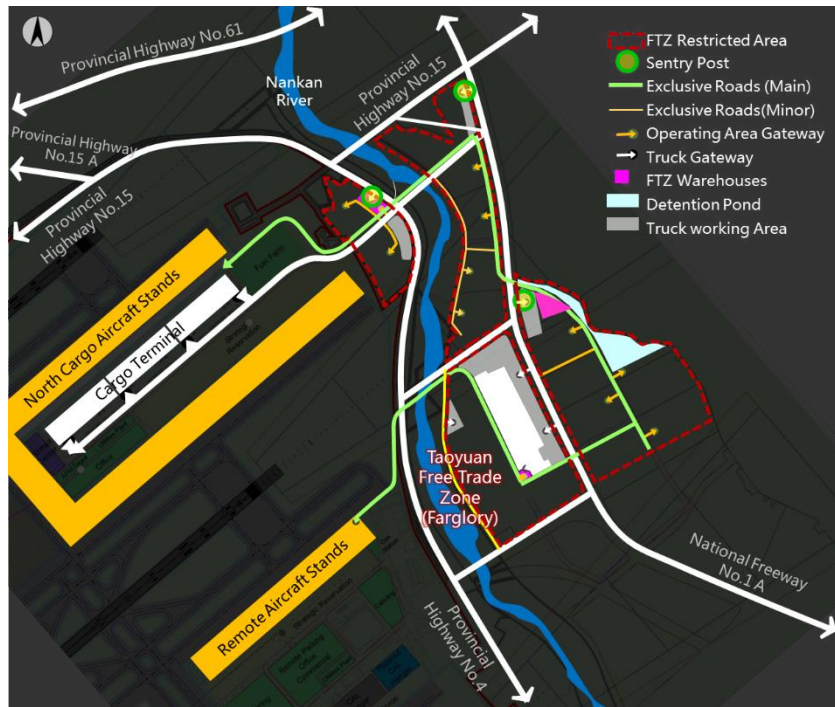


Figure 6-9 Transportation System of FTZ

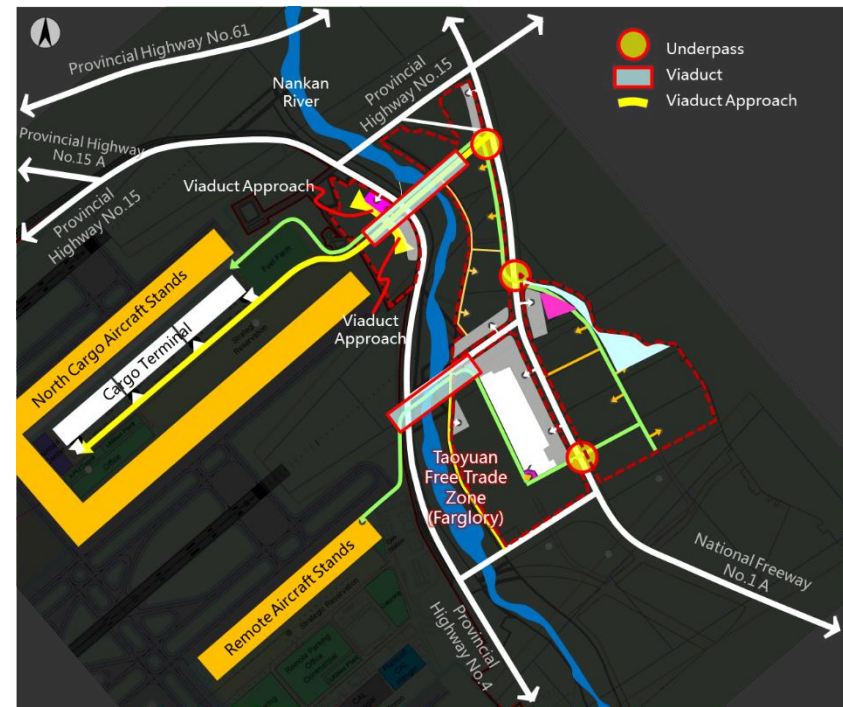


Figure 6-10 Grade Separation Layout of FTZ

Chapter 7 Development Methods and Threshold

7.1 Staged Development Plan

Based on the planning principles of airport development in the 2042 target year, we propose 37 construction projects carried out through a two-zone, three-stage development method. The development strategies and goals of the main construction projects are shown in Table 7-1, the development schedule is shown in Table 7-2, and the internal and external control factors of construction projects are sorted in Table 7-3.

