# Chapter 4 Development Vision and Urban Structure

## 4.1 Socio-economic Framework

### 4.1.1 Population Framework

#### (1) Population Projection

##### 1) Jordanian Population

The future population of Aqaba Governorate was estimated using the cohort factor method from the 2004 and 2015 data of the Jordanian National Population Census.

Assuming that the historical survival rate and the migration rate based on the social growth from 2004 to 2015 will continue, the Jordanian population in Aqaba Governorate in 2040 is estimated to be 471,090, which is 3.5 times the population in 2015. It should be noted, however, that it is unclear whether similar rates of population movement will be sustained, as some believe that the population growth from 2004 to 2015 was influenced by the sudden influx of people following the establishment of ASEZ.

It should be noted that while the overall average population growth rate from 2004 to 2005 was 3.0%, Aqaba Governorate was above the national average at 4.1%. According to the Population Projections for the Residents of the Kingdom of Jordan during the Period 2015-2050 published by the DOS, the country's overall average annual population growth rate from 2015 to 2045 is 2.1%. In contrast, the average annual population growth rate for Aqaba Governorate until 2045, based on population estimates, is 4.4%.

**Table 4-1 Estimated Jordanian Population in Aqaba Governorate**

| | 1994 | 2004 | 2015 | 2020 | 2025 | 2030 | 2035 | 2040 |
|---|---|---|---|---|---|---|---|---|
| Population (Projection) | 67,631 | 86,351 | 134,911 | 167,818 | 219,405 | 284,945 | 367,457 | 471,090 |
| 0-14 age | 31,662 | 36,659 | 51,557 | 64,036 | 80,273 | 103,731 | 131,621 | 165,746 |
| 15-64 age | 34,936 | 48,195 | 80,420 | 99,848 | 133,087 | 170,686 | 218,355 | 278,821 |
| 65 ages+ | 1,033 | 1,497 | 2,934 | 3,934 | 6,045 | 10,528 | 17,481 | 26,523 |
| Aging rate (65+) | 1.5% | 1.7% | 2.2% | 2.3% | 2.8% | 3.7% | 4.8% | 5.6% |

[Method of Population Estimation (Cohort Factor Method)]
(1) Survival rate assumptions
Five-year survival rates by five-year age group were calculated based on the number of deaths in the past two years as stated in the 2015 Census.
(2) Assumption of future net migration rate

(i) Calculate the blocked population every 5 years (2009, 2014, 2019) based on the population and survival rate by 5-year age group in the 2004 Census.
*The blocked population is a theoretical population that is assumed to be defined only by the survival rate without any in-out migration.
(ii) The blocked population in 2015 is estimated from the linear complement of the blocked population in 2014 and 2019.
(iii) Net migration is calculated from the difference between the actual population in the 2015 Census and the calculated blockaded population in 2015.
(iv) Calculate the 11-year net migration rate as the ratio of the number of net migrations to the actual population of the 2004 Census and correct it to the 5-year migration rate.
(3) Estimation of future population
(i) Calculate the rate of change in the 5-9+ age group by 5-year age group from the sum of the remaining birth rate and the net migration rate.
(ii) Multiply the rate of change by the 2015 Census population aged 5-9 and above by gender and by five-year age group to estimate the future population of the five-year age group above by gender in 2020.
(iii) The population in the 0-4 age group cannot be estimated based on the "survival rate" and "future net migration rate," so it is estimated as an approximation based on the "female-child ratio" in relation to the population of women (15-49 years old) who are likely to become mothers.
*The ratio of women to children is the ratio of children (boys and girls) aged 0-4 to the population of potential mothers (15-49 years) and was averaged from the 2004 and 2015 Censuses.

Source: JICA study team

### 2) Non-Jordanian Population

The non-Jordanian population was calculated based on the population growth scenarios presented in the high base scenario of the population projections for the Kingdom's residents during the period 2015-2050 (Table 4-2). High basic scenario, which assumes that the same trend will continue for the foreseeable future was applied as in the current situation in neighboring countries.

Assuming that the population growth based on the applied conditions is realized, the non-Jordanian population of Aqaba Governorate in 2040 is estimated to be 73,651, which is 1.4 times the population in 2015. It should be noted, however, that the impact of the return of Syrians and other refugees on the non-Jordanian population is uncertain.

**Table 4-2 Estimated Non-Jordanian Population in Aqaba Governorate**

| | 1994 | 2004 | 2015 | 2020 | 2025 | 2030 | 2035 | 2040 |
|---|---|---|---|---|---|---|---|---|
| Syrian nationality | - | 612 | 7,799 | 9,008 | 10,404 | 12,017 | 13,879 | 16,031 |
| Palestinian | - | 3,886 | 16,196 | 18,079 | 20,181 | 22,528 | 25,148 | 28,072 |
| Iraqi | - | 707 | 162 | 181 | 202 | 225 | 252 | 281 |
| Yemeni | - | 24 | 322 | 359 | 401 | 448 | 500 | 558 |
| Libyan | - | 23 | 101 | 113 | 126 | 140 | 157 | 175 |
| Egyptian | - | 7,562 | 24,347 | 24,347 | 24,347 | 24,347 | 24,347 | 24,347 |
| Other nationalities | - | 2,802 | 4,188 | 4,188 | 4,188 | 4,188 | 4,188 | 4,188 |
| Total | - | 15,616 | 53,115 | 56,275 | 59,849 | 63,894 | 68,470 | 73,651 |

Source: JICA study team

**Table 4-3 Estimated Scenarios for Non-Jordanian Population**

**Table (1 - 2) Summary of Estimates of Non-Jordanian Population Living in the Kingdom by the Three Scenarios during 2015-2050**

| Estimation elements | High-basic scenario (continuation of the current situation) | Medium scenario | Low scenario |
|---|---|---|---|
| Syrian nationality | • Population growth rate of Syrians is 2.9% during the projection period 2015-2050 (the situation remains unchanged). | • Assuming a voluntary return of Syrians in regular numbers to reach their number before the asylum (assuming return of Syrian refugees after 17 years) so their number by end of the projection period reaches half of what they were in 2015.) | • Assuming return of about quarter of Syrians during 2015-2030 and return of the third during 2030-2050. |
| Palestinian,Iraqi,Yemeni and Libyan nationalities | • Stability of the population growth rate of Palestinians, Iraqis, Yemenis and Libyans at 2.2% during 2015-2025 and then decreases to 2.1% during 2025-2030 and another decrease to 1.9% during 2030-2050. | • Stability of the population growth rate of Palestinians, Iraqis, Yemenis and Libyans at 2.0% during 2015-2025 and then decreases to 1.6% during 2025-2030 and another decrease to 1.2% during 2030-2050. | • Stability of the population growth rate of Palestinians, Iraqis, Yemenis and Libyans at 1.9% during 2015-2025 and then decreases to 1.4% during 2025-2030 and another decrease to 1.0% during 2030-2050. |
| Egyptian and other nationalities | • Stability of Egyptian nationality holders and other nationalities during 2015-2050. | • Gradual decrease in number of Egyptian nationality holders in 2015 to reach half by 2050 and stability of other nationalities during 2015-2050. | |

Source: DOS, Population Projections for the Kingdom's Residents during the Period 2015-2050

### 3) Total Population

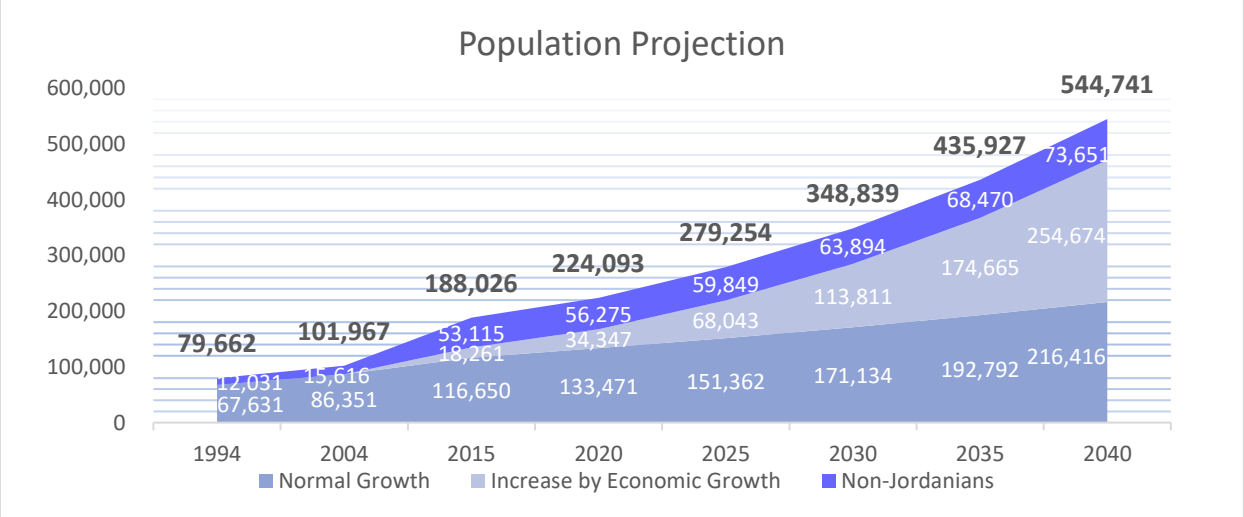
The total Jordanian and non-Jordanian population in Aqaba Governorate in 2040 are estimated to be 544,741, which is 2.9 times the population in 2015. Of the Jordanian population (471,090), 216,416 will come from natural increase due to births and deaths of existing residents, while the remaining 254,674 will come from social increase due to influx, indicating a significant impact from the mobile population.

Due to its nature as a Special Economic Zone (SEZ), ASEZ is significantly influenced by the influx of people seeking employment. Here, we present the population trends under the assumption of "Normal Growth" to understand the impact of economic growth on population increase. While it is not definitive, we also present the population trends considering migration influenced by economic growth, including the reproduction (births) of the incoming population, under the assumption of "Increase by Economic Growth".

**Table 4-4 Population Estimates for Aqaba Governorate**

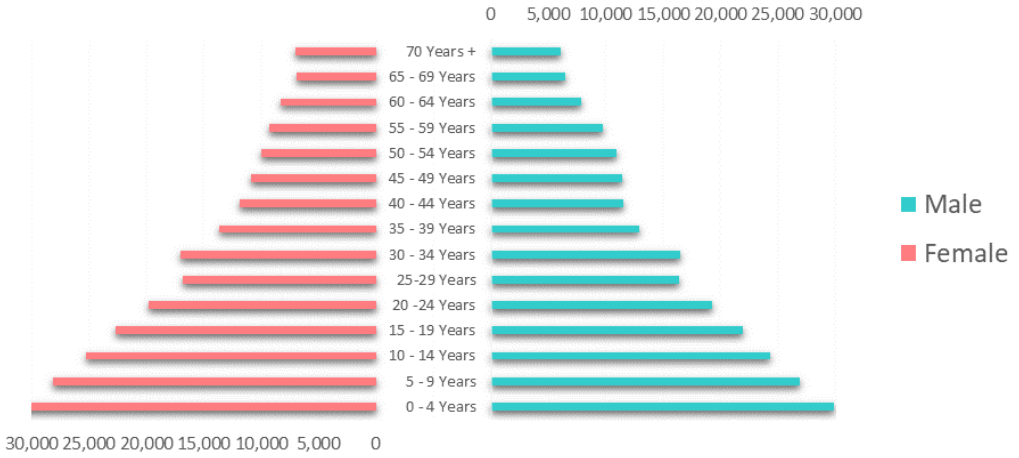
| | 1994 | 2004 | 2015 | 2020 | 2025 | 2030 | 2035 | 2040 |
|---|---|---|---|---|---|---|---|---|
| Jordanians (Normal Growth) | 67,631 | 86,351 | 116,650 | 133,471 | 151,362 | 171,134 | 192,792 | 216,416 |
| Jordanians (Increase by Economic Growth) | - | - | 18,261 | 34,347 | 68,043 | 113,811 | 174,665 | 254,674 |
| Non-Jordanians | 12,031 | 15,616 | 53,115 | 56,275 | 59,849 | 63,894 | 68,470 | 73,651 |
| Total | 79,662 | 101,967 | 188,026 | 224,093 | 279,254 | 348,839 | 435,927 | 544,741 |
| Average Annual Growth Rate | - | 2.5% | 5.7% | 3.6% | 4.5% | 4.6% | 4.6% | 4.6% |

Source: JICA study team




Source: JICA study team

**Figure 4-1 Population Change**




Source: JICA study team

**Figure 4-2 Population Pyramid in 2040**

### (2) Population Scenario Settings

#### 1) Population Scenarios

The following three draft population scenarios were developed to represent ASEZA's direction in establishing a future population frame for Aqaba Governorate.

**[Scenario 1] Zero Option** (assuming no new job are created)

- Jordanian population: Assuming that the population inflow from other cities is maintained at a constant level
- Non-Jordanian population: Based on population estimates

**[Scenario 2] Base Case** (assuming the same increasing trend continues)

- Jordanian population: Based on population estimates
- Non-Jordanian population: Based on population estimates

**[Scenario 3] Dream Plan** (Aiming for a city of 1 million people)

- Jordanian population: Assuming 75% of the inflow population (target population minus natural increase) comes from other cities in the country, in addition to the natural increase population.
- Non-Jordanian population: Assuming 15% of the inflow population (target population minus natural increase)

As a SEZ, ASEZA strategically aims to actively receive population inflows from other cities in the country and needs to become a place that can accommodate Jordan's domestic working population through the concentration of new industries such as ICT-based industries. Although there is a long-term goal of becoming a city of one million population, the decision was made to aim for a population of about 545,000 by 2040, estimating the population continues to grow as it has in the past.

A future population frame will be established based on the 545,000-population scenario, while ensuring consistency with the future land use plan and sector development strategies.

**Table 4-5 Proposed Population Scenario for Aqaba Governorate**

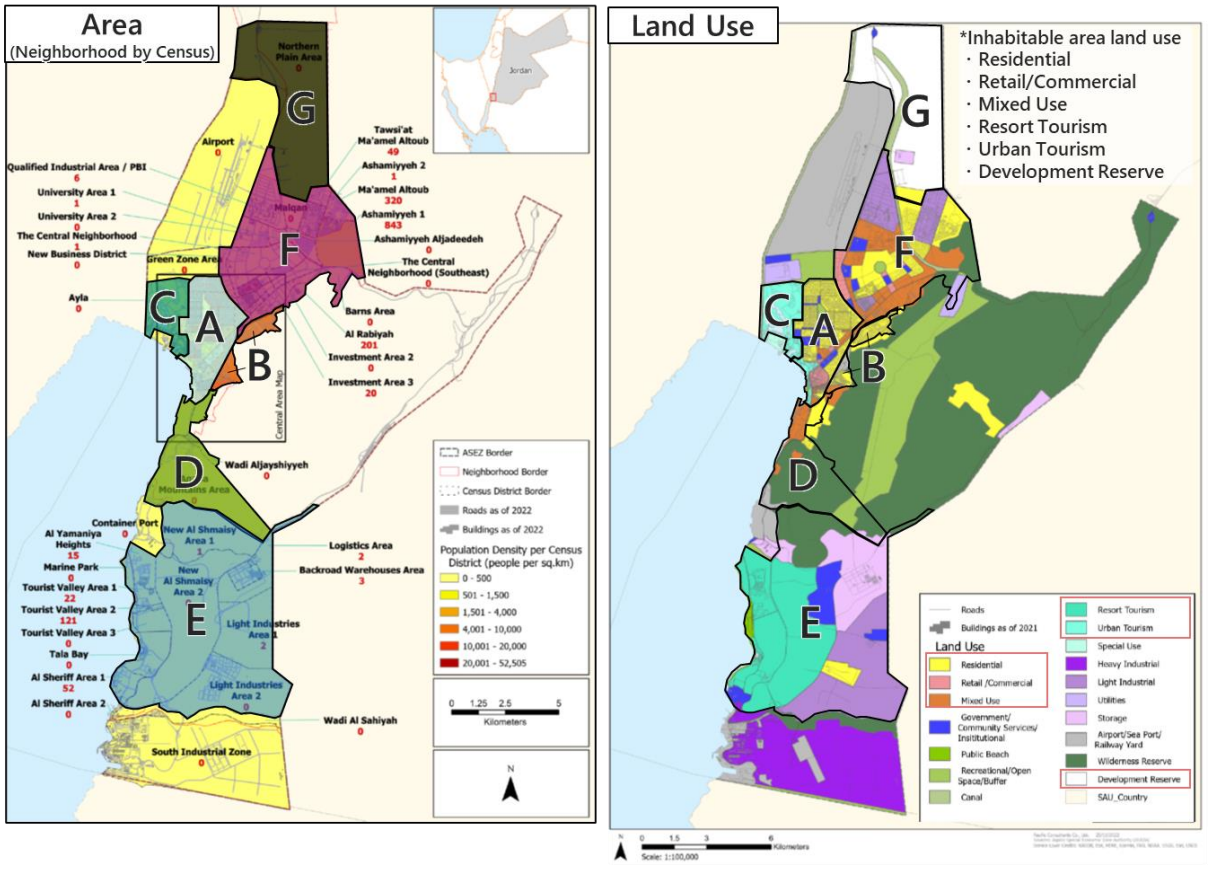
| | Current Situation In 2015 | Scenario 1 ~Zero Option~ (No new development) | Scenario 2 ~Base Case~ (Based on current growth trend) | Scenario 3 ~Dream Plan~ (Attracting New Industry and Highly Skilled Workers) |
|---|---|---|---|---|
| Population in 2040 | 188,160 | 350,000 | 545,000 | 1,000,000 |
| Jordanians (Normal Growth) | 135,045 | 220,000 | 220,000 | 220,000 |
| Jordanians (Increase by Economic Growth) | - | 55,000 | 255,000 | 630,000 |
| Non-Jordanians | 53,115 | 75,000 | 75,000 | 120,000 (Assuming 15% of the pop. to be non-Jordanians, deleting 30,000 skilled workers) |

Source: JICA study team

### 2) Confirmation of Residential Capacity

The estimated capacity of the inhabitable area was examined in the population frame study.

In the charts below, the neighborhoods that include residential land uses in the central part of ASEZ are divided into seven areas (A-G) to estimate the future urban structure. First, the area sizes of Residential, Retail/Commercial, Mixed Use, Resort Tourism, Urban Tourism, and Development Reserve (where people can live under the current land use plan) were identified.



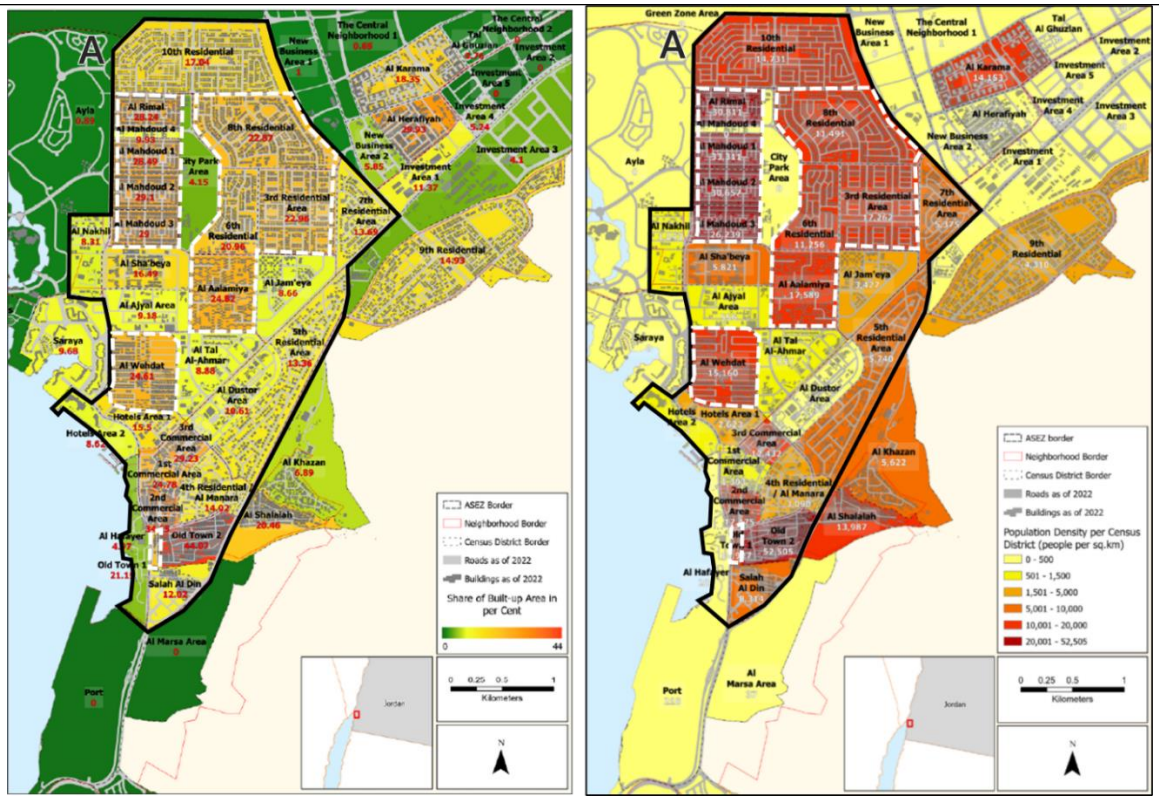
| | Area by Land use(dunum) | | | | | | | Total Inhabitable area (dunum) | Pop 2015 (ppl) | Pop density (ppl/dunum) |
|---|---|---|---|---|---|---|---|---|---|---|
| | Inhabitable area | | | | | | Others | | | |
| | Residential | Mixed Use | Resort Tourism | Urban Tourism | Retail/ Commercial | Development Reserve | | | | |
| A | 6,875.0 | 911.0 | 0.0 | 627.7 | 854.8 | 0.0 | 1,480.6 | 9,268.5 | 120,133 | 13.0 |
| B | 1,955.0 | 196.0 | 0.0 | 0.0 | 0.0 | 0.0 | 464.5 | 2,151.0 | 15,799 | 7.3 |
| C | 27.0 | 0.0 | 0.0 | 4,358.5 | 0.0 | 0.0 | 202.9 | 4,385.5 | 0 | 0.0 |
| D | 900.0 | 1,807.0 | 0.0 | 0.0 | 0.0 | 0.0 | 11,598.2 | 2,707.0 | 308 | 0.1 |
| E | 1,295.0 | 0.0 | 22,620.0 | 0.0 | 0.0 | 0.0 | 36,767.0 | 23,915.0 | 216 | 0.0 |
| F | 7,841.0 | 8,816.0 | 0.0 | 0.0 | 1,227.0 | 0.0 | 12,080.3 | 17,884.0 | 11,934 | 0.7 |
| G | 795.0 | 0.0 | 0.0 | 0.0 | 0.0 | 20,631.7 | 2,595.2 | 21,426.7 | 0 | 0.0 |

Source: JICA study team

**Figure 4-3 ASEZ Central Locations by Area (Top) and Size of Habitable Area (Bottom)**

The population density of the existing residential areas was then checked to determine the assumed population density.

Area A (surrounded by the black lines in the figure below) is the area where a certain degree of residential clustering is already evident with a high building occupancy rate in ASEZ. The average population density of the developed neighborhoods in Area A with building occupancy of 20% or more (dotted white box in the figure below) is 18.3 persons/dunum (=0.001 $km^2$). Assuming that development continues at similar densities in other neighborhoods that currently have room for development, the total population of the residential areas in Area A is expected to be around 170,000. Dividing this population by the total area of Area A, including non-residential areas (government, commercial, open space, etc.), gives a population density of 15.8 persons/dunum.




Source: JICA study team

**Figure 4-4 Percentage of Built-up Areas and Population Density by Neighborhood in Area A**

Based on the above, the population density for residential land use in each Area is assumed to be as follows.