Table 7-1 Staged Development Strategies and Goals

Area Stage	Existing Land	Acquired New Land
Stage 1 (before 2016)	Goal 1: Ground Improvement I → Pavement Rehabilitation, WC Taxiway Relocation and Expansion Goal 2: Terminal Construction → Terminal 2 Expansion, Terminal 3 Area Development (Including related Constructions)	—
Stage 2 (2016- 2020)	Goal 3: Ground Improvement II → Airside Facilities Reinforcement Goal 4: Facilities Improvement → T1 Baggage Handling System Improvement, Yuanshan Apron Construction, Cargo Area Parking Lot	Goal 5: North Area Planning → North Area Ground Leveling and Drainage, 3rd Runway and Satellite Concourse Planning and Environmental Impact Assessment (EIA)
Stage 3 (2021- 2042)	Goal 6: Ground Improvement III → Parallel Taxiway on the North Side of the North Runway, NP Taxiway Extension Goal 7: East Area of EC Taxiway Replanning I → EC Taxiway Expansion (South Section), Hangzhan S. Rd. Underpass Goal 9: East Area of EC Taxiway Replanning II → EC Taxiway Expansion (North Section)	Goal 8: North Area Development I → 3rd Runway, Satellite Concourse (West) and Related Constructions North West MRO Area, A3 Area Development Goal 10: North Area Development II → FTZ, New Cargo Area, Satellite Concourse (East)

Note: Phases are tentative due to the progress of new land acquisition.