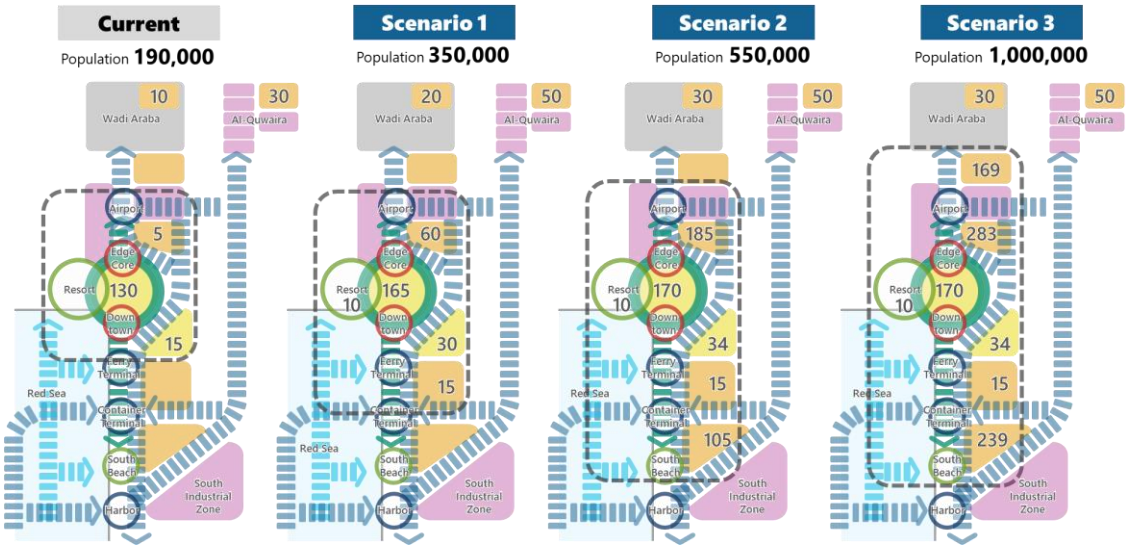
- Area A: 18.3 persons/dunum
- Area B: 15.8 persons/dunum
- Area C: Not determined as it depends on the planned population of the Ayla and Saraya projects.
- Area D: Not determined as it depends on the planned population of the Marsa Zayed project.
- Area E: 15.8 persons/dunum
- Area F: 10.0 persons/dunum (set relatively low to reflect the planned population including beach resorts and villas).
- Area G: 15.8 persons/dunum

Based on these population densities, the estimated capacity of the inhabitable area of each Area was calculated. As there is no clear land use plan for Area G, half of the area was assumed to be habitable.

The results of the estimate showed that if development continues at the above population density, the population capacity of the current residential land use area in Areas A-G, which are the central areas of ASEZ, is approximately 920,000 people. If the suburban areas of Wadi Araba and Quwaria are included, the long-term target of 1 million people can be accommodated without any changes to the existing land use plan.

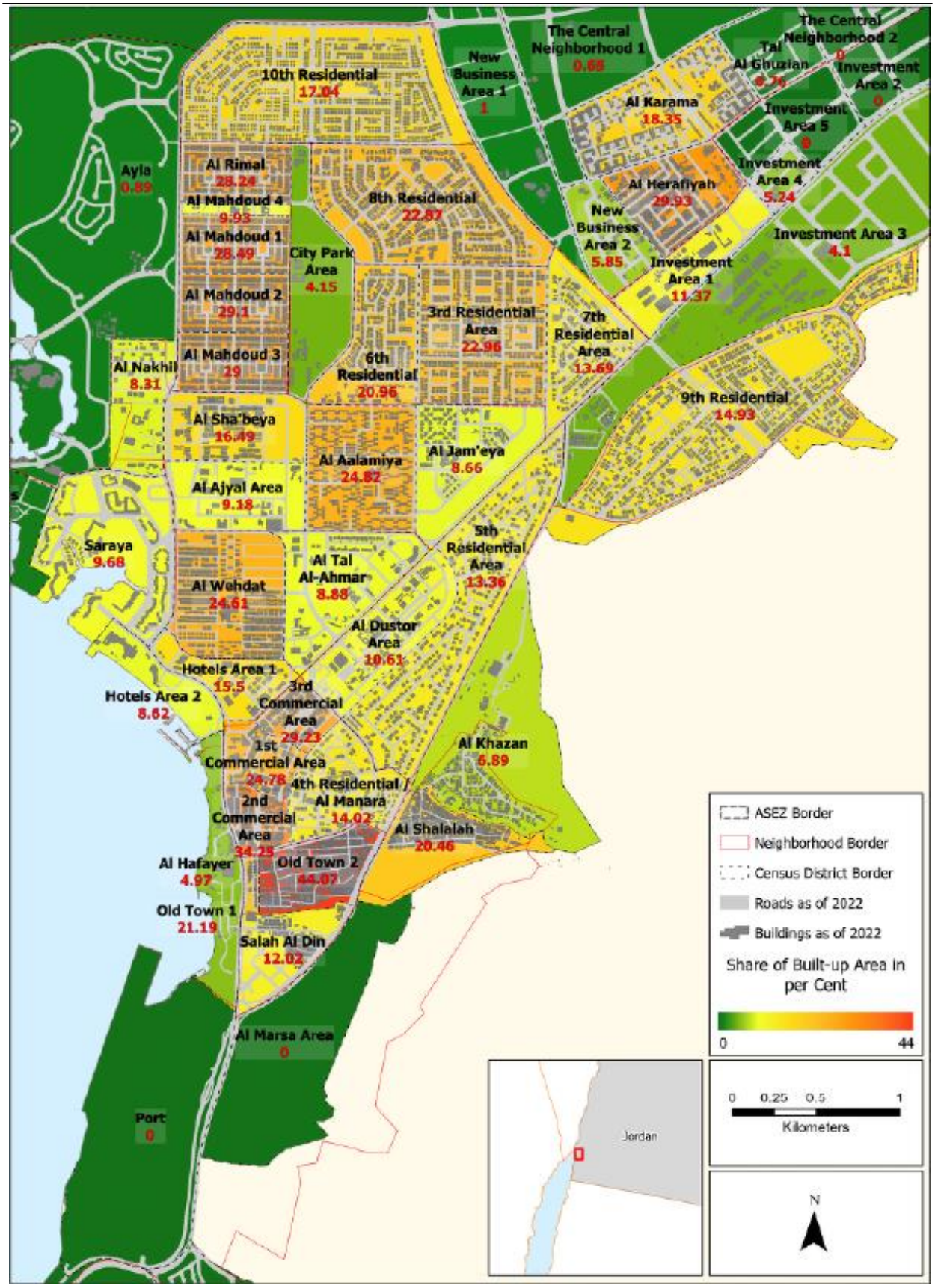
ASEZA will continue to study the population frame based on population density and urban services that can achieve comfortable living conditions, taking into account the capacity of the urban infrastructure and other relevant factors.

| | Inhabitable area(dunum) | Density (ppl/dunum) | Capacity (kk.ppl) | Scenario1 (kk.ppl) | Scenario2 (kk.ppl) | Scenario3 (kk.ppl) |
|---|---|---|---|---|---|---|
| A | **9,267.4** | 18.3 | 170.00 | 165.00 | 170.00 | 170.00 |
| B | **2,151.0** | 15.8 | 34.00 | 30.00 | 34.00 | 34.00 |
| C | **4,385.5** *Including Golf Course | - | 10.00 | 10.00 | 10.00 | 10.00 |
| D | **2,707.0** | - | 15.00 | 15.00 | 15.00 | 15.00 |
| E | **23,915.0** | 15.8 | 239.00 | - | 105.00 | 239.00 |
| F | **17,884.0** | 10.0 | 283.00 | 60.00 | 185.00 | 283.00 |
| G | **10,713.3*** | 15.8 | 169.00 | - | - | 169.00 |
| Wadi Araba | - | - | - | 20.00 | 30.00 | 30.00 |
| Quwaira | - | - | - | 50.00 | 50.00 | 50.00 |
| | (81,737) | | (920.00) | 350.00 | 550.00 | 1,000.00 |



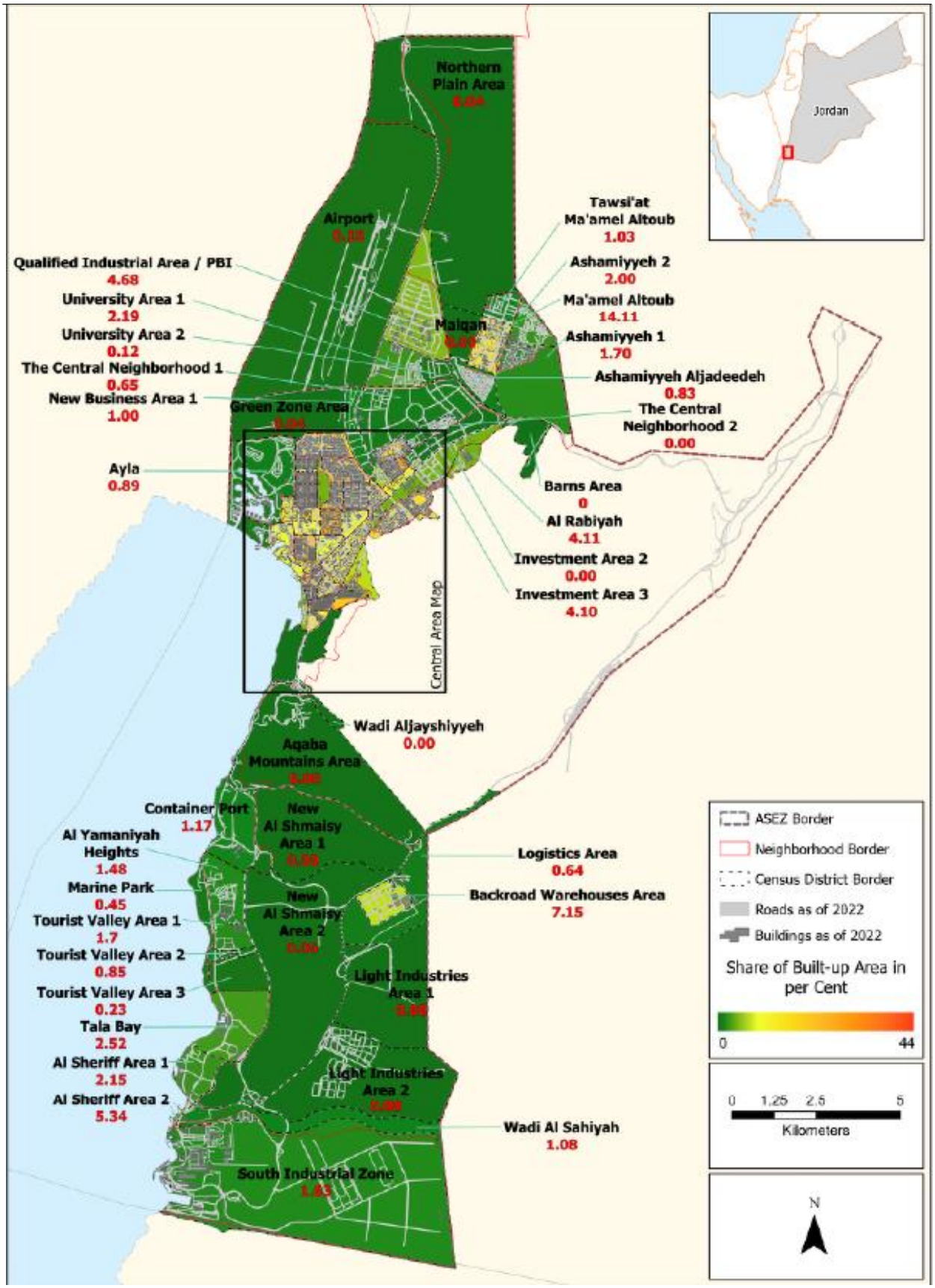

Source: JICA study team

**Figure 4-5 Confirmation of Approximate Living Capacity**




Source: JICA study team

**Figure 4-6 Percentage of Built-up Areas by Neighborhood in Central ASEZ (enlarged)**




Source: JICA study team

**Figure 4-7 Percentage of Built-up Areas by Neighborhood in Central ASEZ (wider area)**

### 4.1.2 Economic Framework

#### 1) Target for Job Creation

For the economic framework, the target number from the country's Economic Modernization Vision was used because GRDP and other industry-specific data for ASEZ were unavailable.

According to projections based on the number of workers by sector in Aqaba Governorate from the social security data and the sector specific CAGRs of the employees from the country's Economic Modernization Vision (see the table below), the total number of jobs in Aqaba Governorate in 2040 is estimated to be about 163,800, including those in the informal sectors. This is based on the assumption that the jobs will be created at a steady pace in line with the goals of the Economic Modernization Vision.

**Table 4-6 Number of Workers by Sector and Forecast Results Based on Sector-Specific CAGRs for Aqaba Governorate**

| Economic Activity | Baseline 2023 (Aqaba branch) | | | | | | Projection 2040 (Aqaba branch) | | |
|---|---|---|---|---|---|---|---|---|---|
| | Nationality | | Gender | | sub-total (Formal Job) | Adjustment (Formal+Informal Job) | CAGR(*) p.a. (%) (*) Economic Modernisation Vision | Projection 2040 (Formal Job) | Adjustment (Formal+Informal Job) |
| | Jordanians | Foreigners | Male | Female | | | | | |
| Agriculture, hunting and forestry | 26 | 202 | 221 | 7 | 228 | 587 | 5.5% | 567 | 1,457 |
| Mining and quarrying | 10 | 13 | 23 | 0 | 23 | 59 | 9.5% | 108 | 277 |
| Transformative Industries | 1,655 | 3,648 | 2,819 | 2,484 | 5,303 | 13,642 | 6.8% | 16,227 | 41,742 |
| Electricity, gas and water supply | 1,538 | 83 | 1,462 | 159 | 1,621 | 4,170 | 4.0% | 3,158 | 8,123 |
| Constructions | 721 | 285 | 887 | 119 | 1,006 | 2,588 | 4.9% | 2,269 | 5,836 |
| Wholesale and retail trade | 2,155 | 1,515 | 2,940 | 730 | 3,670 | 9,441 | 3.5% | 6,586 | 16,943 |
| Tourism | 2,610 | 1,037 | 3,085 | 562 | 3,647 | 9,382 | 9.5% | 17,060 | 43,885 |
| Transportation, storage and communications | 4,865 | 368 | 5,063 | 170 | 5,233 | 13,462 | 4.5% | 11,059 | 28,449 |
| Financial liaison | 52 | 6 | 43 | 15 | 58 | 149 | 5.5% | 144 | 371 |
| Real estate and rental activities | 388 | 111 | 410 | 89 | 499 | 1,284 | 4.9% | 1,125 | 2,895 |
| Public administration, defense and social security | 2,234 | 190 | 2,026 | 398 | 2,424 | 2,424 | 4.9% | 5,467 | 5,467 |
| Education | 998 | 85 | 202 | 881 | 1,083 | 1,083 | 3.5% | 1,944 | 1,944 |
| Health and social work | 630 | 58 | 308 | 380 | 688 | 688 | 6.5% | 2,007 | 2,007 |
| Community service activities | 411 | 350 | 660 | 101 | 761 | 1,958 | 4.9% | 1,716 | 4,415 |
| Non-regional organizations and bodies | 3 | 0 | 3 | 0 | 3 | 8 | 4.9% | 7 | 17 |
| Private families that hire members to perform household | 1 | 0 | 0 | 1 | 1 | 3 | 4.9% | 2 | 6 |
| Total | **18,297** | **7,951** | **20,152** | **6,096** | **26,248** | **60,925** | | **69,445** | **163,834** |

Source: JICA study team based on social security data (Since the social security data reflects only formal jobs, the figures were corrected to include informal jobs based on the assumed number of workers in 2021 of 60,925. The public service, education, and health sectors were excluded from the correction, since only formal jobs exist in these sectors. For sectors for which there is no CAGR target in the Economic Modernization Vision, the population growth rate of 4.9% was used as the target CAGR).

According to the 2015 Census, the total number of people with jobs in Aqaba Governorate was 57,751, of whom 53.9% were Jordanians and 46.1% were non-Jordanians. The labor force as a percentage of the total population (Economically Active Rate) was 55.6%, and the unemployment rate was 15.7%. The number of employed persons in 2021 is estimated to be approximately 60,925, based on the 2021 statistical data published by the DOS. The number of employed persons has not increased significantly since 2015, partly due to the increase in the unemployment rate as a result of the impact of COVID-19.

Applying the 2015 labor force participation rate and unemployment rate (before the impact of COVID-19) to the estimated population in 2040, the plan's target year, the number of jobs needed would be about 168,000. This means that more than 110,000 jobs will have to be created compared to 2015. If the unemployment rate is further improved to 9.17%, which is

the target of the National Vision and Strategy 2025, or if the percentage of the working population increases due to the promotion of women's participation in society, approximately 195,300 more jobs will need to be created.

**Table 4-7 Proposed Population Scenarios for Aqaba Governorate**

| | Population of age 15+ | Economically Active rate | Workforce Population | Unemployment rate (Total) | Number of Employees |
|---|---|---|---|---|---|
| 2021 | 143,052* | 55.6% (rate in 2015) | 79,537* | 23.4% | 60,925* |
| 2040 (Unemployment rate same as 2015 census) | 358,519 | 55.6% (rate in 2015) | 199,336 | 15.7% (rate in 2015) | 168,041 |
| 2040 (Improved unemployment rate) | 358,519 | 55.6% (rate in 2015) | 199,336 | 9.17% (2025 National Vision and Strategy) | 181,057 |
| 2040 (Improved unemployment rate +Grow in Economically active rate) | 358,519 | 60.0% (assuming growth) | 215,111 | 9.17% (2025 National Vision and Strategy) | 195,385 |

Source: JICA study team, calculated from *DOS, Yearbook 2021

The population projections indicate that the future population of ASEZ will depend largely on the migration of people, and how many job opportunities are created will have a direct impact on it. The estimated future job creation potential in Aqaba Governorate in 2040 is about 168,000 as seen in Table 4-7. To improve the unemployment rate, around 181,000 to 195,300 jobs are required. The growth of the current industries in ASEZ shown in Table4-6 are not enough to meet this demand, so new industries have to be created. Given the high cost of Jordanian labor, promoting labor-intensive industries such as low-wage garment manufacturing is unlikely to increase the number of Jordanian jobs. Therefore, the key issue will be how to attract industries that are considered "future services" as indicated in the Economic Modernization Vision mentioned above.

### 2) Number of Tourists

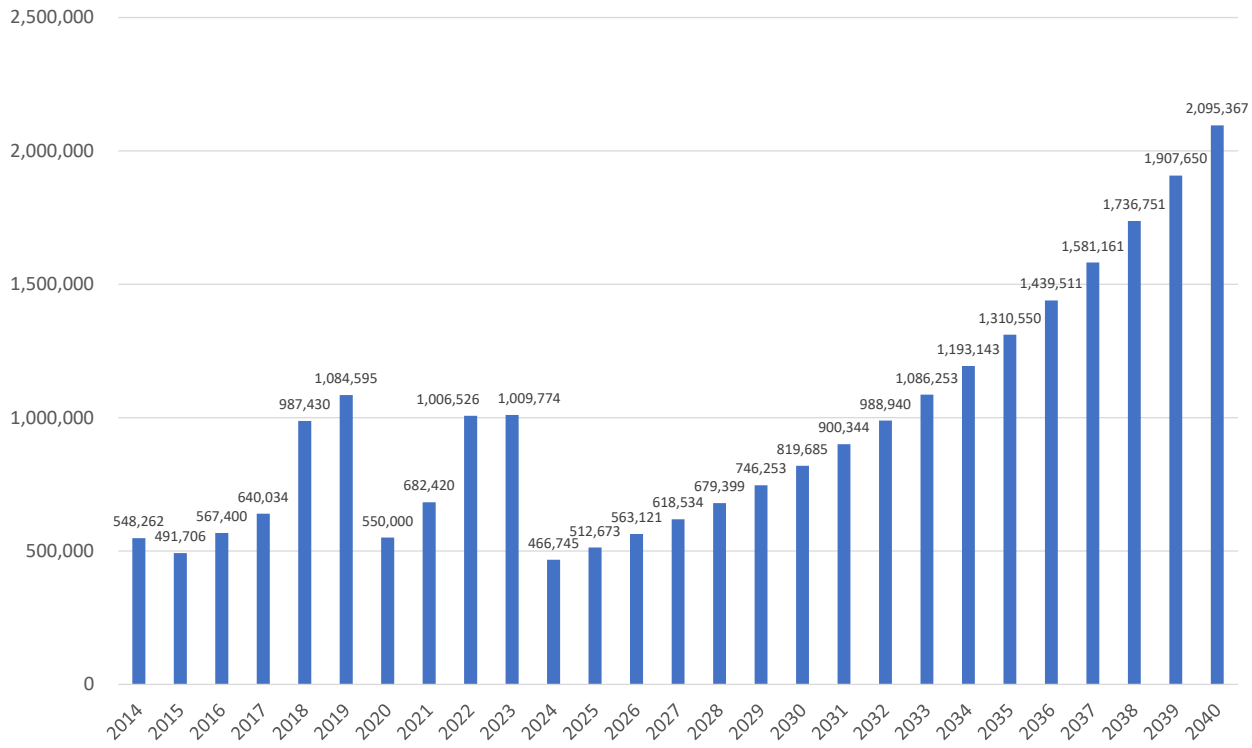
The number of hotel arrivals is the only data available as a reference for forecasting the future tourism demand which is Aqaba's main industry.

The data on hotel arrivals as a reference for the future tourism demand in Aqaba, which is the main industry of the city, has been collected since 2014, but the numbers have fluctuated greatly, and they showed a significant decline due to the coronavirus pandemic from 2020 to 2021. After that, they showed a recovery trend from 2022, but again decreased in 2023 due to the Gaza conflict and the deterioration of the situation in the surrounding areas.

Here, we assume that the number of tourists will decrease in 2024 due to the impact of the Gaza conflict, but will recover at a steady pace thereafter, and forecast the future number of tourists accordingly. First, we assume that the number of tourists in 2024 will decrease by

53.8% p.a. compared to 2023. 53.8% p.a. is the compound annual growth rate (CAGR) of the number of tourists from October to December 2022 and after the Gaza conflict from October to December 2023. Then, we assume that the number of tourists will recover at a growth rate of 9.9% p.a. from 2025 to 2040. 9.9% p.a. is the CAGR of the annual number of tourists from 2018 to 2019 before the coronavirus pandemic. Based on this forecast, we assume that the target number of tourists by 2040 is 2.1 million.

Since cruise ship passengers and people staying in private homes, who are not included in the number of hotel guests, should be added, it is estimated that the carrying capacity of tourists in Aqaba will need to be doubled for hotels and doubled to tripled for other services.




Source: Projection calculated by JICA study team based on data from ASEZA

**Figure 4-8 Projected Number of Hotel Arrivals in Aqaba**

### 3) Confirmation of Industrial Capacity

To confirm the size of land required for each industry by 2040, the ratio of the current number of employees to the projected number of employees from the previous section was used to determine future land area requirements. The magnification of the number of employees compared to 2021 for each industry is shown in Table 4-8.

By multiplying the area of land used by each industry currently in ASEZ by the future growth rate calculated in Table 4-8, we obtained the area of land required for each industry in the future. Comparing this with the industrial land secured for each industry (Commercial, Mixed use, Light Industry, Heavy Industry) in the current ASEZ area, we found that there is no risk of land shortage until 2040.

**Table 4-8 Comparison of Current and Projected Number of Workers by Sector in Aqaba Governorate**

| | Assumed No of Employees 2021 | PROJECTION 2040 | Magnification compared to 2021 |
|---|---|---|---|
| Agriculture, hunting and forestry | 587 | 1,457 | 2.5 |
| Mining and quarrying | 59 | 277 | 4.7 |
| Tourism | 9,382 | 43,885 | 4.7 |
| Transformative Industries | 13,642 | 41,742 | 3.0 |
| Transportation, storage and communications | 13,462 | 28,449 | 2.1 |
| Wholesale and retail trade | 9,441 | 16,943 | 1.8 |
| Financial liaison | 149 | 371 | 2.5 |
| Real estate and rental activities | 1,284 | 2,895 | 2.3 |
| Public administration, defense and social security | 2,424 | 5,467 | 2.3 |
| Education | 1,083 | 1,944 | 1.8 |
| Health and social work | 688 | 2,007 | 2.9 |
| Community service activities | 1,958 | 4,415 | 2.3 |

Source: JICA study team

## 4.2 Urban Planning Directions for MP Review and Revisions

### 4.2.1 Summary of Sectoral Issues

The following is a summary of the sectoral issues identified from the sector-specific status analysis performed in Chapter 3.