Table 7-3 Internal and External Control Factors of Construction Project

Stage	Period	Goal	Construction Project		Internal Control Factors				External Control Factors		
			Project	Period	Advance Project	Period	Related Project	Period	EIA	External Authority / Department / Facilities	
Stage 1	Before 2016	1	Ground Improvement I	Pavement Rehabilitation	2010-2017	-	-	-	-	-	-
		2	Terminal Construction	Terminal 2 Expansion	2015-2019	-	-	-	-	-	-
				Terminal 3 Area Development	2014-2024	WC Taxiway Relocation and Expansion	2014-2019	<ul style="list-style-type: none"> PMS Integration West Wastewater Treatment Plant (Phase I) West F&R Station 	2019-2023 2019-2023 2019-2021	Completed	CAA, ANWS, Airline Company, Bureau of High Speed Rail (A14 Station), Taoyuan City Government (Construction Permit, Fire Control, etc.), Construction and Planning Agency(Special Building Permit), Users (Space Demands)
Stage 2	2016-2020	3	Ground Improvement II	Airside Facilities Improvement	2017-2020	-	-	-	-	-	-
		4	Facilities Improvement	T1 Baggage Handling System Improvement	2016-2019	-	-	-	-	-	-
				Yuanshan Apron Construction	2017-2020	Existing Facilities Relocation	In process	<ul style="list-style-type: none"> TIAS Ground Service Area Relocation G4 Gas Station Relocation 	In process In process	-	South Area of TIAS Ground Service, Gas Station
5	North Area Planning	North Area Ground Leveling and Drainage	2017-2026	Land Acquisition	2017-2023	<ul style="list-style-type: none"> 3rd Runway and Related Taxiway 3rd Runway and Satellite Concourse Planning and EIA 	2017-2021	-	CAA (Land Acquired Schedule)		
Stage 3	2021-2042	6	Ground Improvement III	Parallel Taxiway on the North Side of the North Runway	2021-2023	Navigation Aids Equipment Relocation	Shall conduct	<ul style="list-style-type: none"> 3rd Runway and Related Taxiway 	2017-2025	-	CAA, ANWS
				NP Taxiway Extension	2021-2022	2nd Water Storage/Pump Station Relocation	2019-2022	<ul style="list-style-type: none"> North A3 Area Development 	2023-2024	-	CAA (Land Acquired Schedule)
		7	East Area of EC Taxiway Replanning I	EC Taxiway Expansion (South Section) and Underpass	2019-2022	1st Water Storage/Pump Station Relocation, Facilities in the South of Aviation Police Bureau Relocation	2019-2020	<ul style="list-style-type: none"> Hangzhan S. Rd. Underpass 	2019-2022	-	CAL(Apron Rearrange), Aviation Police Bureau, etc.
				Cargo Area Parking Lot	2020-2023	-	-	-	-	-	-
		8	North Area Development I	3rd Runway and Related Taxiway	2023-2025	North Area Ground Leveling and Drainage	2017-2026	<ul style="list-style-type: none"> Service Roads New North F&R Station 2nd Fuel Farm 	2022-2027 2023-2025 2024-2026	In process	CAA (Land Acquired Schedule), ANWS, Taoyuan City Government, Directorate General of Highways, etc.
				Satellite Concourse and Apron (West)	2024-2026	North Area Ground Leveling and Drainage	2017-2026	<ul style="list-style-type: none"> APM System East Wastewater Treatment Plant Expansion 	2022-2026 2023-2025	Shall conduct	
				Satellite Concourse and Apron (East)	2027-2029			<ul style="list-style-type: none"> 3rd Substation West Wastewater Treatment Plant (Phase II) 	2024-2025 2024-2026		
		9	East Area of EC Taxiway Replanning II	EC Taxiway Expansion (North Section)	2025-2028	New East F&R Station	2025-2026	<ul style="list-style-type: none"> Reorganize East Area of EC Taxiway 	2025-2032	-	Post Office, Quarantine Bureau, ANWS (SMR Relocation), Aviation Police Bureau
		10	North Area Development II	New Cargo Area Development	2022-2034	North Area Ground Leveling and Drainage	2017-2026	<ul style="list-style-type: none"> New Cargo Area - Transportation 	2023-2025	Shall conduct by the user	CAA (Land Acquired Schedule), Freight Forwarder, Users of Existing Cargo Area
				North West MRO Area Development	2023-2026			<ul style="list-style-type: none"> North West MRO Area - Transportation 	2023-2024	-	CAA (Land Acquired Schedule), Aircraft Maintenance Operators

7.2 Airport Infrastructure Development Threshold

I. Runway

The third runway lead time and construction period are expected to be about 9 years. Therefore, the development threshold shall be 9 years before the completion of construction. The development threshold is based on the actual traffic and the average growth rate of the aircraft movements in the peak hour in the past three years, as shown in Table 7-4.

Table 7-4 Development Threshold of the 3rd Runway

Period	Infrastructure	3 rd Runway
Lead time + construction period		9 years
▼ Threshold		
Average growth rate of peak hour ATM in the past 3 years reach 5%		Actual movements reach 38 ATM/hr
Average growth rate of peak hour ATM in the past 3 years reach 3%		Actual movements reach 45 ATM/hr
Average growth rate of peak hour ATM in the past 3 years reach 1%		Actual movements reach 54 ATM/hr

Note: Air Transport Movement (ATM)

According to the historical traffic data, the two-way aircraft movement in the 1st peak hour in 2014 is 44 ATMs, and the average growth rate is above 5%. The development threshold has been achieved, so the relevant early-stage work should be started in 2017. According to the decision made by Taoyuan Aerotropolis Team of Executive Yuan in 26th July 2016, the 3rd runway construction shall be completed before the end of 2025.

II. Passenger Terminal

We estimate the development thresholds of each infrastructure according to the passenger capacity at each stage. The lead time and construction period are temporarily estimated. The development thresholds are based on the actual annual passenger and the average growth rate of the annual passengers in the past three years, as shown in Table 7-5.

According to the historical traffic data, the annual passenger volume in 2015 is 38.47 million passengers, and the annual passenger average growth rate in the past three years is above 1%, so Terminal 3 early-stage construction work has already been commenced.

Table 7-5 Development Threshold of T3 and T3S

Infrastructure Period	T3	T3S (Phase I)	T3S (Phase II)
Lead time + construction period	8 years	9 years	9 years
▼Threshold			
Annual passenger average growth rate in the past 3 years reach 5%	Actual annual passenger volume reaches 27.58 MPPA	Actual annual passenger volume reaches 39.15 MPPA	Actual annual passenger volume reaches 47.21 MPPA
Annual passenger average growth rate in the past 3 years reach 3%	Actual annual passenger volume reaches 32.16 MPPA	Actual annual passengers reach 46.55 MPPA	Actual annual passenger volume reaches 56.14 MPPA
Annual passenger average growth rate in the past 3 years reach 1%	Actual annual passenger volume reaches 37.63 MPPA	Actual annual passenger volume reaches 55.54 MPPA	Actual annual passenger volume reaches 66.97 MPPA

Note: Million Passengers Per Annum (MPPA)

III. Cargo Terminal

We estimate the development threshold of the new cargo area based on the existing 4 cargo terminals with a total capacity of 2.6 million metric tons per year. The development threshold is based on the actual cargo volume and the average growth rate of the annual cargo in the past three years, as shown in Table 7-6.

Taoyuan Airport annual cargo volume in 2015 is 2.02 million metric tons, and the cargo volume annual average growth rate for the past three years is 0.7%, so the development threshold of the new cargo area has not been achieved. However, we suggest relocating the existing cargo terminals to the new cargo area in the north section to enhance operation efficiency. The development threshold of the new cargo area will be in line with the land expropriation process.

Table 7-6 Development Threshold of the Cargo Terminal

period	Infrastructure	New cargo area
Lead time + construction period		8 years
▼ Threshold		
Average growth rate of annual cargo in the past 3 years reach 5%		Actual cargo reach 1.75 million metric tons
Average growth rate of annual cargo in the past 3 years reach 3%		Actual cargo reach 2.05 million metric tons
Average growth rate of annual cargo in the past 3 years reach 1%		Actual cargo reach 2.40 million metric tons

Chapter 8 Construction Costs, Financial Planning and Economic Benefit Analysis

8.1 Annual Funding Demands

According to the different scale and characteristics of each project, the estimation of annual construction costs and funding includes the initial phases such as feasibility, planning, EIA (Environmental Impact Assessment) (if needed), and the design phase. The annual funding demands are calculated in the 2016 currency, and the construction costs index is 1.5% per year. The overall annual funding demands are shown in Table 8-2.

As shown in Table 8-1, for the new cargo area, the Free Trade Zone, and the North West MRO area, adopting an outsourcing model or one with private sector BOT involvement is recommended. The evaluation results are also financially beneficial if a private contractor is engaged for both construction and operation.

Table 8-1 Suggested PPP/Outsourcing Development Models and Items for Taoyuan Airport Areas

Area	Construction Area (ha)	Cost	Development Mode	Benefit for Airport Corporation		Benefit for Private Sectors (Operation Pried assumed: 30 year)		
				1.Reduce capital demands 2.Reduce personnel costs and operational risks 3.Share profits with private sectors		Internal Rate of Return (IRR)	Actual Payback Period	Self-Liquidating Ratio (SLR)
New Cargo Area	35 (Operation Area: 20)	NT\$ 26.778 Billion	Land lease same as current mode	Land Rent (2029~2042)	NT\$ 2.376 Billion	6.00%	The 30 th year	114.30%
				Royalty (2029~2042)	NT\$ 9.427 Billion			
Free Trade Zone	73.81	NT\$ 35.877 Billion	Develop 3 zones by 3 stages	Land Rent (2027~2042)	NT\$ 1.472 Billion	10.26%	The 13 th year	173.03%
				Royalty (2033~2042)	NT\$ 5.616 Billion			
North West MRO Area	9.4	NT\$ 9.091 Billion	Land lease same as current mode	Land Rent (2024~2042)	NT\$ 1.925 Billion	17.74%	The 8 th year	300.01%