**Table 4-9 Sectoral Issues**

| Sector | Issue |
|---|---|
| Natural environment | ▸ Consideration on environmentally friendly urban development<br>- Addressing contamination risks from increased solid waste and sewage, exhaust gas<br>- Increased environmental impacts associated with development, disasters associated with climate change, etc. |
| Socio Economic | ▸ Living environment to cope with population growth<br>- Deterioration in efficiency of urban management due to population growth<br>- Increased need for new housing and urban facilities and services due to changes in population composition<br>- Aging of homes over time and decreased safety against disasters<br>- Increase in the number of poor people due to unemployment, etc.<br>▸ Standard of medical care and education to foster healthy lifestyles<br>- Increased needs for health, medical, and welfare services<br>- Decline in the educational environment and quality of education, such as shortage of schools due to population growth<br>▸ Employment as a source of domestic workers in Jordan<br>- Deterioration of unemployment rate due to the increase in the working-age population<br>-Sluggish opportunities for women to enter society and employment rate |
| Land use | ▸ Creating Identity and Attractiveness<br>- Unclear identity of the city<br>- Lack of charm around downtown area befitting as gateway of the city<br>- Lack of accessibility and visibility to the waterfront area<br>- Slightly dilapidated image of the Old Town area<br>- Large number of underutilized land and vacant houses<br>- Lack of connectivity between the downtown area, historic sites, gated resorts, large scale projects, etc.<br>- Lack of diverse recreational facilities for residents and tourists<br>▸ Land use that harmonizes tourism, industry, residence, etc.<br>- Uniform housing style with site-specific land use rules<br>- Lack of public space and inadequate maintenance<br>- Existence of industrial sites that are not in harmony with residential areas due to sprawl development<br>- Increased need for work and residential environments suitable for new work styles<br>▸ Promotion of appropriate development management<br>- Lack of proper understanding and guidance of development trends and current status of urban use |
| Tourism & industrial development | ▸ Tourism as a key industry<br>- Lack of carrying capacity and quality of accommodations, etc.<br>- Insufficient waterfront and downtown attractions as unique tourism resources<br>- Lack of a pleasant pedestrian environment and tourist circulation<br>- Lack of access to southern beach areas<br>- Short length of stay of tourists<br>- Lack of local products such as souvenirs<br>- Lack of a clear identity compared to other cities along the Red Sea coast<br>▸ Industries other than tourism<br>- Lack of a business environment that attracts high value-added industries<br>- Lack of education and vocational training opportunities to meet employment needs |

| Sector | Issue |
|---|---|
| | - Labor market mainly composed of migrant workers<br>- Inconvenient commuting environment due to inconsistent industrial land use and transportation<br>- Underutilization of coastal land for port and industrial facilities<br>- Impacts of industrial development on marine resources |
| Transportation & logistics | ▸ Transportation strategies consistent with urban development<br>- Transportation demand in response to new urban development<br>- Lack of linkage of various transportation modes and services<br>▸ Convenience of transportation for residents and tourists<br>- Inadequate public transport services<br>- Lack of accessibility between major transportation facilities<br>- Existence of on-street parking<br>- Inefficient urban transportation services and mobility management<br>- Increased environmental impact due to increased traffic demand<br>▸ Logistics capacity as a trading port to support the development of the country<br>- Increase in volume handled as a trading port, increase in containers<br>- Underutilized railroad infrastructure |
| Infrastructure development | ▸ Proper management in existing infrastructure<br>- Poor stormwater drainage that causes flooding during rainfall<br>- Lack of stormwater drainage channels, dams, etc.<br>- Management loss or leakage related to water supply, existence of illegal drainage<br>- Aging of water and sewerage facilities<br>- Inefficient operation of individual stormwater drainage networks by developers<br>- Pollution of marine and other natural environments due to illegal dumping of waste into stormwater infrastructure and polluted water from factories, etc.<br>- Inadequate power distribution to some commercial areas<br>- Voltage loss due to technical problems such as electrical equipment and non-technical problems such as power theft<br>- Environmental impact of waste disposal and sluggish recycling<br>▸ Capacity of supply treatment facilities to serve urban expansion<br>- Insufficiency of water resources due to gradual decrease in water intake from wells and increasing water demand due to population growth and industrial attraction.<br>- Insufficient reservoir capacity for water supply<br>- Growing demand for gray water and wastewater from future urban development<br>- Growing demand for electricity from population growth and industrial attraction<br>- Increased waste disposal demand from population growth and industrial attraction<br>- Deterioration in efficiency of service provision due to future urban expansion |
| Disaster risk control | ▸ Ensuring safety through disaster risk management<br>- Increased risk of extreme rainfall, flash floods, drought, etc.<br>- Lack of land use planning in consideration of disaster risk |
| Smart city | ▸ Efficient urban management using ICT<br>- Lack of appropriate management and accumulation of data<br>- Lack of urban services for a digital society<br>- Insufficient data sharing and collaboration within the government<br>- Insufficient data disclosure to citizens |
| Public participation (Based on the findings of the survey) | ▸ Priority concerns for local residents<br>- Promotion of industry (promotion of manufacturing, agriculture, fisheries)<br>- Job creation (job security, good work environment)<br>- Improve urban services (schooling environment, medical services)<br>- Expansion of open spaces (parks, public beaches)<br>- Promote residents' participation in urban development<br>▸ Addressing issues by sector<br>- Expansion of attractive facilities and places (recreational and cultural facilities)<br>- Improvement of the pedestrian environment in the city center and public beaches<br>- Review of landscape regulations and guidance suitable for different locations |

Source: JICA study team

### 4.2.2 Urban Development Directions

The urban development directions can be summarized into three directions as follows.

**(1) Developing high-quality living society for one and all**

In ASEZ where population growth is expected in the future, improving the living environment and upgrading urban services to ensure comfortable living for all residents (including the growing population) is a top priority of urban planning. This requires not only quantitative improvements through the expansion of residential areas, but also the creation of attractive living spaces and more efficient and targeted urban management. The latter is expected to be achieved by identifying and utilizing vacant land and houses in the central areas of the city, where there are many underused spaces, and by setting different land use rules and providing a variety of housing styles based on the characteristics of each area. It is also necessary to raise the standard of the education and medical services, improve infrastructure and open spaces, and strengthening public transportation and walkability to secure safe living/working environment and better quality of life.

**(2) Developing competitive opportunities to attract new industries and human resources**

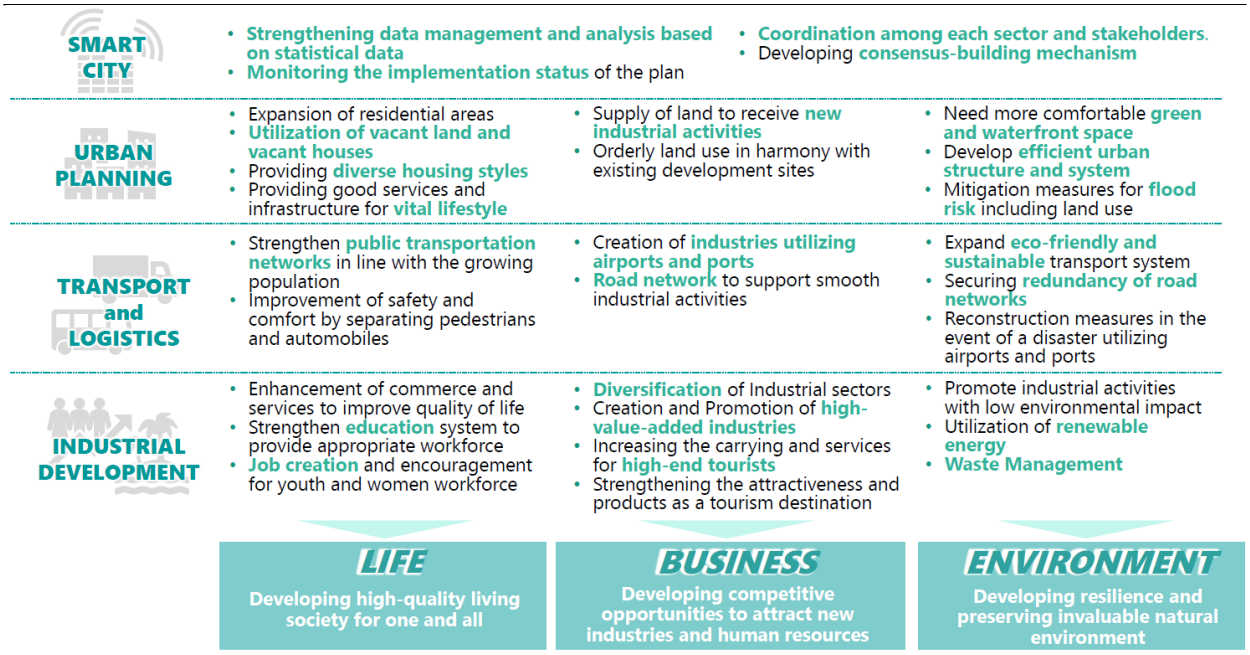
To create jobs for the younger generation in Jordan, where the population is expected to grow nationwide, ASEZ needs to increase their competitiveness against neighboring cities as the country's industrial base and attract business and investment from outside. In order to diversify the industry, including high value-added industries, it is necessary to systematically supply land to accommodate new industrial activities, utilize airports and ports, and strengthen the road network. At the same time, it is necessary to create an attractive work and residential environment to attract highly skilled human resources from inside and outside of the country to engage in these industries.

In ASEZ where tourism is expected to flourish further through the development of large resorts, it is essential to improve existing tourism resources and services (such as those in the waterfront areas), and to increase capacity to improve the quality of stay and diversify tourism products to attract high-end source markets. In addition, in order to connect the development of tourism with the vibrancy of the city and the revitalization of the local economy, it is desirable to improve the mobility of tourists by integrating the city with gated resorts separated from the city, and to aim to attract long-term stays and repeat visitors by enhancing city-specific local resources through improving the attractiveness of the city center and enhancing entertainment and social facilities. It is also desirable for the city to become a place of choice for long-term residents.

**(3) Developing resilience and preserving invaluable natural environment**

In developing urban areas to improve the living environment and promote industry, it is extremely important for the growth of the city to provide spaces where residents and businesses can live and invest with peace of mind. In ASEZ, where there is risk of disasters such as floods and earthquakes, it is essential to properly understand the risks and conduct risk-based development, and flood damage mitigation measures and infrastructure redundancy must be ensured.

In addition, in order to utilize and preserve the valuable natural environment, it is necessary to create greenery and waterfront spaces that are more comfortable to live in, as well as to promote living and industrial activities with less environmental impact, utilize renewable energy, and properly manage wastes.




Source: JICA study team

**Figure 4-9 Urban Development Directions**

### 4.2.3 Urban Management Directions

The followings are the urban management directions identified from the results of the current situation analysis in Chapters 2 and 3.

#### (1) Improvement of Analytical Capabilities based on Statistical Data

Statistical data and mapping information on population, industry, and other relevant issues have not been sufficiently collected over time and centrally maintained at ASEZA. This has resulted in insufficient data-based analysis of the current situation required for urban planning and industrial development. Since the formulation and implementation of urban development master plans require data analysis-based planning and target setting, ASEZA needs to establish an effective data collection method and data centralization approach using digital technology, which should improve its analytical capabilities.

#### (2) Effective Monitoring of Progress of Plan Implementation

In order to implement and revise the master plan, the implementation status of the plan should be monitored and managed over time. As the monitoring of urban planning master plans has not been adequately implemented in ASEZA, it is necessary to organize an appropriate system and strengthen the capacity to monitor and review the implementation status of plans.

#### (3) Ensuring Consistency among Plans and Projects of Each Sector

There is no cross-sectoral high-level plan in ASEZ other than the master plan, and planning and project activities are carried out individually with ASEZA, ADC and government agencies/donors, in the areas related to the individual infrastructure operators. The master plan in the future needs to be implemented with sufficient information sharing and coordination between organizations to ensure alignment of their activities.

### (4) Formation of Public Participation and Consensus-building Mechanisms

In Jordan and ASEZ, the participation of residents in urban planning has been insufficient, resulting in low levels of resident satisfaction. Their perception of urban issues as their own problems and their proactive participation in urban planning should be effective in formulating policies that meet local needs. This will also build trust between government and residents, and therefore public participation should be encouraged. ASEZs need to have a clear decision-making process for planning, updating and prioritizing actions, and a mechanism for identifying the latest needs of residents and visitors and incorporating them into policymaking.

## 4.3 Development Vision and Strategy

### 4.3.1 Development Vision

Based on the results of the current study, we propose the following draft development vision for ASEZ until 2040.

**Yalla ! AQABA**
**~Authenticity and Promising Opportunities~**

Aqaba is the only port city in the country located at the southern tip of Jordan and the northern tip of the Red Sea. The city has long flourished as a strategic point for maritime transportation and trade and is a geographical hub for a variety of people who come and go.

The city has a traditional downtown, an old town spreading out at the foot of the mountains, historical remains, a beautiful coastline and mountain ranges, and other local resources, which contribute to the city's identity. It is hoped that the city will become a place that gives "vitality" to the people by welcoming them with its authenticity and the unique resources.

In the calm sea, mild climate, and open atmosphere, people can refresh their minds and bodies, maintain their health, and enjoy a variety of lifestyles that meet their diverse values.

Various industries and jobs that support the life, health and comfortable stay of such people will grow, and equal opportunities will be given to those who challenge new businesses.

The geographical characteristics, historical values, natural environment, and landscapes that form the basis of these lifestyles are valued and harmonized with people's activities.

For Aqaba to achieve further growth as an internationally competitive city to lead the development of the nation, it is necessary that the future vision is shared among the residents and partners, and that new human resources and businesses work together for realization.

We believe that the role of Aqaba and ASEZ is to lead the country and the region in creating cutting-edge values and styles, where people can embrace promising opportunities.


Source: JICA study team

**Figure 4-10 Image of Development Vision and Strategy**

### 4.3.2 Basic Strategy

In order to realize the development vision, the following three pillars are set forth as the development strategy.

| | |
|---|---|
| Strategy 1 | **[QUALITY of LIFE] Full of Smile**<br>**- From expansion-oriented to value-driven development -**<br>1) Land Use – Providing lands for residences, business, and services corresponding to diverse values<br>2) Industry – Enhancing industry and improvement of the working environment to support healthy and comfortable lifestyles<br>3) Transport Environment – Ensuring a walkable environment that promotes health and a smooth mobility environment<br>4) Urban Design – Creating living spaces and public spaces with a sense of diversity |
| Strategy 2 | **[OPPORTUNITY of BUSINESS] Full of Investment Opportunities**<br>**- From Labor intensive to high value-added tourism, industries and education -**<br>1) Land Use – Ensuring employments and workplaces s for the people in high value-added industries<br>2) Industry and Tourism – Promoting digital transformation and high value-added industries that contribute regional economy<br>3) Transport, Logistics and Utility – Creating competitive investment environment by strengthening transport networks and infrastructure<br>4) Urban Design – Guiding sophisticated urban landscape for existing urban areas and newly developed areas |
| Strategy 3 | **[VALUE of ENVIRONMENT] Full of Green and Nature**<br>**- From gray infrastructure to green Infrastructure -**<br>1) Land Use – Preservation of the beautiful natural environment of the Red Sea and harmony with urban space<br>2) Industry and Tourism – Decarbonization in business activities and expansion of renewable energy projects<br>3) Transport and Logistics – Promoting use of renewable energy in mobility and bicycle use<br>4) Utility – Stable supply of water, electricity, and so on to meet demand and proper treatment of wastewater and waste<br>5) Environment – Preservation and management of abundant marine resources, natural resources, clean air, and rich ecosystems<br>6) Disaster Prevention – Strengthening of buildings and infrastructure and use of green infrastructure to minimize damage from disasters<br>7) Urban Design – Ensuring views to the Red Sea and producing public spaces using green |

In addition, since it is extremely important to create the environment and system for the implementation of the vision and strategies, the following three management frameworks are set forth to strengthen the activation system in ASEZA and ADC.

| | |
|---|---|
| Sustainable Managemen | **[SMART GOVERNANCE] - Efficient Urban Management and Monitoring -**<br>● Develop a data platform/dashboard to obtain, consolidate and organize the various data<br>● Strengthen cooperation/collaboration mechanism for proper implementation of projects<br>● Establish Periodical Monitoring/Reviewing/Revising System of the M/P |

**(1) [QUALITY of LIFE] Full of Smile- From expansion-oriented to value-driven development -**

In order to accommodate future population growth, the city will not only expand the urban area from the built-up area to the outside, but also prepare a residential and commercial/industrial catchment area that meets the diverse needs of the target population to be attracted to the ASEZ in the future, including qualitative improvements in the built-up area.

Make the most of Aqaba's open atmosphere and the sea and create an environment where both residents and visitors can enjoy the richness of the area in equal measure.

To create an environment in which quality educational and cultural services are equally accessible and accessible to all, so that everyone, from children to the elderly, can lead a fulfilling and enriched life.

To this end, the basic strategies for each of the relevant sectors are as follows.

**1) Land Use – Providing lands for residences, business, and services corresponding to diverse values**

- Allocation of Hubs for effective delivery of services
- Provision of residential areas that accommodate diverse lifestyles (singles, families, high-income households, retirees, etc.)
- Creation of urban spaces that integrate diverse values through an effective mixed use (mixed commercial and residential, mixed engineering and residential)
- Arrangement of commercial and service areas that enhance the convenience of daily life
- Appropriate arrangement of parks, schools, cultural facilities, etc.
- Improvement of urban density and quality through optimization of area by use

**2) Industry – Decarbonization in business activities and expansion of renewable energy projects**

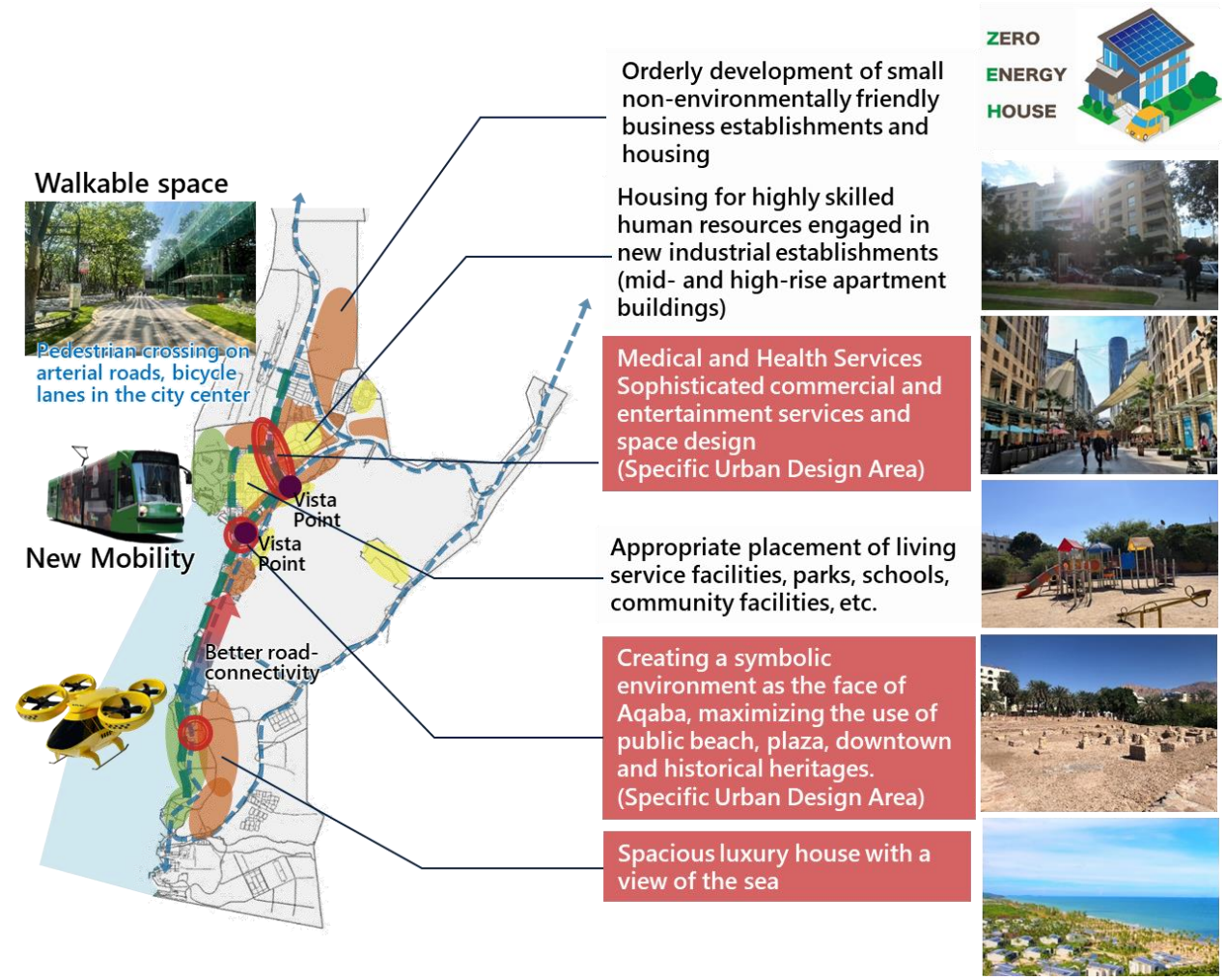
- Attract new industries by creating a comfortable working and living environment
- Attract new industries by promoting Inclusive urban development

**3) Transport, Logistics– Ensuring a smooth mobility environment**

- Minimizing the impact of heavy trucks in the ASEZ city center (improvement of intersections on truck routes, countermeasures for truck routes, etc.)
- Strengthening the public transport system (strengthening public bus services, introducing new public transport modes such as LRT, etc.)
- Ensuring traffic safety (traffic safety measures for accident-prone locations and road sections)
- Realizing smooth road traffic by urban traffic management (improving intersection operations, establishing a traffic control center, implementing parking measures, etc.)

**4) Urban Design – Creating living spaces and public spaces with a sense of diversity and ensuring a walkable environment that promotes health**

- Design various living spaces corresponding to lifestyles
- Creation of urban spaces with walkability




Source: JICA study team

**Figure 4-11 Examples of Area Based Approaches to Realize Strategy (1/3)**

### (2) [OPPORTUNITY of BUSINESS] Full of Investment Opportunities

**- From Labor intensive to high value-added tourism, industries and education -**

Promote industrial diversification by attracting high value-added and knowledge-intensive industries, as well as promoting the efficient allocation of industrial sites and the formation of industrial clusters. In addition, the outflow of high-level human resources who are the key players in these industries will be prevented, attracted from outside the region and nurtured within the region.

In terms of tourism, in addition to the services provided by the development of resorts by private-sector companies, the project aims to strengthen related industries that provide a variety of services, activities and accommodation environments in downtown areas, public beaches and historical remains, with the aim of expanding the target market and increasing tourism consumption.

The development of transport and logistics infrastructure and related services that are attractive to businesses will be promoted by utilizing transport hubs such as airports and ports.

To this end, the basic strategies for each of the relevant sectors are as follows.