8.2 Financial Planning

I. Overall Financial Plan

According to the growth of the traffic and the demand for infrastructure, we plan the construction schedule and estimate the budgets for each project. Based on conservative and stable development principles, we estimate the operating revenue, related to the traffic in the moderate development scenario. Besides, estimates are provided for various infrastructures in the optimistic development scenario to meet the maximum demand.

Due to the growing traffic of the passenger and cargo, the revenue and the net profits will increase. However, during the evaluation period (2016 to 2042), there will be a large amount of capital demand driven by the construction. As 65% of the Taoyuan Airport Corporation's retained earnings need to be allocated to the local compensation funds and the CAA Operating Fund, the cash flow is insufficient to support the situation.

In order to generate positive cash flow, the financial model of the project assumes that the financing is provided mainly by banks, supplemented by the government increasing the Airport Company's capital.

The principle of the government-provided capital increase, which refers to the Airport Park Master Plan (First Edition), will allow controlling the total debt-to-equity ratios within 2 during the financial trial. It is estimated that the Airport Corporation needs to increase its capital by NT\$ 25.5 billion from the government and receive the funding from the bank of NT\$ 294.1 billion to support the hefty future construction costs.

The financial plan is presented in Table 8-3. The Airport Corporation basic financial situation evaluation results are as per Figure 8-1.

Table 8-3 Summary of the Financial Plan

Item (Project Period)		The Project (2014-2042)	
Construction Costs (not including private participation) (Project Period)		NT\$ 196.6 Billion (2016 to 2032)	
Interest Expense		NT\$ 50.7 Billion (to 2050)	
Total Cost (Construction Cost + Interest Expense)		NT\$ 247.3 Billion	
Main Financial Indicators	Loan Ending Balance (Peak Period)	NT\$ 116.6 Billion (2026)	
	Debt/Equity Ratio	~2022	≤1.5 times
		2023~	≤2.0 times
Government Capital Increase		25.5 Billion (Including the amount of 2016-2017 which budgeted by the MOTC)	

Note 1: Because the construction projects amounts of T1 Renovation Plan, Pavement Rehabilitation, WC Taxiway Relocation and Expansion, Terminal 3 Area Development, and Terminal 2 Expansion are higher than the Airport Park Master Plan (First Edition). The Airport Park Master Plan (Revised Edition) financial plan adopts the preliminarily report to estimate from 2016 to 2032 annual construction funding demands, and compile the financial statements to 2042.

Note 2: The actual construction costs of T1 Renovation Plan, Pavement Rehabilitation, WC Taxiway Relocation and Expansion, Terminal 3 Area Development, and Terminal 2 Expansion, before 2015 is NT\$ 11.2 billion and the Airport Park Master Plan (Revised Edition) construction costs is NT\$ 196.6 billion, total amounts to NT\$ 207.8 billion.

Note 3: In the situation of a government-provided capital increase to NT\$25.5 billion, the interest expense is NT\$50.7 billion.

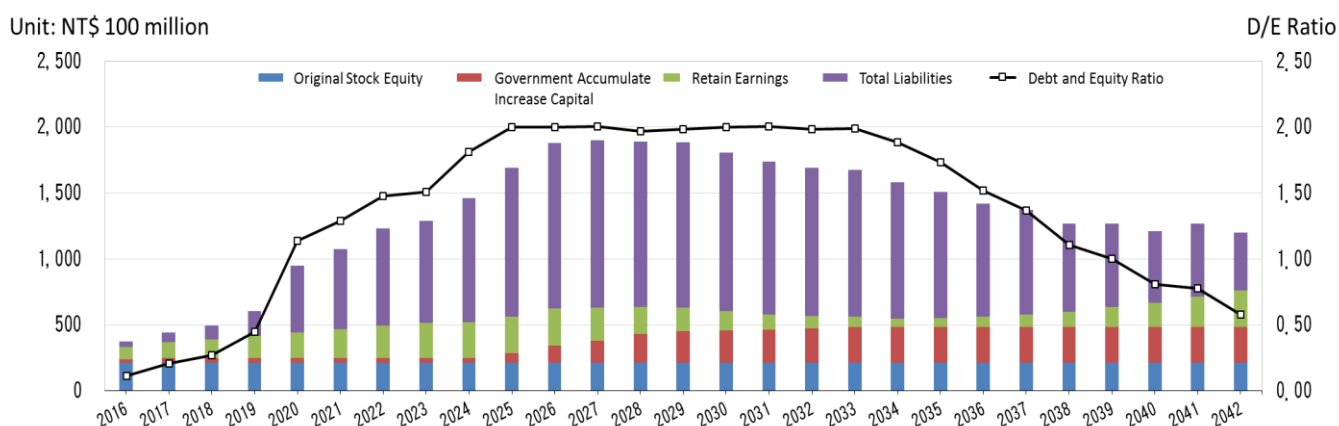


Figure 8-1 Airport Corporation Change in Debt to Equity Ratio

To meet the needs of interim and long-term funds and reduce annual financing amount, the suggested strategies are as follows:

- ◆ Increase in profit and cost control
 1. Review the aviation rates regularly to improve the intensity of commercial development.
 2. Review the allocation ratio of airport service fee and the special paid-in capital ratio regularly.
 3. After the new land acquisition, review the land rental rate according to the regulation.
- ◆ Multi-dimensional financing tools
 1. The source of funds is mainly from the Airport Corporation's retained earnings and financing, supplemented by the government increase the capital.
 2. Finance from the financing market with the progress of the project.

II. Financial Sensitivity Analysis

Besides the government's capital increase, most of the funding sources come from the Airport Corporation's retained earnings and financing. Due to the financial benefit analysis being based on the predictive factors, we conduct sensitivity analysis on four variables that have significant impacts on the income: **(1) construction costs, (2) passenger traffic, (3) changes in interest rates and (4) the assumption that the government has stopped investing from 2018**, as a reference for risk control and business strategy adjustments.

Table 8-4 Sensitivity Analysis Results and Response Actions

Situation Results & Response	Construction Costs Increase by 10%		Passenger Traffic Decreases by 20%		Interest Rates increase to 6%		Government Stops Increasing Capital from 2018	
	Financing amount	NT\$ 294.1 Billion		NT\$ 294.1 Billion		NT\$ 294.1 Billion		NT\$ 392.8 Billion (Add NT\$ 98.7 Billion)
Government Capital Increase	NT\$ 25.5 Billion		NT\$ 25.5 Billion		NT\$ 25.5 Billion		NT\$1.752 Billion (2016~2017)	
Debt Equity Ratio	Exceeds 2 from 2025		Exceeds 2 from 2025		Exceeds 2 from 2025		Exceeds 2 from 2025	
Retained Earnings Reserve	Positive to Negative from 2032 Results Equity <Capital		Positive to Negative from 2030 Results Equity <Capital		Positive to Negative from 2034 Results Equity <Capital		Positive to Negative from 2034 Results Equity <Capital	
Response Actions	Item	Implementation Period	Item	Implementation Period	Item	Implementation Period	Item	Implementation Period
	1. Increase 10% of Landing Fee and Baggage Facility Fee	From 2016	1. Decrease the External Distribution Ratio of Airport Service Fee (50%→30%)	From 2016	1. Increase 10% of Landing Fee and Baggage Facility Fee	From 2016	1. Increase 10% of Landing Fee and Baggage Facility Fee	From 2016
	2. Increase Airport Service Fee to NT\$700	From 2016	2. (1) Decrease the External Distribution Ratio of Airport Service Fee (50%→40%) (2) Increase Retain Earning Paid-in Capital Ratio to 45% (35%→45%)	From 2016	2. Increase Airport Service Fee to NT\$700	From 2016	2. Increase Airport Service Fee to NT\$700	From 2016
	3. Increase Retain Earning Paid-in Capital Ratio to 50% (35%→50%)	2016~2026		2016~2026	3. Increase Retain Earning Paid-in Capital Ratio to 50% (35%→50%)	From 2016	3. Increase Retain Earning Paid-in Capital Ratio to 45% (35%→45%)	2016~2026
Implement Item 1, 2 and 3 at the Same Time		Implement Item 1 or 2		Implement Item 1, 2 and 3 at the Same Time		Implement Item 1, 2 and 3 at the Same Time		