**1) Land Use – Ensuring employments and workplaces s for the people in high value-added industries**

- Creation of business environment that encourages new industries to locate in the area
- Promotion of tourism development in downtown and southern areas
- Expansion of industrial sites taking advantage of geographical and environmental conditions
- Ensuring a comfortable and sophisticated working and living environment that attracts highly skilled human resources from inside and outside Jordan

**2) Industry and Tourism – Promoting digital transformation and high value-added industries that contribute regional economy**

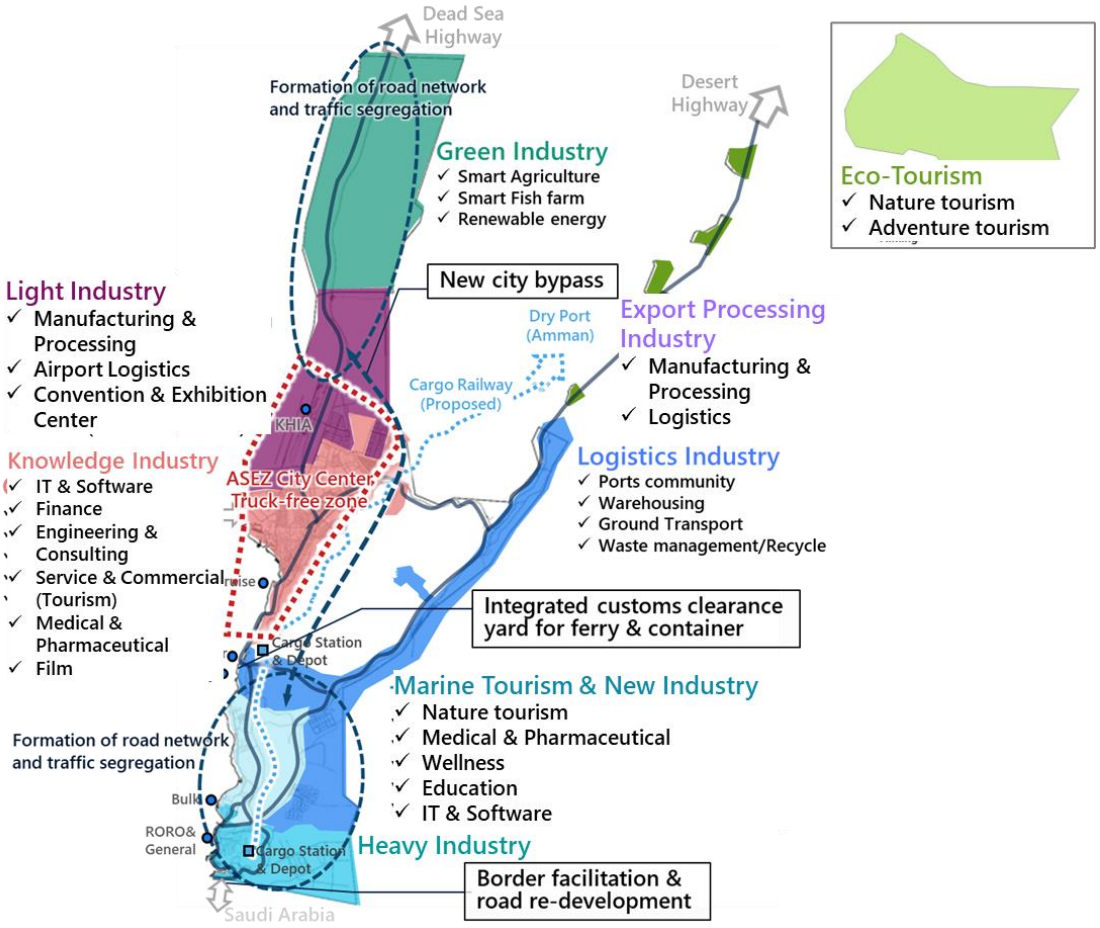
- Develop a new industrial cluster with wide supporting industries.
- Increase value-added in industries through DX
- Develop high value-added and diversified tourism products.
- Maximize Regional Potential

**3) Transport, Logistics and Utility – Creating competitive investment environment by strengthening transport networks and infrastructure**

- Strengthening the regional arterial road network that allows logistics vehicles to travel safely and smoothly
- Improving airport functions for the improvement of convenience for domestic/international tourists and visitors and developing commercial facilities for the improvement of airport operation & management
- Contributing to high-value-added tourism (development of Aqaba Cruise Terminal as a marine transport hub and its surrounding areas, etc.)
- Strengthening port functions that contribute to the national economy and ASEZ regional development (Aqaba Container Terminal, Ferry Terminal, Aqaba New Port, etc.)
- Introduction of economical and highly efficient freight transport modes (revival of cargo railways and strengthening of the national railway network)

**4) Urban Design – Guiding sophisticated urban landscape for existing urban areas and newly developed areas**

- Designing active downtown area with a sense of identity
- Designing new development areas with a sense of symbolic value
- Guiding unique landscapes for resort areas




Source: JICA study team

**Figure 4-12 Examples of Area Based Approaches to Realize Strategy (2/3)**

### (3) [VALUE of ENVIRONMENT] Full of Green and Nature

**- From gray infrastructure to green Infrastructure -**

In future urban development, attention should be paid to the preservation of the natural environment, which is the original landscape of the city and the basis of its attractiveness, and urban development with low environmental impact should be promoted.

We will protect the lives and property of citizens and businesses from disasters, and work to create a disaster-resistant city where all citizens can continue to live comfortably with peace of mind and businesses can invest with peace of mind. In particular, with regard to flood damage, we aim to build green infrastructure that effectively utilizes rainwater for daily life and industry, based on the two-sided issues related to 'water' of reducing flood damage caused by recent climate change and effectively utilizing precious water resources in arid regions.

As there are few places where people can feel greenery and moisture due to climatic factors, green and water are effectively placed along the city streets and in spaces that serve as symbols of the city to create attractive urban spaces that attract people, and to create spaces that are comfortable and inviting to visit.

The basic strategies for each of the relevant sectors are as follows.

**1) Land Use – Preservation of the beautiful natural environment of the Red Sea and harmony with urban space**

- Promote land use that takes into account disaster and flood risks
- Ensure parks, green spaces, and waterfront spaces where residents and visitors can relax
- Preservation and appropriate use of nature conservation areas
- Establishment of development reservations and phased expansion of development areas to create cities with high energy and management efficiency

**2) Industry and Tourism – Decarbonization in business activities and expansion of renewable energy projects**

- Develop environmentally friendly industries
- Develop sustainable tourism

**3) Transport and Logistics – Promoting use of renewable energy in mobility and bicycle use**

- Securing a bicycle-use environment and promoting bicycle use that contributes to $CO_2$ emission reduction and public health (reallocation of road space for bicycles, development of bicycle lane network, securing bicycle parking spaces, promoting bicycle rental services, etc.)
- Promotion of EV use (strategic implementation of EV charging stations)

**4) Utility – Stable supply of water, electricity, and so on to meet demand and proper treatment of wastewater and waste**

- Upgrading water supply, sewage and wastewater treatment system corresponding to future urban and industrial development
- Developing rainwater drainage system considering future conditions and rainfall
- Ensuring stable electricity supply in the future
- Promoting telecommunication business with collaboration between public sector and private sector
- Upgrading and expanding waste treatment facilities and improving waste management system

**5) Environment – Preservation and management of abundant marine resources, natural resources, clean air, and rich ecosystems**

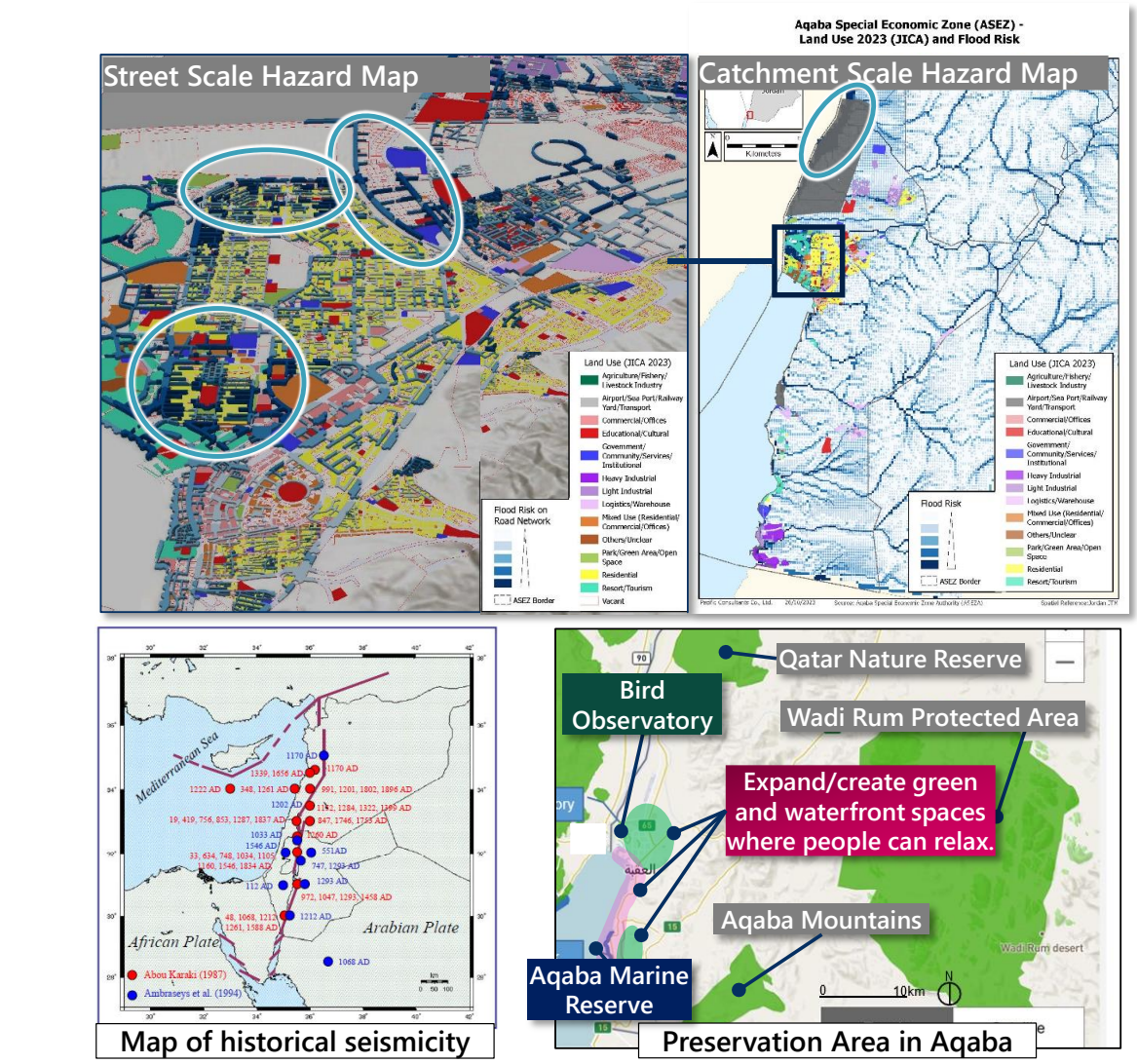
- Implementation of environmental monitoring and improvement measures on air quality, water quality, noise and vibration for better life in ASEZ
- Preservation of invaluable natural resources and ecological system
- Appropriate water resource management and waste treatment

**6) Disaster Prevention – Preservation and management of abundant marine resources, clean air, and rich ecosystems**

- Developing Disaster-Resilient Urban Structure
- Promoting safe and secure evacuation and emergency response
- Structuring organizations, people, and companies to be resilient to disasters

**7) Urban Design – Ensuring views to the Red Sea and producing public spaces with green**

- Conservation of landscapes with the view to the Red Sea
- Conservation of accessible green and nature landscapes




Source: Disaster Risk Assessment for Aqaba, JULY2011, UNDP/ASEZA

Source: JICA study team

**Figure 4-13 Examples of Area Based Approaches to Realize Strategy (3/3)**

## (4) [SMART GOVERNANCE]
## - Efficient Urban Management and Monitoring –

In order to effectively operate urban development and community development based on the Urban Development Master Plan, it is necessary to monitor the state of the city over time, identify issues according to the updated situation, and take necessary measures to solve them. In order to ensure efficient urban management and monitoring, as described below, this Master Plan will effectively utilize digital (smart) technology to acquire data, share information, and collaborate effectively with other organizations and residents, as well as regularly monitor the implementation of positioned projects and their effects, and flexibly revise the plan according to progress and effects.

### 1) Develop data platform/dashboard to obtain, consolidate and organize various data

In order to guide appropriate urban development, surveys on population, industry, land use, etc. should be conducted over time, and a database should be created and shared widely.

**a) Conduct basic surveys on population, industry, land use, etc.**

- Conduct surveys to obtain statistical data over time in cooperation with the national government
- Review future projections based on trends of actual data

**b) Establishment of database**

- Efficient data acquisition using digital technology
- Organization and publication of statistical information
- Proper update and utilization of GIS data

### 2) Strengthen cooperation/collaboration mechanism for project implementation o

The goal is to establish a system in which related sectors mutually share information and collaboration from the planning to the execution of the projects. In addition, public participation in the planning stage of important plans and project needs to be realized.

**a) Inter-organizational collaboration**

- Mutual information sharing and collaboration among related sectors from the project conception stage
- Promoting project promotion through public-private partnerships

**b) Building Consensus**

- Continuous dentification of the needs of residents and visitors, and their participation in the planning process
- Establishment of a systematic consensus-building process within ASEZA when formulating plans

### 3) Establish Periodical Monitoring/Reviewing/Revising System of the M/P

The implementation status and effects of the projects positioned in the master plan will be monitored over time and reviewed accordingly. In addition, it is encouraged that the related guidelines will be updated, and appropriate guidance will be provided.

**a) Update of guidelines**

- Update of related guidelines based on the new M/P
- Organize data on construction activities, etc. based on the guidelines

**b) Review of plans based on evaluation**

- Monitoring the implementation status and impact of projects /other activities in the MP
- Continuous review/revision of the contents of the M/P based on the monitoring results

The summary of the process for identifying the development vision and strategy in shown in the next page.

**National trends and positioning**

- Jordan 2025 National Vision and Strategy
- Jordan Economic Growth Plan 2018-2022
- Government Economic Priorities Program 2021-2023
- Economic Modernization vision
- Jordan National Tourism Strategy 2021-2025
- National Disaster Risk Reduction Strategy and Action Plan 2021-2025
- Green Growth National Action Plan 2021-2025

**Higher level plan and related surveys**

**ASEZA Master Plan 2001-2020**
- Creating the future of the Aqaba Special Economic Zone (ASEZ), as an oasis of commerce and trade, a tourist destination, a technology incubator for the Middle East, and an environmental research and conservation center.

**Draft ASEZA Master Plan 2010-2030**
- ASEZA Master Plan was reviewed and amendment was proposed, but not approved.

**Related surveys**

Studies conducted in the areas such as tourism/industry, urban development, environment and energy by donors
- Current analysis of Aqaba's strategic direction (UK Aid/2020)
- Aqaba Marine Reserve (UNDP/ 2020), etc.

**Historical background of the city**

**Ancient trading hub**
- Humans have inhabited the area since about 4000 B.C. and it was a strategic hub for trade between Asia, Africa and Europe.
- Stopover for the pilgrimage to Mecca

**Base for military and logistics strategies**
- Aqaba was called Aelana or Aela in the era of Roman Empire and was one of the most important military strongholds.
- A symbolic place under Ottoman rule that was attacked and fell during the Arab uprisings during World War I.
- Located at the far end of the Red Sea, it functions as a transportation hub.

**Sectoral conditions (internal environment)**

**Socio-economic trends**
- Population is 222,000, increasing continuously
- Unemployment is relatively low and income levels are high in the country

**Land use**
- Controlled residential area development by era
- Public beaches are limited due to the coastal resort development
- Underutilized areas a prominent
- Not very attractive downtown

**Large-scale development**
- Development plans exist throughout the city
- Large additional area incorporated in ASEZA

**Infrastructure**
- Water and sewage systems are already in place
- Electricity are provided by three companies (generator, transmitter, distributor)
- Telecommunications services are provided by several private companies.
- Waste is collected and filled at dumping sites

**Industry and tourism**
- Marine resorts and diving are the mainstay of the tourism industry.
- Strong phosphate industry
- Out flow of high skilled domestic human resource

**Transportation and logistics**
- Vulnerable bus network
- No barrier-free environment
- Logistics centered on Aqaba Port and Container Terminal

**Disaster Management**
- Danger of flash flood
- Hazard maps not prepared

**Environment**
- The rich natural environment, including coral reefs, with the existence of protected areas

**Management condition (internal environment)**

**Related laws and regulations (guidelines)**
- Standards exist/prior consultation are required for all construction activities based on the M/P.
- Not yet responded to new social demands

**Organizational structure**
- Cross-organizational structure for development, updating, monitoring, etc. of M/P is not clear

**Project monitoring**
- Achievement of the plan presented in the M/P is not monitored and cannot be evaluated.

**Trends (External environment)**

**●Competitive development in region**
- Neom, Sharm El Sheikh, Eilat

**●Energy and decarbonized society**
- Promotion of a petroleum-free and decarbonized society

**●Climate change**
- Damage due to frequent flash floods

**Intentions of residents and visitors**

**●Residents**

Intention of living
- Many people live in Aqaba because it is their hometown or because of work.
- The intention to stay is very high.

Attraction of the city
- Lack of facilities and places that are attractive such as recreational facilities, open spaces, and cultural facilities

Satisfaction/importance of living environment
- Low satisfaction and high importance of initiatives related to industry, employment, and work environment in particular.
- The same trend applies to parks, public beaches, school education, medical services at hospitals, and opportunities for residents to participate in urban development.

Pedestrian environment
- Comfortable pedestrian environment is required in town centers and public beaches.

Landscape
- Few people are willing to accept the current landscape. Amendment of regulations and guidance is required in accordance with the situation of locations.

**●Visitors**

Propose of visit
- Most people come for Sightseeing and Relaxation, Marine leisure.

Image of Aqaba
- Many people identify Aqaba as a beach resort with beautiful beach and think the Beach/Sea is the landmark for the city.
- Downtown is the popular destination.

**Trends (External environment)**

**●Smart City Initiatives**
- Urban management and services using digital technology and data
- Promotion of digital transformation
- Agile-type development and implementation practices

**Urban development directions**

**1)Developing high-quality living society for one and all**
- Expansion of residential area
- Creation of attractive living spaces
- Utilization of vacant lots and houses
- Provision of a variety of housing styles
- Provision of good open spaces and infrastructure for vital lifestyle
- Raise the standard of the education and medical services
- Strengthening public transportation and walkability

**2)Developing competitive opportunities to attract new industries and human resources**
- Diversify industry including high value-added industries
- Systematically supply land to accommodate new industrial activities
- Create an attractive environment to attract highly skilled human resources
- Improve existing tourism resources and services (e.g. waterfront areas)
- Increase capacity and improve quality of tourism products

**3)Developing resilience and preserving invaluable natural environment**
- Assumption of disaster risks Risk-based land development
- Preserve the natural environment with less environmental impact
- Create greenery and waterfront spaces

**Urban Management directions**

**1)Analysis based on statistical data**
- Need to accumulate data on population and industry continuously
- Need to establish data acquisition methods using digital technology

**2)Monitor progress against the plan**
- Actual situation of project implementation should be monitored against the plan and reviewed/revised

**3)Ensure consistency of the plans and businesses across sectors**
- Need to ensure consistency among projects conducted separately by each sector

**4)Establish consensus building mechanism**
- Need to identify needs of residents and visitors continuously
- Need to clarify the process (authority) for developing and updating plans and determining priorities (SEA)

**Socio-economics framework**

**Population**
- Target of 545,000 by 2040.

**Industry**

**●Total number of people employed**

Year 2040 168,000

⇒ more jobs need to be created to improve the unemployment rate

**●Economic frame (vs. current)**
- Agriculture: 2.5 times employment
- Mining: 4 to 5 times employment
- Manufacturing and logistics: 2 to 3 times employment
- Commercial: 2 times employment

**Development vision**

***Yalla ! AQABA***

***~Authenticity and Promising Opportunities~***

**Development strategies**

**[QUALITY of LIFE]**
**Full of Smile**
**- From expansion-oriented to value-driven development -**

**[OPPORTUNITY of BUSINESS]**
**Full of Investment Opportunities**
**- From Labor intensive to high value-added tourism, industries and education –**

**[VALUE of ENVIRONMENT]**
**Full of Green and Nature**
**- From gray infrastructure to green Infrastructure –**

**Management strategies**

**[SMART GOVERNANCE]**
**- Efficient Urban Management and Monitoring -**

● Develop data platform/dashboard to obtain, consolidate and organize various data
- Conduct basic surveys on population, industry, land use, etc.
- Establishment of database

● Strengthen cooperation/collaboration mechanism for project implementation
- Inter-organizational collaboration
- Building Consensus

● Establish Periodical Monitoring/Reviewing/Revising System of the M/P
- Update of guidelines
- Review of plans based on evaluation

Source: JICA study team

**Figure 4-14 Process for identifying the development vision and strategy**

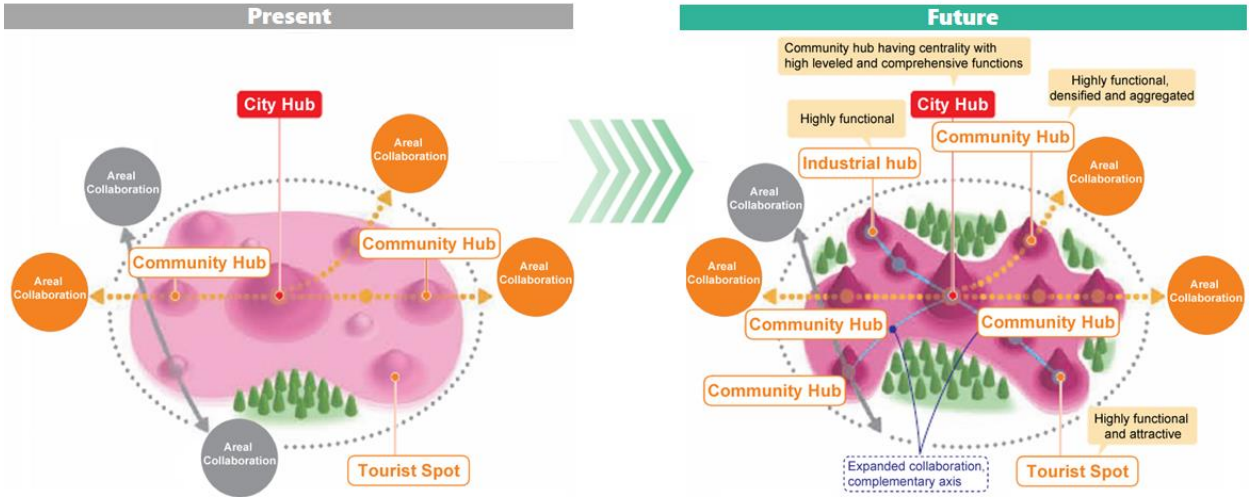
## 4.4 Urban Structure

### (1) Urban Transformation Concept: Compact and Networked City

In Aqaba, urban development has been expanding in an expansive manner against the backdrop of its vast administrative area. However, the actual state of development in the existing urban areas shows that the density of the city is decreasing due to the large number of vacant plots and properties in the central area, while in the suburban areas, unplanned and random development is taking place in a scattered manner, leading to the expansion of low-density urban areas and sprawl development. On the other hand, the existing urban areas are not sufficiently developed to provide a livable environment and public services, and residents have voiced their dissatisfaction. It can be said that Aqaba is "a thinly spread urban area of low quality". Insufficient personnel and financial resources for the maintenance and management of infrastructure and public services have already become an administrative issue, and if the urban area continues to expand, the burden is expected to increase further.

In the future, from the perspectives of both improving urban convenience and attractiveness and increasing management efficiency, it will be necessary to shift the policy from conventional expansion-oriented urban development to intensive urban development, and to work on increasing urban density by prioritizing infill development within existing urban areas and gradually expanding development areas in response to development demand. In addition, it is encouraged to guide and consolidate development to defined areas based on its function and characteristic to create a well-defined urban development.

To this end, the urban transformation concept of ASEZ will be set as "Compact and Networked city". ASEZ aims to promote "compactness" by systematically guiding development to areas of appropriate size for the population and industry, and to enhance the quality and value of urban space by optimizing land use and creating bases where functions are shared. In addition, "networking" will be promoted to connect the bases to activate the movement of people and goods within the ASEZ and to make it function as a single urban system in a coordinated manner.




Source: Translated by JICA study team from "Utsunomiya city 5th comprehensive development plan"

**Figure 4-15 Image of Compact and Networked City**

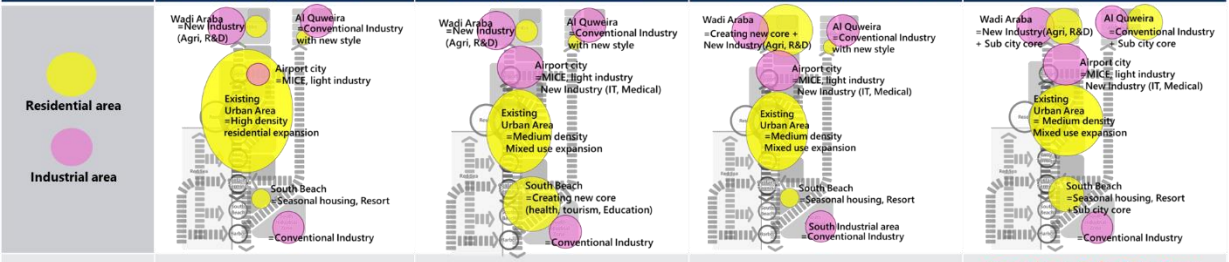
### (2) Development Scenarios

In studying the urban structure in Aqaba, alternative development scenarios were developed and compared. The following four scenarios were initially proposed for the southern beach area.

**Table 4-10 Development Scenarios and Concepts**

| | Scenarios | Concept |
|---|---|---|
| 1 | Strengthening City Center | To continue and concentrate urban expansion around the existing city center, where housing and urban functions are already concentrated, to create a unipolar structure. |
| 2 | 2nd City Center in the South | To create urban area with urban functions in the southern beach area as the second core to support the existing city center, creating a structure with two decentralized centers. |
| 3 | 2nd City Center in Wadi Araba | To create urban area with urban functions in Wadi Araba in the northern part of the city as the second core to support the existing city center, creating a structure with two decentralized urban centers. |
| 4 | Decentralization | To create mid-size urban areas in addition to the existing city center to create a multi-location, decentralized structure. The potential urban areas will be the Southern beach, Wadi Araba, and Quwaira |

Source: JICA study team

| | Strengthening City Center | 2nd City Center in the South | 2nd City Center in Wadi Araba | Decentralization |
|---|---|---|---|---|
| |  | | | |
| Al-Quwaira | Mainly Industry | Mainly Industry | Mainly Industry | Creating Sub City Core (Industry + Residential) |
| Wadi Araba | Mainly Industry | Mainly Industry | 2nd Inland City Center + Industry | Creating Sub City Core (Industry + Residential) |
| Airport adjacent area | Medium density expansion | Mainly Industry | Mainly Industry | Mainly Industry |
| City Center | Infill & High density expansion | Infill & Medium density expansion | Infill & Medium density expansion | Infill & Medium density expansion |
| South Beach | Medium density tourism development (seasonal) | 2nd Coastal City Center+ Mixed use community (Marine Park, Tala Bay) | Medium density tourism development (seasonal) | Creating Sub City Core (Tourism + Residential) |

Source: JICA study team

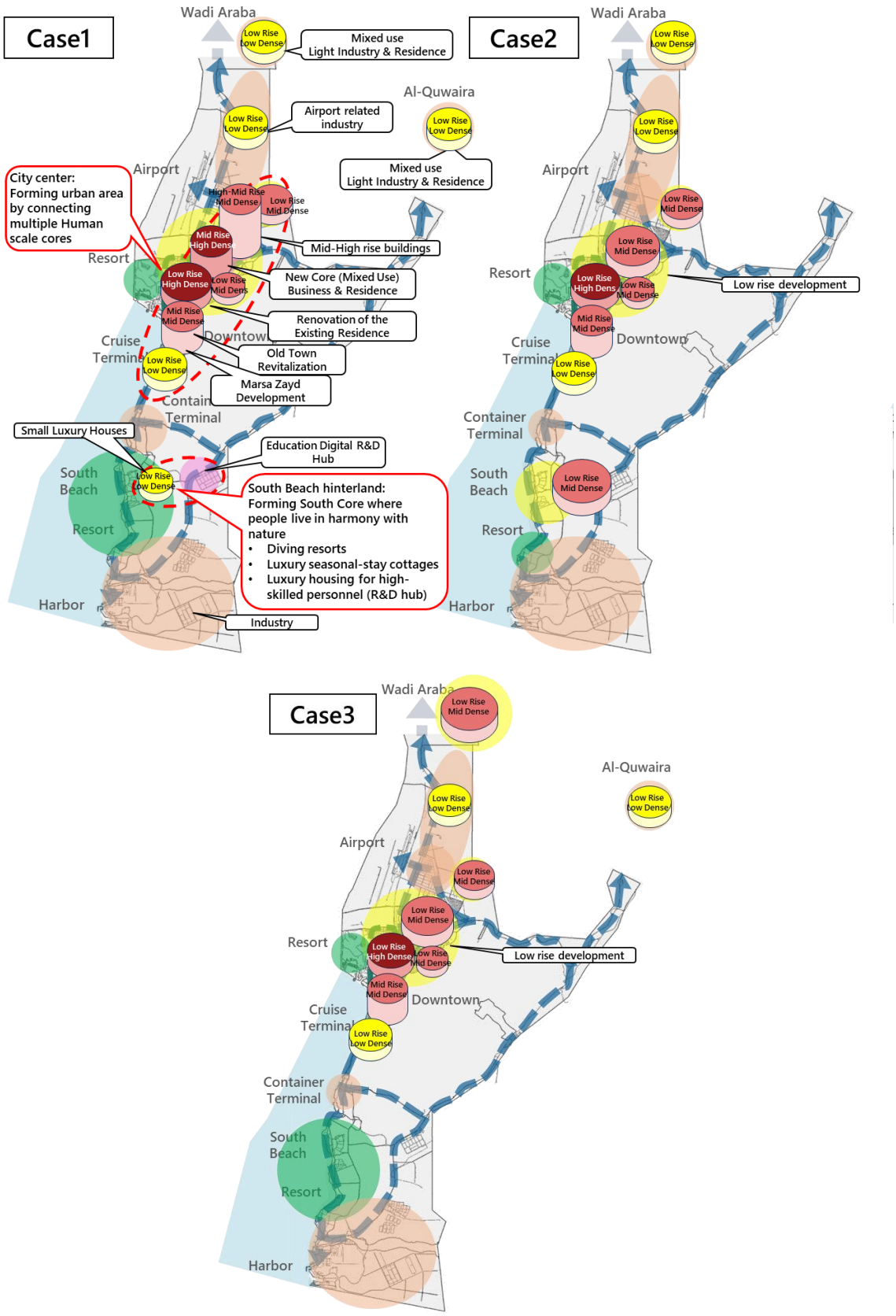
**Figure 4-16 Development Scenarios and image of the development**

After discussions with counterparts, it was agreed that the fourth scenario, Decentralization, was not the direction that should be pursued in Aqaba.

The remaining three scenarios were discussed during stakeholder consultations in the Strategic Environmental Assessment (SEA), and a participant survey was conducted on the most desirable scenario among the proposals. The Pros and Cons of the three scenarios are listed as below. As a result, the number of votes was close among the three proposals, but the second proposal, the 2nd City Center in the South scenario, had the most votes as the most desirable scenario.

**Table 4-11 Pros and Cons of the three scenarios**

| | Scenarios | | Pros | Cons |
|---|---|---|---|---|
| 1 | Strengthening City Center | Economic | ・Compact city development can reduce investment and maintenance costs for infrastructure and public transportation services. | ・Land with high industrial potential around the airport needs to be used for residential purposes.<br>・Does not contribute to the development of surrounding areas, including the southern part of the country where development and investment are stagnant. |
| | | Social | ・The concentration of all services improves convenience, economic scale, and labor and business productivity. | ・Human and traffic congestion are expected due to the concentration of urban services. |
| | | Environment | ・Reduces the risk of pollution due to population concentration in southern marine environmental reserves. | ・The need to cluster residences and other uses in a limited area around the city center will require higher density mid- and high-rise housing, which will have an impact on the landscape. |
| 2 | 2nd City Center in the South | Economic | ・The foundation of the southern area, where some infrastructure development is already underway, can be used for strategic development.<br>・The provision of basic urban services through the establishment of a hub can also induce private development in the southern beaches, where development has not progressed as expected. | ・Valuable coastal area for the Jordanian nation will be used for housing and limit the coastal area that can be used for industry, logistics, etc. in the future.<br>・Transportation infrastructure is needed to connect the two centers, the city center and the south. |
| | | Social | ・The development of an attractive urban area that takes full advantage of the sea, which is one of Aqaba's strengths, will be possible.<br>・Housing, parks, schools, medical facilities, etc. are being built to the south, improving convenience and community development. | — |
| | | Environment | ・It will provide residential areas for the future population without the need to introduce mid- to high-rise housing.<br>・Reducing the concentration of one area will allow for the creation of more spacious residential areas in all areas. | ・Increased risk of pollution due to population concentration in southern marine environmental reserves. |
| 3 | 2nd City Center in Wadi Araba | Economic | ・The proximity to the central city and the continuous flat area compared to the south allows for the development of transportation infrastructure connecting to the central city at a lower cost.<br>・The valuable coastal area will be preserved. | ・Infrastructure is underdeveloped in the area and maintenance costs are enormous.<br>・Development in all areas - central, southern, and northern - will be halfway through, increasing investment and maintenance costs for infrastructure and public transportation services. |
| | | Social | ・New value can be created by creating attractive living environments, such as low-rise, widely spaced residential neighborhoods that take advantage of the large area. | ・Development is likely to be halfway through in all areas - central, southern, and northern - and not enough urban services will be provided in each area. |
| | | Environment | ・Reduces the risk of pollution due to population concentration in southern marine environmental reserves.<br>・It will be possible to provide residential areas for the future population without introducing mid- to high-rise housing.<br>・Reducing the concentration of one area will allow for the creation of more spacious residential areas in all areas. | — |




Source: JICA study team

**Figure 4-17 Development Scenarios and image of the density of development**

Subsequent discussions with counterparts and urban planning experts from the Jordan Engineers Association resulted in the following comments.

- Since land is not limited in Aqaba, there is no necessary to consider high-rise residential buildings, to preserve Aqaba's distinctiveness, aesthetics, and its human scale.
- The lack of urban services in the south is one reason for the stagnation of investment and development in the area. There is a necessity to locate housing and service facilities that would serve as a catalyst. However, the land should be utilized to attract highly skilled workforce rather than the general population, as the land is of high value to Jordan with its limited coastline.
- There is a vision to develop an urban center in Wadi Araba in the north, but it is a long way off because the infrastructure is not yet in place. Since there are many vacant lots in the existing city center, the city should first focus on infill development.
- Considering the linkage with NEOM development in Saudi Arabia, it is preferred to establish a second center in the south. The closest port to NEOM is the port of Aqaba and considering the distance to major cities in Saudi Arabia, human and material exchanges can be expected.

### (3) Preferred Scenario

As a result of the discussion, it was shared that the first priority should be given to infill development in the city center, where there are many vacant lots, and to promoting development in the southern area, where some development is already underway. The decision was made not to expand the city to Wadi Araba in the near future, as it would lead to an increase in infrastructure development and maintenance costs. On the other hand, since the southern area is a valuable land in Jordan with a limited coastline, it was confirmed that the policy is to promote mixed use development that includes not only residential, but also commercial, service, and educational functions, thereby taking advantage of the value of the area.

Hence, this Master Plan for Urban Development will adopt "Scenario 2: Formation of a 2nd City Center in the South" as the preferred scenario for urban development until 2040.

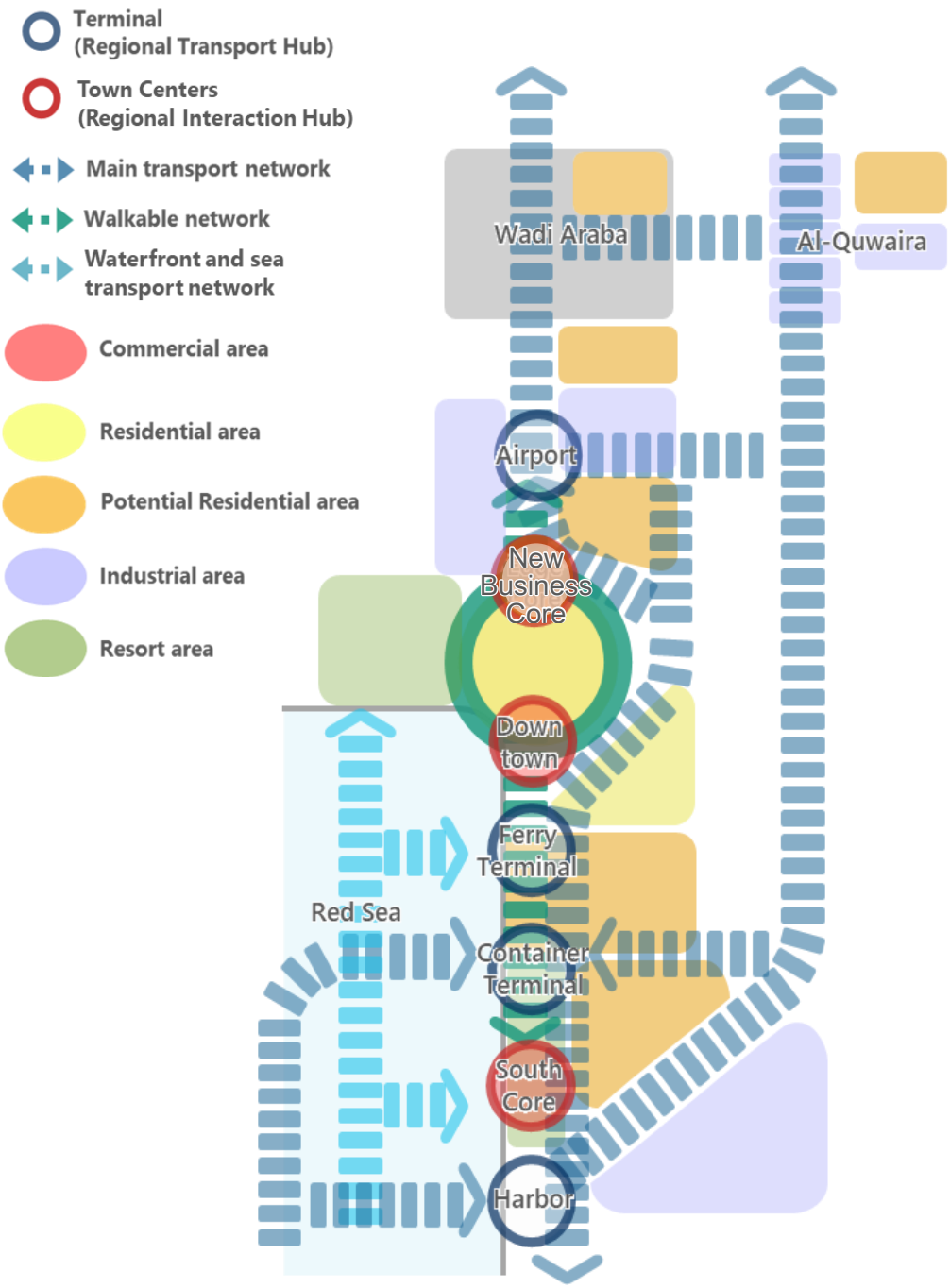
The southern region is arguably the most valuable area in the ASEZ, given its proximity to the only coastline in Jordan, and the creation of a new city hub that takes advantage of its unique features, such as its exceptional natural environment and views, has the potential to attract the diverse population needed to develop Aqaba. In order to attract further investment and highly skilled people to ASEZ, it is necessary to provide a sophisticated and relaxing living environment and services that have not been available in ASEZ in the past, and to maximize the potential of the region by appropriately guiding development throughout the region, including urban design is required.

### (4) Future Urban Structure

In line with the development strategy, ASEZ aims to create an urban structure based on "compact and networked" concept that effectively functions as a single urban system by forming unique urban hubs and strengthening cooperation through transportation axes in order to form an activity space where diverse values are integrated.

#### 1) High-level structure of the city

The high-level structure of the city consists of the following elements.




Source: JICA study team

**Figure 4-18 Proposed Urban Structure of Aqaba**

### 2) Urban structure

#### a) City wide structure

In accordance with the framework of the city, the roles of each base, network, and area are indicated, and the urban structure that the city as a whole should aim for is indicated.

**■HUB**

**Town Centers (Regional Interaction Hubs)**

| | |
|---|---|
| ●Downtown | ・The symbolic center of Aqaba, including the Aqaba Fortress, Revolt Plaza, hotels and shops.<br>・Waterfront space in Al Hafayer (approach to the sea from downtown, Securing views and harmonizing private development). |
| ●New Business Core | ・New business center to be filled with advanced service and industries. |
| ●South Core | ・Function of services for residents and visitors in the South Beach area. |

**Terminals (Regional Transport Hubs)**

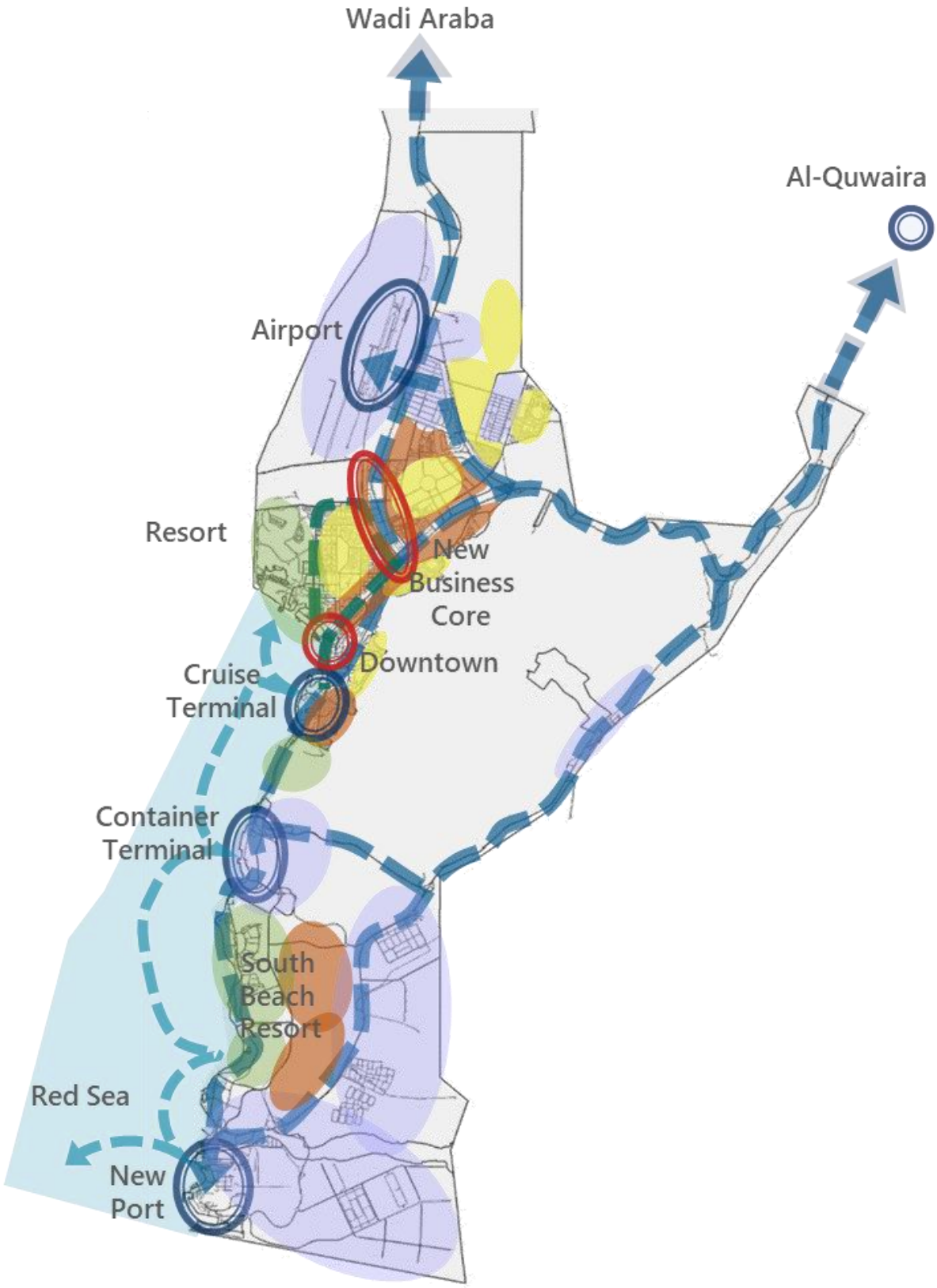
| | |
|---|---|
| ●Airport | ・Gateway from the air where expansion project is underway.<br>・Construction of an international convention center, aircraft museum, etc. |
| ●Cruise terminal | ・Waterfront development to enhance the function and attractiveness of the sea gateway to Aqaba and Jordan.<br>・Marsa Zayed project is underway (development of a complex buildings, hotels, commercial, residential, entertainment and educational districts.). |
| ●Container terminal | ・Development and operation through concession business. Strengthening port functions to increase handling volume and decarbonization is underway. |
| ●New Port | ・Aqaba New Port and port facilities consisting of various industrial terminals. |

**■AREA**

| | |
|---|---|
| Commercial area | ・ Area to enhance commercial and service facilities for consumers.<br>・ Area to enhance hotels, restaurants, and entertainment facilities for visitors.<br>・ Area to guide business facilities to conduct new business activities. |
| Residential area | ・ Providing good housing mainly for families.<br>・ Providing small-scale living services for single workers. |
| Mixed-use Area | ・ Area to attract business establishments and educational institutions, etc. mainly along the roadside of the trunk road network.<br>・ Area to provide residence for high-skilled human resources, etc.<br>・ Area to supply second homes and workcation-friendly housing in resorts. |
| Industrial Areas | ・Area to attract industries around transportation terminals such as airports and ports that take advantage of convenience of transportation and logistics. |
| Resort Area | ・ Area for resort development by private operators and to provide variety of tourism activities. |

**■NETWORK**

| | |
|---|---|
| Main Transportation network | ・ Road and transportation network that will serve as the backbone of transportation between each hubs.<br>・ Wide-area public transportation routes (highway buses, LRT, etc.). |
| Walkable Network | ・Providing comfortable mobility spaces for pedestrians in central areas of Aqaba, such as downtown (Old Town), New Business Core, and resorts (barrier-free, landscape, vegetation, slow mobility). |
| Waterfront and Maritime Networks | ・ Connecting people and goods with the world through maritime network.<br>・ Connecting the waterfront area with each other's attractions (landscape, coastline, pleasure boats). |




Source: JICA Study Team

**Figure 4-19 Urban structure (city-wide)**

### b) Regional structure

The urban structure of the city center and the southern area is shown as focus areas.

To provide efficient urban services and ensure smooth transportation environment, the formation of community hubs and transportation axis will be realized.

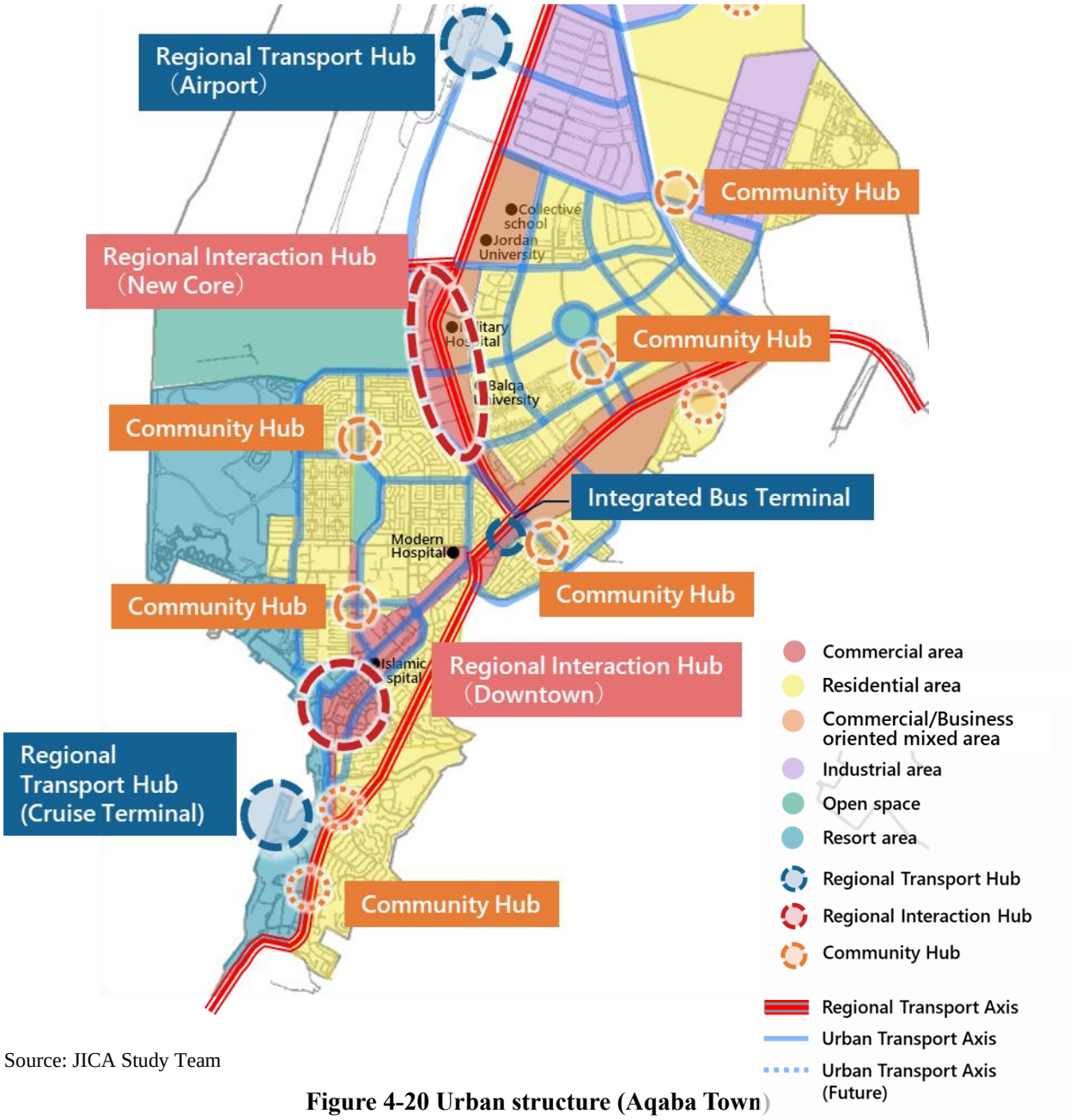
**Table 4-12 Components of the regional urban structure**

| | |
|---|---|
| Hub | In addition to the two types of urban hubs, a community hub should be established to function as a center for daily services. Concentration of services and functions will be promoted.<br>●**Urban hubs**<br>・Regional Interaction Hub (Town Center):<br>Downtown, New Business Core, South Core<br>・Regional Transport Hub (Terminal):<br>Airports, Cruise Terminals, Container Terminals, Ports<br>●**Community hubs**<br>Bases in each community (daily living area) to accumulate urban functions for the local community. |
| Area | ●**Commercial Areas**：Area to provide commercial facilities and offices for daily life services.<br>・Areas that provide regional commercial services for wide area<br>・Areas that provide living services for the local community<br>●**Residential Areas**：Area to provide good housings, living services and living environment.<br>・Low-rise and spacious residential areas<br>・Medium- and high-rise residential areas<br>●**Mixed-use area**：Areas where multiple uses exist in harmony.<br>・Areas where commercial facilities and residences exist in harmony<br>・Areas where offices and residences exist in harmony<br>●**Industrial area**：Area where Industrial function is concentrated.<br>・Areas to guide heavy industry<br>・Areas to guide light industry<br>・Areas to guide logistics and warehouses<br>・Areas to guide the food production industry<br>●**Resort area**：Areas to provide resort services.<br>・Resort development area by private sector<br>・Waterside activity area along the coastline |
| Network | ●**Wide-area Trunk axis(Highways)**<br>Intracity network to connect urban hubs and Intercity network to enhance wide-area connectivity.<br>・Main Transport Network：South Beach Highway, Ports Highway<br>・Waterfront and Maritime Network：Water front area<br>●**Urban Trunk Axis（Primary roads）**<br>Connecting community hubs to enhance connectivity within the city<br>(As a guideline, nets are formed at intervals of 1km)<br>●**Public Transportation Axis**<br>Enhancing connectivity through public transportation to increase mobility in the city<br>●**Walkable Network**<br>Building pedestrian-centered network: New Business core、CBD & Downtown |

Source: JICA study team

**●AQABA Town**

- Community Hubs will be formed inside existing and planned residential areas to provide daily life services. (Commercial, Education, Community centers, Health centers, Middle size parks, etc.)
- Urban Hubs will be set to accumulate larger scale service facilities based on their respective user areas.
- Urban Trunk Axis will be secured to support access to neighborhoods from the Wide-area Trunk Axis.
- Public transportation axis will be organized to connects urban hubs (Regional Interaction Hub, Regional Transport Hub) and Community Hubs.