8.3 Economic Benefit Analysis

After the airport construction completion, user benefits will include reductions of passengers' delay time, as well as cargo delay time, and improvement of the aircrafts airside operation time. The results of the evaluation are shown in Table 8-5. The cost-benefit ratio is over 1, Net Present Value of the project is above 0, and the IRR is more than the discount rate of 5.5%. So, it is economically viable.

Table 8-5 Economic Benefit Analysis Results

Evaluation Indicators	Value
Net Revenue Present Value	NT\$ 723, 480 Million
Net Cost Present Value	NT\$ 494, 770 Million
Net Present Value (NPV)	NT\$ 228, 710 Million
Cost-Benefit Ratio (B/C)	1.46
Internal Rate of Return (IRR)	10.86%

In addition to the internal user benefits showing above, the development of airport parks will also drive external and government benefits, including:

- ♦ Direct Benefits:
 1. Increased airport service fee.
 2. Increased revenue of airport-related industries.
 3. Increased airline companies' revenue.
 4. Increased airport's access transportation income.
 5. Increased spending of foreign visitors in Taiwan.
 6. Facility construction cost.

- ◆ Indirect Benefits:
 1. Increased output of the related industries.
 2. Increased output due to the stimulation of consumption by increasing the employees' income.
- ◆ Government Benefits
 1. Increase in the central government's tax income.
 2. Create Job opportunities.

The results of the benefit evaluation are shown in Table 8-6.

Table 8-6 Benefits of the Development and Construction of Taoyuan Airport Park

Benefits		Airport Park Development	Airport Construction
Direct Benefits		NT\$ 436.7 Billion	NT\$ 268.4 Billion
Indirect Benefits	First phase	NT\$ 514.7 Billion	NT\$ 547 Billion
	Second phase	NT\$ 236.2 Billion	NT\$ 113.7 Billion
	Subtotal	NT\$ 750.9 Billion	NT\$ 660.6 Billion
Total Benefits		NT\$ 1, 187.6 Billion	NT\$ 929.1 Billion
Central government tax income Increase		NT\$ 56.8 Billion	NT\$ 44.5 Billion
Job Opportunities Created		119 Thousand People	73 Thousand People

Chapter 9 Conclusions and Suggestions

Airport infrastructure construction schedule and threshold will allow to much better anticipate the supply and demand situation of future facilities, understand the development blueprints of each stage, arrange related administrative operations, properly prepare manpower, funds, and resources. As a reference, the relevant authorities can promote the feasibility studies or construction project.

The overall construction schedule has taken into account the land acquisition schedule, traffic growth and infrastructure demand, airside and landside operational efficiency, operational needs, existing land usage, construction and administrative processes, related utilities construction schedule, planning stage, EIA (Environmental Impact Assessment) etc. to ensure the schedule can meet the growth of the airport and provide a superior operating environment.

With the trend of the new generation airport, Taoyuan International Airport will continue to promote smart airport as a policy through advanced technology to enhance airport security, passenger satisfaction, and operational efficiency. In addition to improving the overall operational efficiency and passenger experience of the airport at a direct level, the smart airport can also drive the development of IoT (Internet of Things) related service industries and attract the industry investment at an indirect level.

The project will focus on the next five years (2016-2020). The main construction projects are organized in Figure 9-1 and Table 9-1.