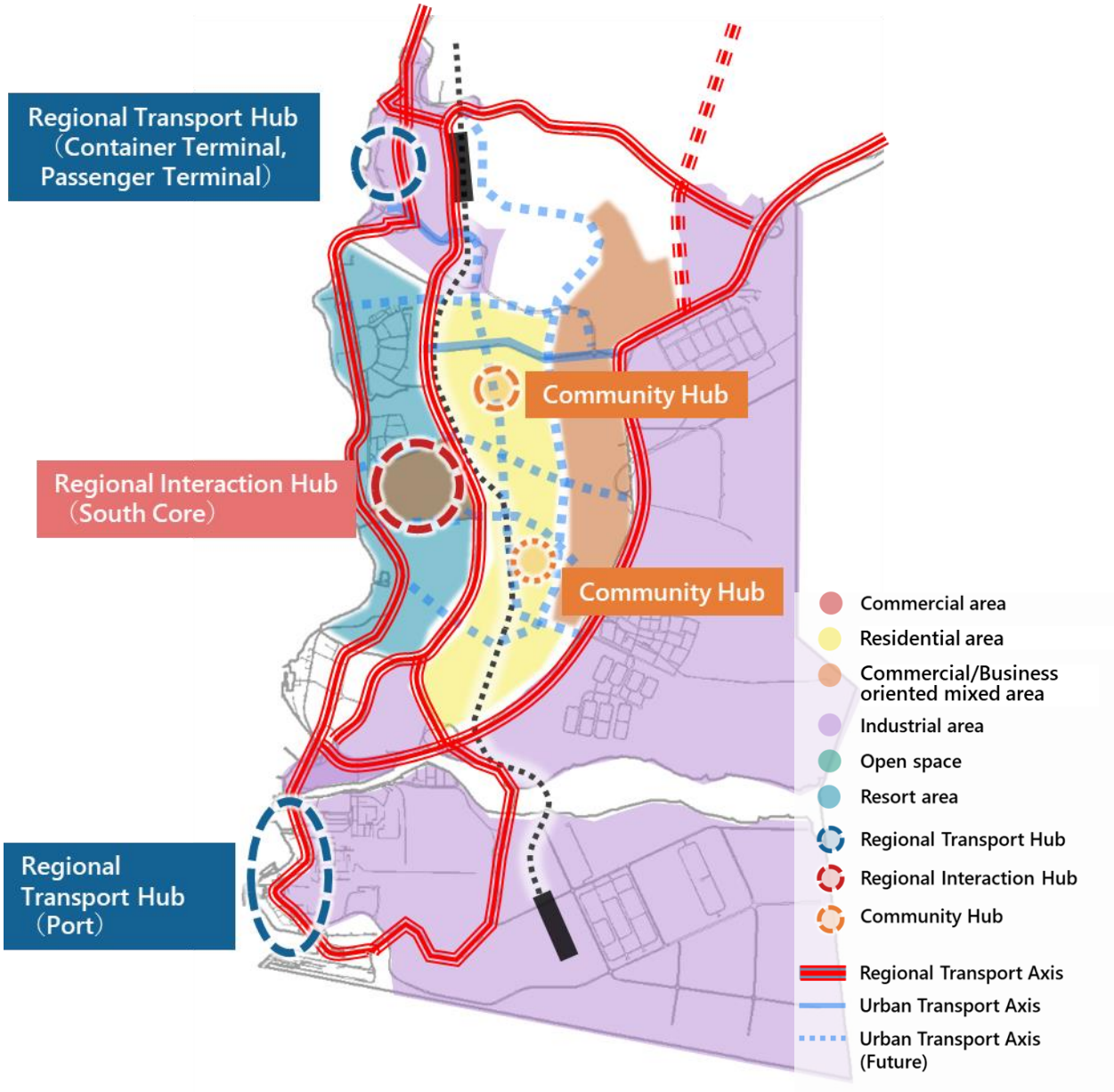



Source: JICA Study Team

**Figure 4-20 Urban structure (Aqaba Town)**

## ●South Area

- Urban hub (South Core) will be formed in a location to play a central role in the southern region.
- Community hubs will be formed to accumulate functions for providing services to residents in anticipation of the future resident population.
- Urban Trunk Axis will be secured to support access to neighborhoods from the Wide-area Trunk Axis.
- Public transportation axis will be organized to connects urban hubs (Regional Interaction Hub, Regional Transport Hub) and Community Hubs.




Source: JICA Study Team

**Figure 4-21 Urban structure (South Area)**

# Chapter 5 Land Use Plan

## 5.1 Land Use Plan Update

### 5.1.1 Land Use Strategies for ASEZ

The table below shows the Land Use Policies to realize the development vision and the three development strategies and urban structure organized in Chapter 4. The land use plan will be updated to realize these policies.

**Table 5-1 Land Use Policies to realize the development vision**

| Development strategies | Land Use Policies |
|---|---|
| **[QUALITY of LIFE]**<br>**Full of Smile**<br>**- From expansion-oriented to value-driven development -** | ・ Provision of residential areas to accommodate diverse lifestyles (singles, families, upper income families, retirees, etc.)<br>・ Allocation of commercial and service areas to enhance convenience of daily life<br>・ Formation of urban spaces where diverse values are integrated through effective mixing of uses (commercial/residential mix, industrial/residential mix)<br>・ Appropriate layout of parks, schools, cultural facilities, etc.<br>・ Improvement of urban density and quality through optimization of area by use |
| **[OPPORTUNITY of BUSINESS]**<br>**Full of Investment Opportunities**<br>**- From Labor intensive to high value-added tourism, industries and education -** | ・ Focus on sustainable land use and phasing to avoid scattered development<br>・ Revitalization of downtown as a bustling center of ASEZ<br>・ Creation of a business environment that attracts new industries<br>・ Promotion of tourism development in the southern area<br>・ Expansion of industrial areas taking advantage of geographical and environmental conditions<br>・ Creation of a comfortable and sophisticated working and living environment that attracts highly skilled human resources from inside and outside Jordan |
| **[VALUE of ENVIRONMENT]**<br>**Full of Green and Nature**<br>**- From gray infrastructure to green Infrastructure -** | ・ Promotion of land use in consideration of climate change and disaster risks<br>・ Creation of green spaces and waterfront areas for residents and visitors to relax and enjoy<br>・ Preservation and appropriate use of nature conservation areas<br>・ Creation of urban structure with high energy and management efficiency for decarbonization |

Source: JICA study team

## 5.1.2 Land Use Plan Review Policy

### (1) Case studies

In reviewing land use plans in ASEZs, we have compiled reference cases to examine the types of land use, permitted uses, and operation of building regulations.

#### 1) Land Use Types and Regulations in Jordan (Regulation No. (1) for the Building Regulations and Organizing Cities and Villages, 2022)

This system is equivalent to the Regulations for Enforcement of the Building Code in Jordan, which stipulate the principle building restrictions (building use, setbacks, maximum height, number of stories, etc.) for each type of land use. The ASEZ is **not** applied in principle because the ASEZ has its own regulations (Regulation on Zoning and Construction Licensing in Aqaba Special Economic Zone, Design Standards, etc.).

The types of land use for which building restrictions are set under the law is: Residential area, Commercial area, Mixed use area, Public buildings, Offices and departments, Industrial area, Agricultural Establishments, and Car parks. In principle, the uses and building restrictions shown in the table below are applied, but with the approval of the board of commissioners and the payment of the necessary fees, the uses and building standards can be relaxed.

Residential areas are divided into four types with different densities (Residencial A to D) depending on the setback and building coverage ratio. Low-density, low-rise residential uses for suburban areas such as green housing/rural housing and agricultural housing are also included. As for the differences between Residencial A to D, there is no mention of differences in the types of uses for which buildings can be constructed, the differences in land size are set in a range, building-to-land ratio are set in a limited range between 39% and 55%, and the height is standardized to a maximum of 17 meters (maximum of four stories) in each case. It is difficult to say that the regulation is guiding residential areas that differ greatly in aspect. In addition, facilities that contribute to local convenience (schools, hospitals, welfare facilities, and small commercial facilities), small businesses, and hotels are also permitted as needed.

There are four types of commercial areas: Central Commercial, Trade Fairs, Commercial Longitudinal (roadside commercial), and Local Commercial, and there is no mention of differences in the types of uses that can be built. Although there is no mention of the different types of uses for what type of buildings can be constructed, it is clear that they are divided into areas that are the commercial center of the city and areas used by neighborhood residents on a daily basis.

Industrial areas are subdivided into Craft areas, Technical industries zones, Light industries zones, Medium industries zones, and Heavy industries zones, according to the type of industry in which they can be built.

The maximum height of buildings in the case of deregulation with the approval of the board of commissioners is also mentioned: 30 m (maximum 8 stories) in the Residential area, 35 m (maximum 8 stories) in the Commercial area, and 50 m (maximum 16 stories) in the Mixed use area.

**Table 5-2 Overview of Land Use Types and Main Uses in Jordan**

| Type of Land use | | Land uses allowed |
|---|---|---|
| Residential areas | Residence A | ・ Housing<br>・ Permissible of following use in accordance with instructions.<br>➢ Hotels, hostels, hotel suites<br>➢ Private hospitals<br>➢ Private schools, education<br>➢ Special care centers, homes for the elderly<br>➢ Local services to be on the ground floor of the building (pharmacies, water stations, flower shops, general medicine clinics, stores selling freezers and groceries, vegetable and fruit stores, home maintenance services, kindergartens and nurseries)<br>➢ Small businesses (business from home, translation, printing, fashion design, design, marketing, advertising, architectural drawing, studies, consulting, and financial, administrative, technical and information services work, jewelry, ceramic decoration, mat weaving, carpets, and jammed manufacturing) |
| | Residence B | |
| | Residence C | |
| | Residence D | |
| | Green/Rural housing | |
| | Agricultural housing | |
| Commercial areas | Central commercial | ・ Housing<br>・ Commercial purposes and restaurants<br>・ Public services<br>・ Places of worship<br>・ Offices<br>・ Hotels<br>・ Exhibitions<br>・ Oil change stations, car washes<br>・ Warehouses |
| | Trade fairs | |
| | Commercial longitudinal | |
| | Local commercial | |
| Mixed Use areas | | ・ Housing<br>・ Commercial purposes<br>・ Offices<br>・ Stadiums, exhibitions, conferences, showrooms<br>・ Renewable energy projects<br>・ Any other uses that are indicated on the detailed/structural plans |
| Public buildings | | (No definitions) |
| Offices and departments | | (No definitions) |
| Industrial areas | Craft areas | ・ Tailoring, craft operator, handicrafts and works, painting, bag issues<br>・ Car painting and electrics, maintenance<br>・ Maintenance of electrical equipment<br>・ Equipment and equipment rental<br>・ Factories for canning or preserving fruits and vegetables<br>・ Factories of pottery<br>・ Factories of brick and tile<br>・ Any industry that falls under the provisions mentioned in this paragraph. |
| | Technical industries zones | ・ Technical industries of all kinds<br>・ Warehouses and storage of products related to technical industry and wholesale<br>・ Research and vocational training centers<br>・ Planning and development operations centers<br>・ Exhibition and conference centers and showrooms<br>・ Any industry that falls under the provisions mentioned in this paragraph. |
| | Light industries zones | ・ Food industries<br>・ Pharmaceutical industries<br>・ Glass industries<br>・ Furniture Industries<br>・ Manufacture of fabrics, clothing and textiles<br>・ Manufacture and assembly of electrical tools, devices and equipment<br>・ Paper mills<br>・ Storage warehouses<br>・ Any industry that falls under the provisions mentioned in this paragraph. |
| | Medium industries zones | ・ Any industry allowed in “Technical industries zones” and “Light industries zones”, except for the food industries, pharmaceutical industries, and paper mills<br>・ Plastic industries<br>・ Textile industries<br>・ Cement industries<br>・ Iron industries<br>・ Stone and marble saws<br>・ Manufacture and assembly of tools and devices<br>・ Repair and maintenance of fittings and painting of trucks<br>・ Waste transfer stations |
| | Heavy industries zones | ・ The use of all types of industries is permitted except for the food industries, pharmaceutical industries, and paper mills |
| Agricultural Establishments | | ・ Sheds of animals<br>・ Olive presses |
| Car Parks | | (No definitions) |

Source：Regulation No. (1) for the Building Regulations and Organizing Cities and Villages, 2022 より調査団作成

**Table 5-3 Overview of building control in Jordan**

| Type of Land use | | Minimum Set back(m) | | | Maximum Building Coverage Ratio (%) | Maximum Number of Floors | Maximum Height (m) | Minimum Green space Coverage Ratio (%) |
|---|---|---|---|---|---|---|---|---|
| | | Front | Lateral | Rear | | | | |
| Residential areas | Residence A | 5 | 4 | 5 | 39 | 4 | 17 | 15 |
| | Residence B | 4 | 3 | 4 | 45 | 4 | 17 | 15 |
| | Residence C | 3 | 2.5 | 3 | 51 | 4 | 17 | 15 |
| | Residence D | 3 | 2.5 | 2.5 | 55 | 4 | 17 | - |
| | Green/Rural housing | 8 | 6 | 6 | 27 | 2 +Roof floor | 9 +Roof floor | 10 |
| | Agricultural housing | 10 | 6 | 10 | 15 | 2 +Roof floor | 9 +Roof floor | - |
| Commercial areas | Central commercial | 10 | 6 | 6 | 50 | 4 | 20 | 15 |
| | Trade fairs | 10 | 6 | 6 | 60 | 4 | 20 | 15 |
| | Commercial longitudinal | 4 | 4 | 4 | 70 | 4 | 20 | 15 |
| | Local commercial | *According to the Provision of the vacant housing | | | | | 20 | 15 |
| Mixed Use areas | | 10 | 6 | 6 | 50 | 8 | 30 | 15 |
| Public buildings | | 10 | 6 | 6 | 50 | 8 | 30 | 15 |
| Offices and departments | | 6 | 5 | 6 | 50 | 8 | 30 | 15 |
| Industrial areas | Craft areas | 10 | - | - | 50 | 2 | 12 | 20 |
| | Technical industries zones | 6 | 5 | - | 50 | 4 | 18 | 20 |
| | Light industries zones | 12 | 5 | - | 50 | 4 | 18 | 20 |
| | Medium industries zones | 12 | 10 | - | 50 | 4 | 18 | 20 |
| | Heavy industries zones | 15 | 10 | - | 50 | 4 | 18 | 20 |
| Agricultural Establishments | | 15 | 15 | - | 10 | - | 12 | 20 |

[Tall Buildings: Tall buildings may be allowed in accordance with the following terms and condition]

| Type of Land use | Minimum Set back(m) | | | Maximum Building Coverage Ratio (%) | Maximum Number of Floors | Maximum Height (m) | Minimum Green space Coverage Ratio (%) |
|---|---|---|---|---|---|---|---|
| | Front | Lateral | Rear | | | | |
| Residential areas | 8 | 10 | 10 | 35 | 8 | 30 | 20 |
| Commercial areas | 8 | 10 | 10 | 50 | 8 | 35 | 20 |
| Mixed Use areas | 15 | 12 | 12 | 50 | 16 | 50 | 15 |

Source：Regulation No. (1) for the Building Regulations and Organizing Cities and Villages, 2022 より調査団作成

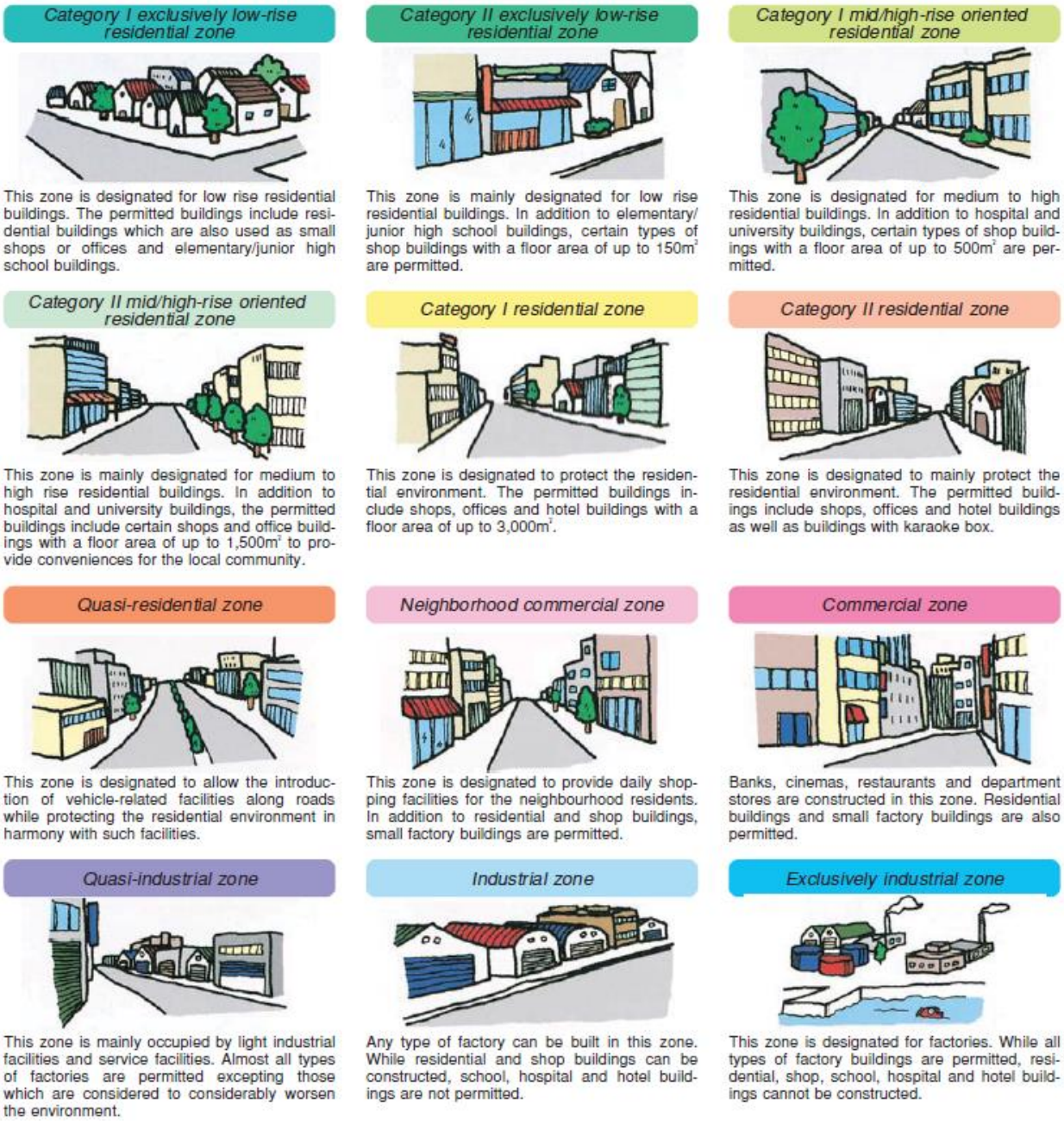
### 2) Land Use Types and Regulations in Japan

In Japan, thirteen categories of Land Use Zones provide a pattern for land-use zoning in each type of urban area. These can be generally categorized into residential, commercial, and industrial uses. Each Land Use Zone has specifications concerning the uses of buildings which can be constructed in the zone and the regulation controls the volume and height of buildings under provisions of the Building Standard Law. These regulations are designed to prevent a mixture of buildings used for different purposes in one area, and to ensure the suitable environment for the specified type of land use. A summary of the 12 types of uses, excluding the less informative rural residential area, is shown in the figure below.

As for the floor-area ratio and building-to-land ratio, each municipality sets its own standards from among a wide range of options for each use, according to the characteristics of the area and the type of town it wants to create and guides the location of buildings. The building-to-land ratio ranges from 30 to 60% in residential zones, which is a wider range than the Jordanian standard. The maximum height limit is 10m or 12m in Category 1 Exclusive low-rise residential area and Category 2 Exclusive low-rise residential area. The characteristic of Japan's zoning districts is that they are characterized by a purely residential use.

The characteristic feature of zoning in Japan is that zoning districts are subdivided into areas for purity of use and areas for a certain mix of uses, allowing a variety of urban development

in a gradational manner, thereby promoting the integration of functions within the city and enhancing convenience. It also manages to ensure that development in each area is properly controlled in coordination with the Building Standards Law and other regulations.




Source：Introduction of Urban Land Use Planning System in Japan, Ministry of Land, Infrastructure, Transport and Tourism, Japan

**Figure 5-1 Types and Development Image of Zoning in Japan**

**Table 5-4 Use regulations in each zoning district**

can be built　　usually cannot be built

| Examples of buildings | Category I exclusively low-rise residential zone | Category II exclusively low-rise residential zone | Category I mid/high-rise oriented residential zone | Category II mid/high-rise oriented residential zone | Category I residential zone | Category II residential zone | Quasi-residential zone |
|---|---|---|---|---|---|---|---|
| Houses, Houses with other small scale function (store, office, etc.) | | | | | | | |
| Kindergartens, Schools (Elementary, Junior High, Senior High) | | | | | | | |
| Shrines, Temples, Churches, Clinics | | | | | | | |
| Hospitals, Universities | | | | | | | |
| Stores (mainly selling dairy commodities)/Restaurants with floor space of 150m² max. on the first or second floor (excluding※) | | | | | | | |
| Stores/Restaurants with floor space of 500m² max. on the first or second floor (excluding※) | | | | | | | |
| Stores/Restaurants not specified above (excluding※) | | | | A | B | | |
| Offices, etc. not specified above | | | | A | B | | |
| Hotels,Inns | | | | | B | | |
| Karaoke boxes (excluding※) | | | | | | | |
| Theaters, Movie theaters (excluding※) | | | | | | | C |
| ※Theaters, Movie theaters, Stores, Restaurants, Amusement facilities and so on, with more than 10,000m² of floor area | | | | | | | |
| Bathhouses with private rooms | | | | | | | |
| Independent garage with floor space of 300m² max. on the first or second floor | | | | | | | |
| Warehouse of warehousing company, Independent garage of other types than specified above | | | | | | | |
| Auto repair shop | | | | | E | E | F |
| Factory with some possibility of danger or environmental degradation | | | | | | | |
| Factory with strong possibility of danger or environmental degradation | | | | | | | |

| Examples of buildings | Neighborhood commercial zone | Commercial zone | Quasi-industrial zone | Industrial zone | Exclusively industrial zone | Areas with no land-use zone designation (Urbanization Control Areas are excluded) |
|---|---|---|---|---|---|---|
| Houses, Houses with other small scale function (store, office, etc.) | | | | | | |
| Kindergartens, Schools (Elementary, Junior High, Senior High) | | | | | | |
| Shrines, Temples, Churches, Clinics | | | | | | |
| Hospitals, Universities | | | | | | |
| Stores (mainly selling dairy commodities)/Restaurants with floor space of 150m² max. on the first or second floor (excluding※) | | | | | D | |
| Stores/Restaurants with floor space of 500m² max. on the first or second floor (excluding※) | | | | | D | |
| Stores/Restaurants not specified above (excluding※) | | | | | | |
| Offices, etc. not specified above | | | | | | |
| Hotels,Inns | | | | | | |
| Karaoke boxes (excluding※) | | | | | | |
| Theaters, Movie theaters (excluding※) | | | | | | |
| ※Theaters, Movie theaters, Stores, Restaurants, Amusement facilities and so on, with more than 10,000m² of floor area | | | | | | |
| Bathhouses with private rooms | | | | | | |
| Independent garage with floor space of 300m² max. on the first or second floor | | | | | | |
| Warehouse of warehousing company, Independent garage of other types than specified above | | | | | | |
| Auto repair shop | G | G | | | | |
| Factory with some possibility of danger or environmental degradation | | | | | | |
| Factory with strong possibility of danger or environmental degradation | | | | | | |

Note A : Must not be built on the third floor or higher. Must not exceed a floor area of 1,500m².
B : Must not exceed a floor area of 3,000m².
C : Audience seating floor area must not exceed 200m².
D : Stores and restaurants must not be built
E : Floor area must not exceed 50m².
F : Floor area must not exceed 150m².
G : Floor area must not exceed 300m².

Source：Introduction of Urban Land Use Planning System in Japan, Ministry of Land, Infrastructure, Transport and Tourism, Japan

**Table 5-5 Overview of Land Use Types and Main Uses**

| Category of Land Use Zone | Maximum floor-area ratios (%) | Maximum building coverage ratios (%) |
|---|---|---|
| *Category I exclusively low-rise residential zone* | 50 60 80 100 150 200 | 30 40 50 60 |
| *Category II exclusively low-rise residential zone* | 50 60 80 100 150 200 | 30 40 50 60 |
| *Category I mid/high-rise oriented residential zone* | 100 150 200 300 400 500 | 30 40 50 60 |
| *Category II mid/high-rise oriented residential zone* | 100 150 200 300 400 500 | 30 40 50 60 |
| *Category I residential zone* | 100 150 200 300 400 500 | 50 60 80 |
| *Category II residential zone* | 100 150 200 300 400 500 | 50 60 80 |
| *Quasi-residential zone* | 100 150 200 300 400 500 | 50 60 80 |
| *Neighborhood commercial zone* | 100 150 200 300 400 500 | 60 80 |
| *Commercial zone* | 200 300 400 500 600 700 800 900 1000 1100 1200 1300 | 80 |
| *Quasi-industrial zone* | 100 150 200 300 400 500 | 50 60 80 |
| *Industrial zone* | 100 150 200 300 400 | 50 60 |
| *Exclusively industrial zone* | 100 150 200 300 400 | 30 40 50 60 |

Source：Introduction of Urban Land Use Planning System in Japan, Ministry of Land, Infrastructure, Transport and Tourism, Japan

## (2) Review Policy

As shown in Chapter 3, the current ASEZ land use plan has 17 different uses. As described in Chapter 2, the actual building standards for land use are custom-made for each district according to the Design Standards established by ASEZ, while in principle using the uses specified in the land use plan, and the regulations (numerical standards) are subdivided on a lot-by-lot basis. ASEZA recognizes the need for mixed-use and allocates land uses as appropriate to make the neighborhoods pleasant and well-served in some area, but it also acknowledges that the plots are still limited. While the purity and orderly streetscape is maintained by preventing the mixing of uses in each area as much as possible, the diversity and convenience of the area are reduced.

In this Master Plan, based on the current status of land use shown in Chapter 3 and the land use policies and examples shown in the previous section (Jordan, Japan), land use applications are reviewed from the following perspectives. While maintaining areas that maintain the high purity of land use that has been formed in ASEZ so far, such as low-rise residential areas, the plan aims to create a more attractive urban space through the integration of diverse values by enabling the proximity of business and residential areas that improve living convenience and ease of working.

### 1) Strategy 1 [QUALITY of LIFE] Full of Smile (From expansion-oriented to value-driven development)

#### a) Provision of residential areas to accommodate diverse lifestyles

Current residential zone regulations specify the number of floors for residences to be up to 3 floors, and up to 5 floors in limited areas, and in principle, high-rise residences are not permitted. In addition, many residential areas are high-density residential areas, as most residential areas are built with the maximum volume of housing that can be built due to the size of the site and restrictions on setbacks, building coverage ratio, and other factors.

To realize housing styles that allow for a variety of lifestyles, residential uses should be subdivided to create diversity in the size of lots, building height, and density allowed in each area.

**b) Allocation of commercial and service areas to enhance convenience of daily life**

In addition to areas that attract advanced commercial functions such as urban centers, commercial uses that allow convenient facilities for daily living should be provided in regional centers adjacent to residential areas and along major arterial roads to enhance the convenience of residential areas and realize a walkable city, especially in the new development areas.

**c) Formation of urban spaces where diverse values are integrated through effective mixing of uses**

In addition to the current high purity of land uses, the objective is to improve convenience and liveliness through mixture of land uses. In order to prevent disorderly mixing of land uses, the mixed-use area will be subdivided and change to other uses according to the types and image of the uses to be guided in the area.

In particular, based on the current land use situation and the current lack of progress in mixed-use land development along arterial roads, mixed-use for residential/commercial and mixed-use for residential/business shall be established.

**d) Appropriate layout of parks, schools, cultural facilities, etc.**

To raise awareness of the importance of open space within the ASEZ, parks, green spaces and public beaches should be identified as Open Space uses for recreational purposes.

Since there is little need to establish areas for administrative facilities only as a separate use, it should be eliminated as a land use type and allowed to be located for other uses.

**e) Improvement of urban density and quality through optimization of area by use**

In setting residential, commercial, and other uses, population and industrial frameworks should be considered, and appropriate size, layout, and allowable density (building coverage ratio and floor area ratio) should be set according to new lifestyles (residential style) and new commercial and service types to improve the density and quality of the urban area by improving the low underutilized land in town.

**2) Strategy 2 [OPPORTUNITY of BUSINESS] Full of Investment Opportunities (From labor intensive to high value-added tourism, industries and education)**

**a) Revitalization of downtown as a bustling center of ASEZ**

Downtown, as the bustling center of ASEZ, will provide residents and visitors with a variety of shopping, dining, lodging, entertainment, cultural services, etc. The renewal and renovation of commercial and service facilities, etc. will be promoted in conjunction with the development of a walkable transportation environment.

**b) Creation of a business environment that attracts new industries**

Based on the future population and industry framework, induce higher-order and mixed-use land use in harmony with the surrounding area as an area to expand commercial and business functions through the concentration of new industries in the ASEZ.

**c) Promotion of tourism development in the southern area**

Concerning the South Beach area, the land use near the beach and in the hinterland will be revised, assuming that a certain number of residents will live in the area in the future.

Commercial land uses that provide daily living services would be positioned.

In the area to the rear, land uses that allow for cutting-edge industries and education should be positioned, taking into consideration the presence of existing universities and media hub.

**d) Expansion of industrial areas taking advantage of geographical and environmental conditions**

Given the potential future shortage of heavy industrial areas in proximity to the port in the southern industrial region, it is essential to prioritize the proximity to the port and sea for relevant industries. As a general rule, industries not requiring such proximity will not be permitted to establish themselves in this area. To prevent sprawling developments that decrease the convenience and efficiency of land use within the area, including adjacent light industrial zones, a phased development approach needs to be implemented.

As an alternative to the southern industrial region, the Al Quwaira area will be designated for industrial uses that do not necessitate proximity to the port or sea. This will guide the development of such industries to this new area.

**e) Creation of a comfortable and sophisticated working and living environment that attracts highly skilled human resources from inside and outside Jordan**

The city will provide housing and commercial/industrial facilities that meet the diverse needs of the highly skilled human resources that it hopes to attract in the future, including qualitative improvement of the existing urban areas. To this end, effective location of industries and development of residential areas that provide living space for their employees will be carried out in accordance with the geographical and environmental conditions of each area.

**3) Strategy 3 [VALUE of ENVIRONMENT] Full of Green and Nature (From gray infrastructure to green Infrastructure)**

**a) Promotion of land use in consideration of climate change and disaster risks**

In establishing land use, based on disaster and flood risks (detailed in Chapter 3), measures such as risk reduction measures for high-risk areas and restrictions on residential use should be implemented. ASEZA must prepare and adopt detailed master plan and mitigation measures for specific area before starting any development in it.

Also, land to support green energy supply and green growth should be secured.

**b) Creation of green and waterfront spaces for residents and visitors to relax**

Green areas and waterfront areas (reservoirs) should be appropriately set up as buffer zones between residential areas and other uses and along trunk roads, and properly maintained, managed, and utilized as landscaped areas and places for relaxation and recreation. In the event of flooding, these green spaces and reservoirs should also function as flood buffer zones.

**c) Preservation and appropriate use of nature conservation areas**

Areas with irreplaceable natural resources should be preserved as Nature Reserve or Protected Area.

Buffer, canal, and wildness reserve areas that are not designated as nature reserves shall be designated as Urban Control Areas(buffer).

**d) Creation of urban structure with high energy and management efficiency for**

**decarbonization**

Infill and compact development should be promoted to encompass enhanced energy efficiency alongside advantages such as efficient transportation, optimized resource usage, and preservation of natural habitats through effective land use and infrastructure planning, which will contribute to decarbonized city by high energy and management efficiency.

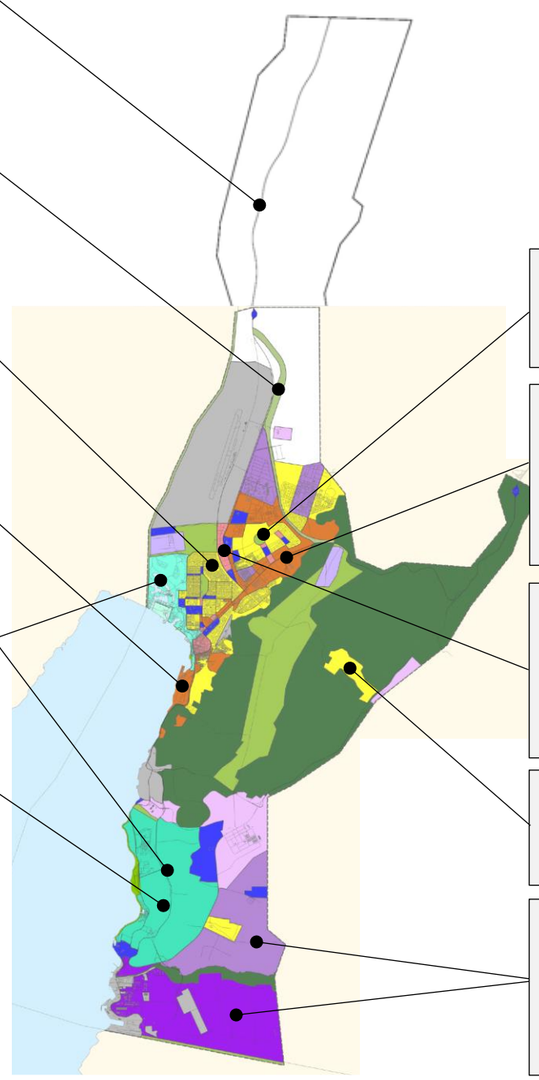
Area unnecessary for short term development but has potential for future development should be set aside as development reserves, and gradual expansion should be made appropriately according to the future development frame and phasing to achieve environmental benefits.

**Table 5-6 Perspectives on Review of Uses**

| Land use type | Perspectives |
|---|---|
| Residential | Current residential zone regulations specify the number of floors for residences to be up to four floors (including roof floors), and up to five floors in limited areas, and as a rule, high-rise residences are not permitted. In addition, many residential areas are high-density residential areas, as most residential areas are built with the maximum volume of housing that can be built due to the size of the site and restrictions on setbacks, building-to-land ratio, and other factors.<br>To realize housing styles that allow for a variety of lifestyles, residential uses should be subdivided to create diversity in site size, building height, and density. |
| Retail / Commercial | In addition to areas that attract advanced commercial functions such as urban centers, commercial uses that allow convenient living facilities will be established in regional centers near residential areas and along major arterial roads (some on the service roads parallel to arterial roads) in order to increase the convenience of residential areas and realize a city where people can walk and live. |
| Mixed Use | In addition to the current high purity of uses, the project will be operated to improve convenience and liveliness through a mixture of uses.<br>In order to prevent disorderly mixing of uses, subdivide uses according to the types of uses to be guided and the image of mixing, and change to other uses. |
| Government/ Community Services / Institutional | Since there is little need to establish an area with only administrative facilities as an independent use, it should be eliminated as a land use type and allowed to be located for other uses. |
| Resort Tourism | Considering the characteristics of Aqaba as a tourist resort area, a separate use shall be established. However, since there is no difference in the types of uses allowed, they should be consolidated into one as the same resort-type use. |
| Urban Tourism | |
| Storage | Consolidate the warehouse-only area into Light Industrial, as there is little need to establish it as a separate use. |
| Light Industrial | No change, as there is no problem with the current use. |
| Heavy Industrial | No change, as there is no problem with the current use. |
| Utilities | Since there is little need to establish the area as a separate use, eliminate it as a land use type and allow it to be located for other uses. |
| Airport/Sea Port/ Railway Yard | No change, as there are no problems with the current use. |
| Special Use | No change because there is no problem with the existing use. |
| Public Beach | Re-organize uses according to purpose since they are similar uses.<br>・ To raise awareness of the importance of open space within the ASEZ, parks, green space, and public beaches should be positioned as Open Space uses for recreational purposes.<br>・ The areas of Buffer, Canal, and Wildness reserve that are not designated as nature conservation areas will be designated as Urban Control Areas.<br>・ Wildness reserve should be designated as Nature Reserve, Protected Area, etc. |
| Recreational / Open Space / Buffer | |
| Canal | |
| Wildness Reserve | |
| Development Reserve | No change will be made because there is no problem with the current use. It will be necessary to continue to set the area appropriately according to the development frame in the future. |

Source: JICA study team

The following are recommendations given to the current land use plan. The updated plan will be proposed based in these directions under continuous discussion with ASEZA/ADC.



**Wadi Araba Area**
- West area for **light industry(special use)** to accept green growth industry.
- Set Hazardous areas for reserves.
- East area for Future development reserve.

**Airport Adjacent Area**
- West area and roadside for **light industry.**
- Set Hazardous areas for reserves.
- East area for **Future residential reserve**.

**Existing Residential Area**
- Add **community commercial** in existing residential areas to provide commercial and lifestyle services near walking distance.
- Add Parks in residential neighborhoods.

**Marsa Zayed Development Area**
- Consider Buffer land use to align with the private development.

**Resort Area**
- Combine two land use types into one.

**South Beach Area**
- Classify different land use for area near the beach and the hinterland.
- Set land use in the hinterland area to accept **commercial** and **mixed use** to provide living services for residents in the future.

**Government/Community Services/ Institutional**
- To be reclassified into commercial and other land use categories according to the needs.

**Residential Expansion Area**
- Diversify residential land use to realize different housing styles.

**Mixed Use Area**
- Clarify the purpose of the land use and reclassify the land use.

(e.g.) Commercial (store/office) + Residential, Business + Residential

**Retail Commercial**
- Induce land use to accept higher-order and complex development in harmony with the surrounding area to accept commercial and business functions as a new business area.

**Back road**
- Reconsider the land use as light industry for **logistic/storage and Tourism**.

**South Hinterland Area**
**South Industrial Area**
- Classify the use for residential and industry.
- To control sprawl development, carefully select the use and set phased development.

**Al-Quwaira Area**
- Set **industrial land use** to serve as a complementary to the South Industrial Area.
- To control sprawl development, set development reserve and Phase development.

**Wadi Rum Area**
- Identify reserve area and development areas to preserve the unique nature and landscape.

Roads
Buildings as of 2021
Land Use
Residential
Retail /Commercial
Mixed Use
Government/ Community Services/ Insititutional
Public Beach
Recreational/Open Space/Buffer
Canal
Resort Tourism
Urban Tourism
Special Use
Heavy Industrial
Light Industrial
Utilities
Storage
Airport/Sea Port/ Railway Yard
Wilderness Reserve
Development Reserve
SAU_Country

Source: JICA study team

**Figure 5-2 Recommendation for the Land Use Plan update by area**

### (3) Reorganization of Land Use Types

The land use types and outlines applicable to the new land use plan shall be as follows

**Table 5-7 Newly applied land use types and images**

| Current type | New land use type | Development images |
|---|---|---|
| Residential | Low-rise residential (Residential with special regulation) | This zone is designated for low rise residential buildings with special regulations (villas, etc.). The permitted buildings include residential buildings (up to 11m height) which can also be used as small shops or offices with a floor area of up to 50m2 and some community service facilities to provide conveniences for the neighborhood. |
| | Mid-rise residential | This zone is mainly designated for medium rise residential buildings (up to 21m height). In addition to hospital and university buildings, the permitted use includes shops and office buildings with a floor area of up to 1,500m2 to provide conveniences for the local community. |
| | High-rise residential | This zone is mainly designated for medium to high rise residential buildings. The permitted buildings include shops, offices and hotel buildings with a floor area of up to 1,500m2. The maximum height of the building shall be 27 m according to the rules of ASEZA. |
| Retail / Commercial | Community commercial | This zone is designated to provide daily shopping facilities, offices and sports facilities with a floor area of up to 3,000m2 for the neighborhood. In addition to all kinds of residential and community service facilities, warehouses are permitted. |
| | Commercial | This zone is designated to provide large size commercial and service facilities like commercial complex, theaters, hotels, restaurants. In addition to all kinds of service facilities, warehouses are permitted. (Except factories) |
| Mixed Use | Commercial Oriented Mixed use | This zone is designated as a mixed-use area to enhance integrated development of residential and commercial to allow the living environment in harmony with commercial, entertainment and service facilities. |
| | Business Oriented Mixed use | This zone is designated as a mixed-use area to allow the living environment in harmony with business and educational facilities. |
| Resort Tourism<br>Urban Tourism | Tourism | This zone is mainly designated for tourism related and service facilities. All types of residential, hotel, commercial, entertainment facilities are permitted while large size offices, hospitals and schools are not allowed. |
| Storage<br>Light Industrial | Light Industrial | This zone is mainly designated for light industrial and service facilities. Almost all types of factories are permitted excepting those which are considered hazardous or have possibility to worsen the environment. (Light Industrial area in Wadi Araba is designated for special use only for green growth industry) |
| Heavy Industrial | Heavy Industrial | This zone is designated for factories. While all types of factory buildings are permitted, residential and most of the commercial and service facilities cannot be constructed. |
| Airport/Sea Port/ Railway Yard | Airport/Sea Port/ Railway Yard | This zone is designated for large transportation and logistics facilities for future expansion. |
| Special Use | Special Use | This zone is designated for special use. (Royal Palace) |
| Public Beach<br>Recreational / Open Space / Buffer | Recreation / Open Space / Services | This zone is designated for parks, public beaches and open spaces to enhance recreation of residents and visitors. |
| Canal | Urban Control Area (Buffer) | This zone is designated for buffers, canals, wadis and mountains where urban development is not promoted. |
| Wildness Reserve | Wildness reserve | This zone is a protected area to avoid development. |

| | | |
|---|---|---|
| Development Reserve | Development Reserve | This zone is reserved for future urban expansion. |
| Government/Community service/Institution | (Obsolete) | Any facilities related to Government/ Community Services / Institutional/ Utilities can be located in any type of land use under certain instruction. |
| Utilities | | |

Source: JICA study team

The following table shows the images of buildings that are allowed or recommended for each land use.

In ASEZA, building regulations for the actual construction of buildings are defined in detail in the Design Standards, and are not specified here in detail. Based on this policy, it is conceivable that regulations may be established in the Design Guideline or other guidelines as necessary.