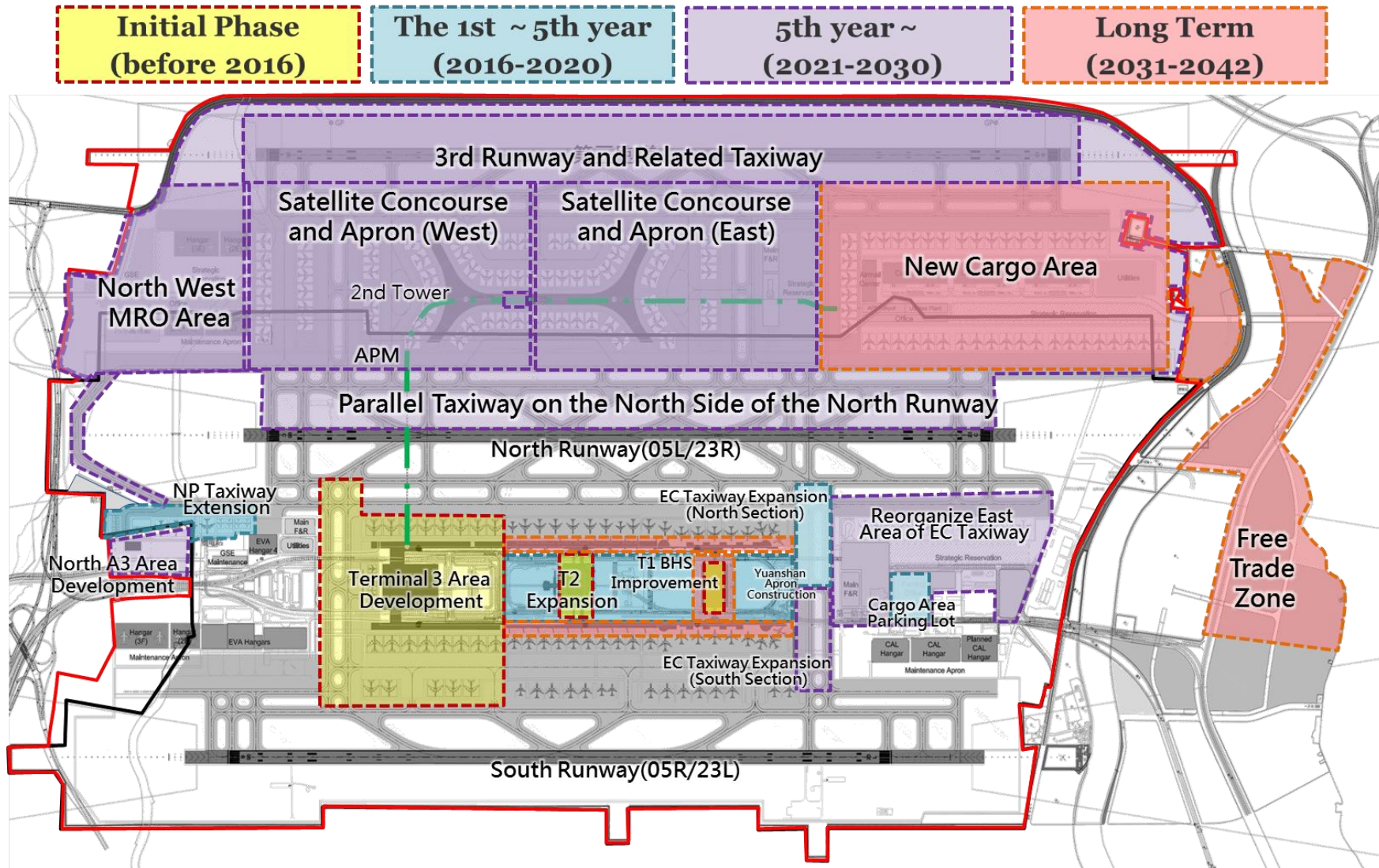


Figure 9-1 Staged Development Plan of Airport Constructions

Table 9-1 Staged Development Schedule in the Near Five Years (2016-2020)