**Table 5-8 Permittable use by land use types and images**

◎ Recommended
○ Buildable
△ Limited in scale
× Cannot be built

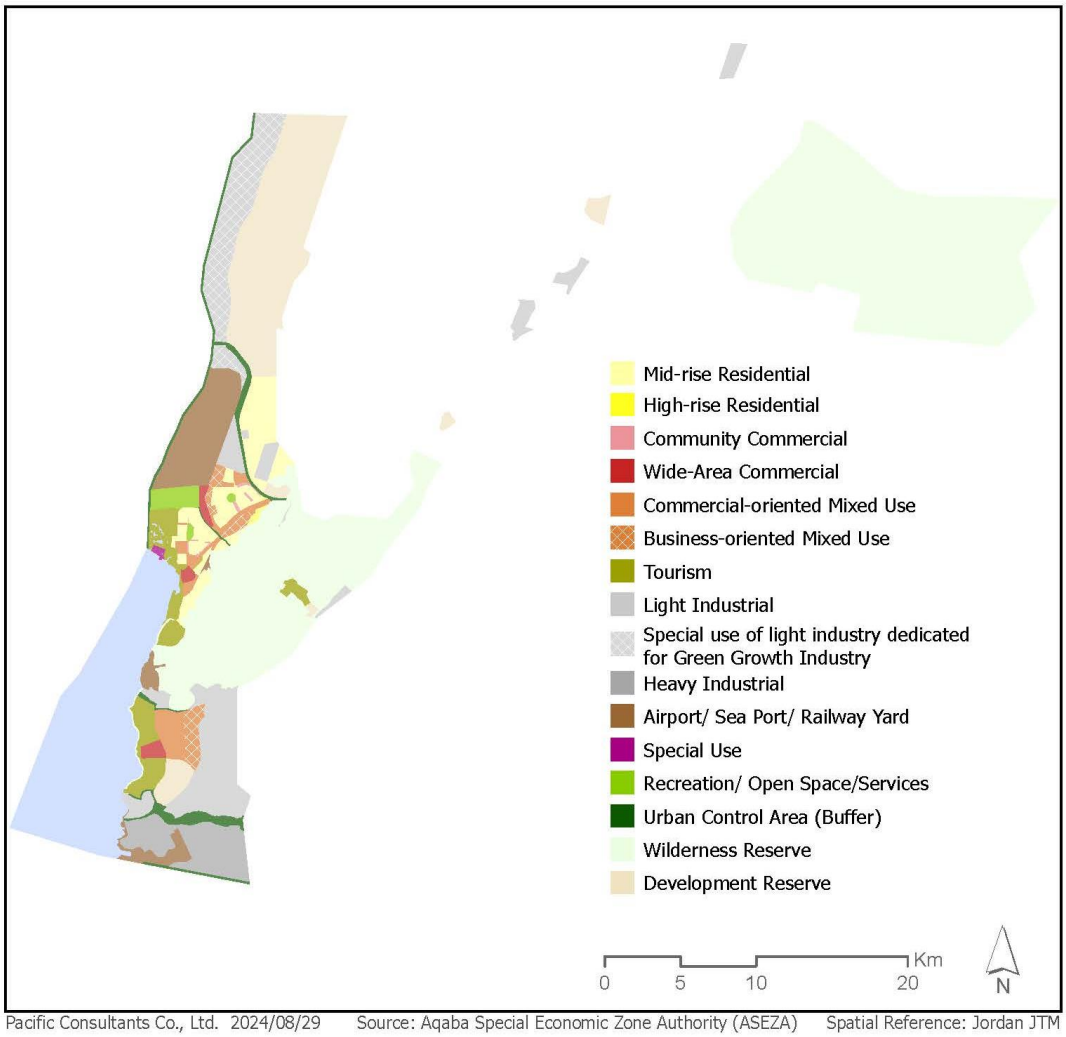
| Land use category | Permitted use | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Residence | | | Commercial | | Office | | Entertainment | | Hotel | Community Service | | | | | | Industry | | | | | |
| | Low rise ~11m | Mid rise ~21m | High rise ~27m | Small to Medium (under 500㎡) | Large (over 500㎡) | Small to Medium (under 500㎡) | Large (over 500㎡) | Sports (Swimming pool) | Theater, Amusement park | Hotel | School | University, Vocational training | Cultural (Library, Community center) | Religious facilities | Hospital | Clinic, Nursury | Factory: Less hazardous | Factory: Hazardous | Auto Repair shop | Ware house | Hazardous materials storage |
| Low-rise residential (Residential with special regulation) | ◎ | × | × | △ ~50㎡ | × | △ ~50㎡ | × | × | × | × | ○ | × | ○ | ○ | × | ○ | × | × | × | × | × |
| Mid-rise residential | ◎ | ◎ | × | ○ | △ ~1,500㎡ | ○ | △ ~1,500㎡ | × | × | × | ○ | | ○ | ○ | ○ | ○ | × | × | × | × | × |
| High-rise residential | △ | ◎ | ◎ | ○ | △ ~1,500㎡ | ○ | △ ~1,500㎡ | × | × | × | ○ | | ○ | ○ | ○ | ○ | × | × | × | × | × |
| Community commercial | △ | △ | △ | ◎ | △ ~3,000㎡ | ◎ | △ ~3,000㎡ | △ ~3,000㎡ | × | × | ○ | ○ | ○ | ○ | ○ | ○ | × | × | △ ~50㎡ | ○ | × |
| Commercial | × | △ | △ | ○ | ◎ | ○ | ◎ | ○ | ◎ | ◎ | ○ | ○ | ○ | ○ | ◎ | ○ | × | × | △ ~300㎡ | ○ | × |
| Commercial Oriented Mixed use | ◎ | ◎ | ◎ | ○ | △ ~10,000㎡ | ○ | ○ | ○ | △ ~500㎡ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | × | × | △ ~150㎡ | ○ | × |
| Business Oriented Mixed use | ○ | ○ | × | ○ | × | ○ | ○ | × | × | × | ○ | ○ | ○ | ○ | ○ | ○ | × | × | × | × | × |
| Tourism | ○ | ○ | ○ | ◎ | ◎ | ○ | × | ◎ | ◎ | ◎ | × | × | ○ | ○ | × | ○ | × | × | × | × | × |
| Light Industrial | × | ※ | × | ○ | × | ○ | ○ | × | × | × | × | × | × | ○ | × | ○ | ◎ | ○ | ○ | ○ | ○ |
| Heavy Industrial | × | × | × | × | × | ○ | ○ | × | × | × | × | × | × | ○ | × | ○ | ◎ | ◎ | ○ | ○ | ◎ |
| Open Space, Urban Control area (Buffer), Wilderness reserve) | × | × | × | × | × | × | × | × | × | × | × | × | × | × | × | × | × | × | × | × | × |

*Governmental and Institutional / Utilities and be located under any Land Use Type
*Labor housing can be permitted in the Light Industrial Category after study

Source: JICA study team

### 5.1.3 Land Use Plan

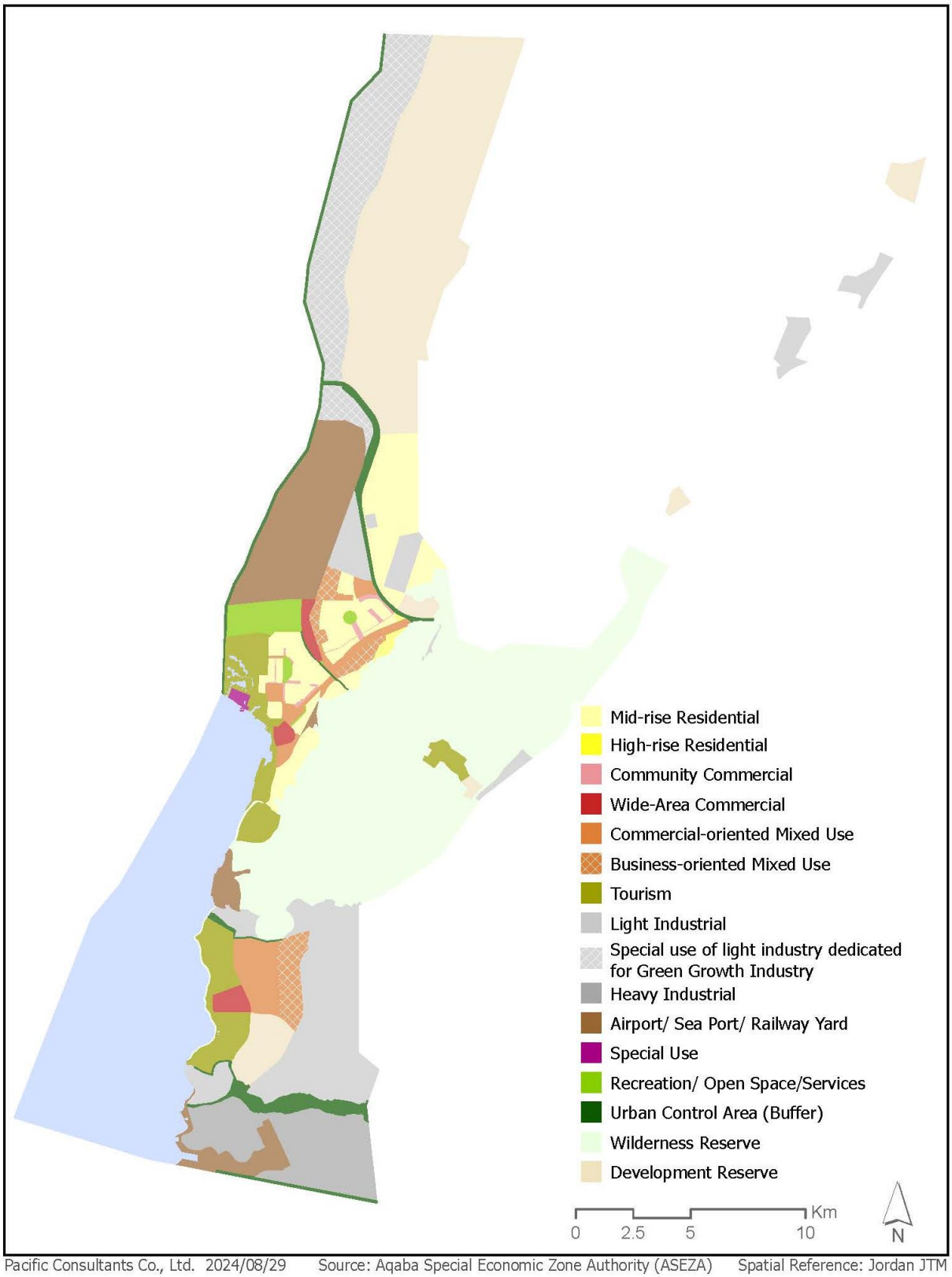
The land use plan for the ASEZ will be updated based on the reorganized land use types as shown in the figure below.




| Land Use Type | Area in Square Meters | Area in Square Kilometers | Per Cent of Total Area (Land Use data coverage area of ASEZ incl. Wadi Araba, AlQuwairaArea and Diseh) |
|---|---|---|---|
| Low-rise Residential | 2,139,135 | 2.14 | 0.36% |
| Mid-rise Residential | 29,143,539 | 29.14 | 4.94% |
| High-rise Residential | 849,547 | 0.85 | 0.14% |
| Community Commercial | 1,586,484 | 1.59 | 0.27% |
| Wide-Area Commercial | 3,208,659 | 3.21 | 0.54% |
| Commercial-oriented Mixed Use | 10,134,570 | 10.13 | 1.72% |
| Business-oriented Mixed Use | 6,933,541 | 6.93 | 1.18% |
| Tourism | 18,706,134 | 18.71 | 3.17% |
| Light Industrial | 45,492,701 | 45.49 | 7.72% |
| Heavy Industrial | 20,818,926 | 20.82 | 3.53% |
| Airport/Sea Port/Railway Yard | 33,251,762 | 33.25 | 5.64% |
| Special Use | 504,174 | 0.50 | 0.09% |
| Special Use of light Industry dedicated for Green Growth Industry | 29,464,196 | 29.46 | 5.00% |
| Recreation/ Open Space | 5,179,466 | 5.18 | 0.88% |
| Urban Control Area (Buffer) | 11,087,063 | 11.09 | 1.88% |
| Wilderness Reserve | 293,185,761 | 293.19 | 49.75% |
| Development Reserve | 77,671,047 | 77.67 | 13.18% |
| **Sum** | **589,356,708** | **589.36** | **100%** |

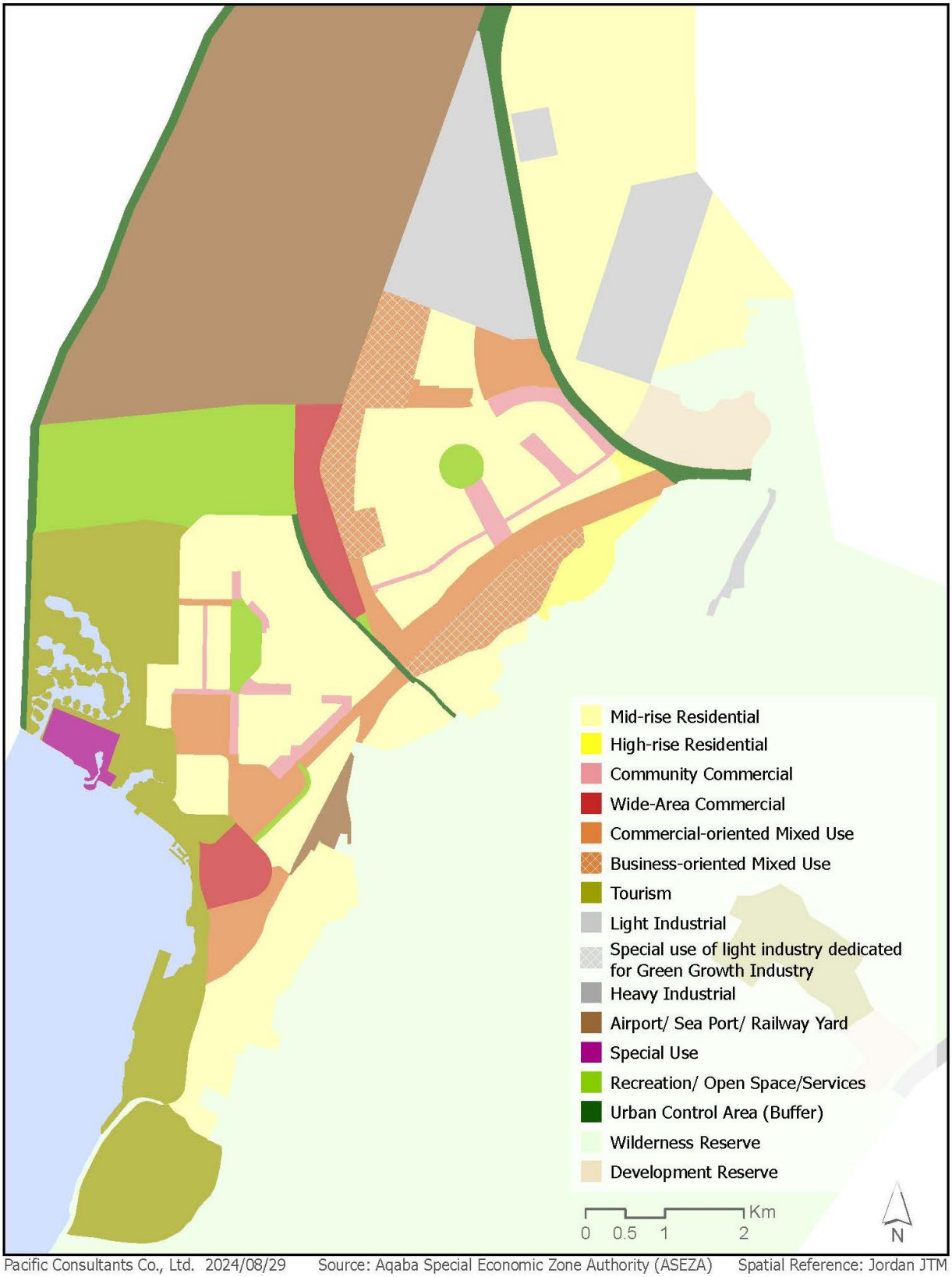
Source: JICA study team

**Figure 5-3 Updated New Land Use Plan (Whole ASEZ) and Area**




Source: JICA study team

**Figure 5-4 Updated New Land Use Plan (exc. Wadi Rum area)**




Source: JICA study team

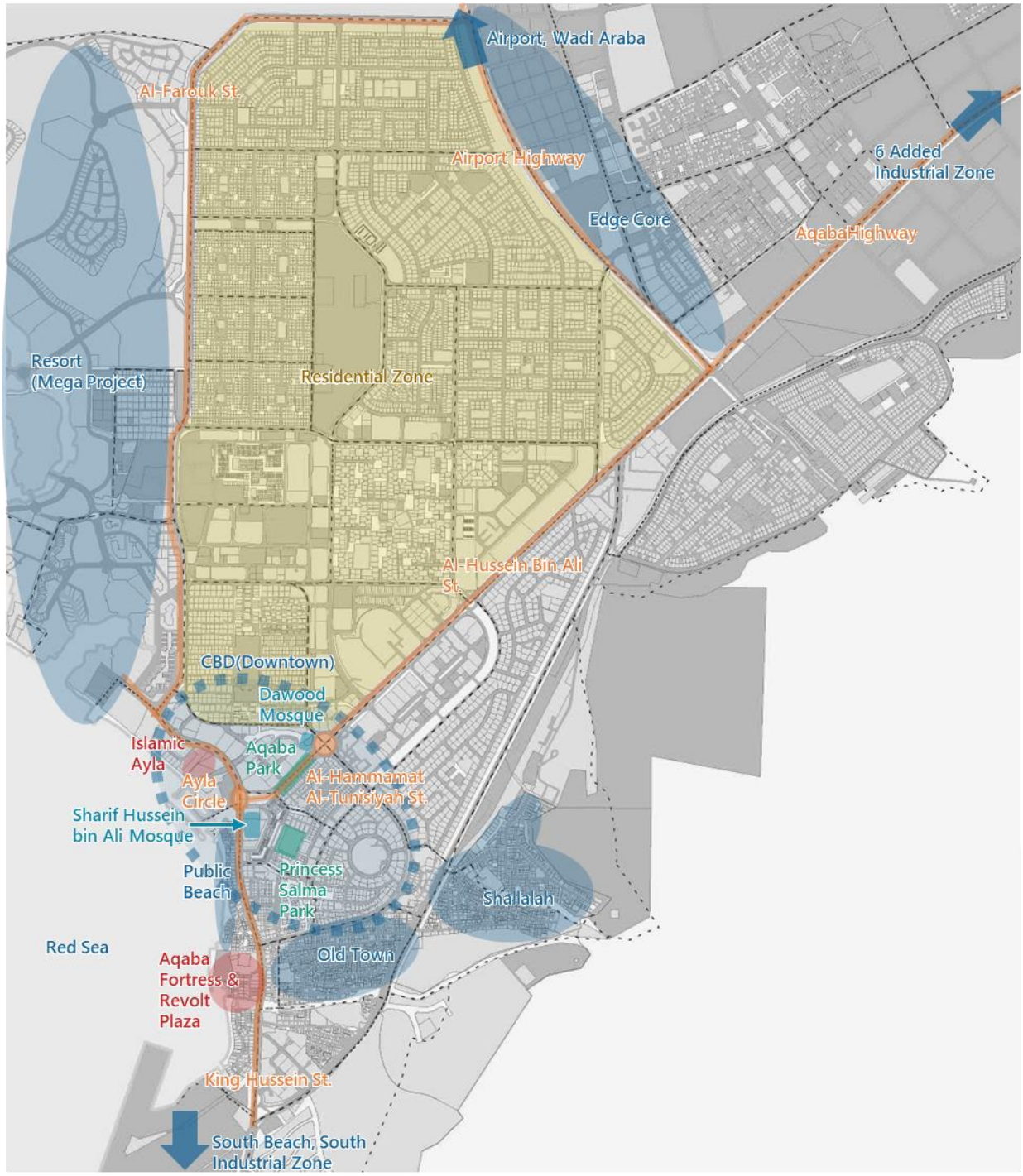
**Figure 5-5 Updated New Land Use Plan (Central area)**

# Chapter 6 Urban Design

## 6.1 Sources of Identity in Landscape and Urban Design of ASEZ

The major role expected of landscape and urban design is to realize, or facilitate the realization of, the future vision of the city targeted in the M/P, based on the resources available in the region, through the power of design.

The following is a summary of Aqaba's landscape and urban design resources and characteristics as a basis for strategy development.




Source: JICA study team, based on the GIS data from ASEZA

**Figure 6-1 Aqaba downtown area and its major roads**

### 6.1.1 Quality of Life

#### (1) Ruins and historical sites

In the downtown area of ASEZ, there are several historical heritages such as the ancient city site of Islamic Ayla, the Aqaba Fortress, which is a castle and fortress site, the oldest Christian church site in the world, and the site of an archeological excavation on the grounds of Ayla Resort. In addition, although not explicitly marked as archaeological sites, there are some spaces used as parks and open spaces where retaining walls and other remains are exposed.

It is understood that many ancient cities ruins remain underground in the present urban space of Aqaba due to the effects of past ground shifting, etc. However, those that were not recognized as having high historical value according to the judgment of the Ministry of Tourism and Antiquities are left without special conservation activities, such as the retaining wall mentioned above, and can be freely touched.

Source: JICA study team

**Figure 6-2 Historical site of Islamic Ayla**

Source: JICA study team

**Figure 6-3 Ancient retaining wall left on unused land**

### (2) Mosque

There are several large mosques in the downtown area, including the Sharif Hussein bin Ali Mosque and the Dawood Mosque, both of which are in close proximity to land abuts along major roads. In downtown Aqaba, where relatively low-rise and small-scale buildings are common, these large mosques are ice-top structures.

Source: JICA study team

**Figure 6-4 Sharif Hussein bin Ali Mosque**

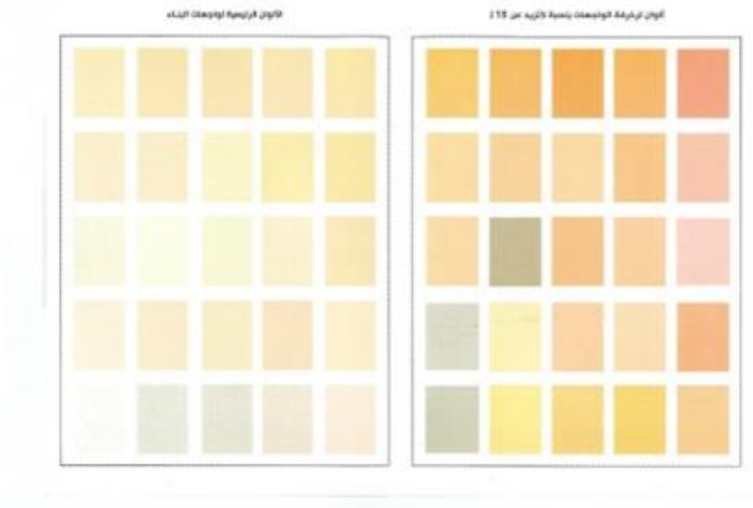
### (3) Façade made of stone

Like the structure and design (representation) of the archaeological and historical sites, many of the buildings still feature facades made of stone. Arab Revolt Plaza and its surrounding facilities around Aqaba Fortress are consciously planned with stone as the finishing material. Most of the stone materials are domestic materials procured from northern Jordan.

Stone is also listed as the first building material recommended for use in the existing Design Guidelines (D/G), which stipulates the use of natural color-based tones. Although no quantitative color codes are provided for these colors, they are defined within a relatively narrow range of hue, lightness, and saturation. In addition, existing regulations (Regulation on Zoning and Construction Licensing in Aqaba Special Economic Zone, a design standard established after the D/G) include restrictions on the percentage of glass and reflective materials used in facades, etc. As a result of designing in accordance with regulations, there is a tendency to create facades with a certain uniformity.

Source: JICA study team

**Figure 6-5 Revolt Plaza commercial building using stone facade**



Source: ASEZA

**Figure 6-6 Colors that may be used on building facades in ASEZ**

### 6.1.2 Opportunity of Business

#### (1) Small-scale commercial clusters

Currently, there are few large-scale shopping malls in Aqaba, and the downtown area, which is the commercial center of the city, has a concentration of small and medium-sized street-level retail stores and restaurants. As a result, the store front and surrounding area is routinely overflowing with merchandise, equipment, signage, seating, etc. These areas are also characterized by a partial mix of souvenir stores and restaurants for tourists and stores used by residents daily. There are also a variety of small stores located in each Neighborhood.

Source: JICA Study Team

**Figure 6-7 Stores by the public beach**

Source: JICA Study Team

**Figure 6-8 Small stores at the downtown area**

### (2) Large resort hotel complexes along the coastline

Several large-scale resort developments and resort hotels are located along the coastline of the Gulf of Aqaba, including the Mega Project (a gated development and not applicable to the existing D/G) such as Ayla, Saraya, and Tala Bay. In addition, planning, design, and construction of the Marsa Zayed Project is still in progress on the south side of the Aqaba fortress.

Although these are relatively new land uses that began to be developed primarily around the 2010s, they occupy a large footprint in the center of Aqaba and are the principal spaces that give visitors staying at these resorts the impression of the city. These luxury resorts site is particularly well developed and maintained with planting strips and pedestrian spaces separated by footpaths, compared to Aqaba's existing central city streetscape. They also offer a wide variety of functions, including a private beach, restaurants, and spa, as well as various commercial facilities, souvenir shops, and a reception desk for nature tours, allowing guests to enjoy all-inclusive services on site. Furthermore, in addition to functions for tourists, there is planned to be more than 30 diverse urban functions within the Marsa Zayed project, including residential, business, commercial, educational, and public services.

On the other hand, despite its large scale and significant impact on urban design, the Mega

Project is not covered by the existing D/G. As a result, although a consistent design is adopted within each development area, the Mega Project site has a different landscape from the Aqaba cityscape inside the city. Many colors not allowed under the D/G are used and the layout of the facilities block the views to the Red Sea.

Based on these circumstances, Al hafayer area (around the public beach in the city center) is an area that connects the city center to the limited public beach, and the conservation and management of this area is considered to be an important point that connects the cityscape of Aqaba to the Red Sea.

Source: Provided by ASEZA Mega Project Department

**Figure 6-9 Excerpts from the Master Plan for Marsa Zayed Project**

Source: JICA study team

**Figure 6-10 New hotel under construction in Saraya**

Source: JICA study team

**Figure 6-11 Private beach in Saraya**

Source: JICA study team

**Figure 6-12 Buildings and pedestrian path in Ayla Resort**

### 6.1.3 Value of Environment

#### (1) The Red Sea

Aqaba is the only city in Jordan with a coastline, and the Red Sea is an iconic landscape resource for Aqaba, as indicated in the existing M/P and D/G.

Currently, most of the land along the coastline in the downtown area has already been occupied by luxury resorts / hotels. For local residents and visitors staying outside of the resorts, access to the beach and the seaside is limited, only being able to view the waterfront from the public beach adjacent to the downtown and Revolt Plaza adjacent to Aqaba Fortress.

Another area where you can enjoy the sea is the South Beach, which has a large public beach. However, there are limited transportation options from downtown, and the area is still underdeveloped, and the services are inadequate due to the insufficient number of residents in the surrounding developed housing areas.

With Aqaba being a city formed between the sea and the mountains, the road leading down from the mountain side to the Red Sea offers a distant view of the Gulf of Aqaba.

Source: JICA study team

**Figure 6-13 Distant view of public beach, Downtown and mountains from the Gulf of Aqaba**

Source: JICA study team

**Figure 6-14 The view of Red Sea from Revolt Plaza**

Source: JICA study team

**Figure 6-15 The current situation of South Beach**

Source: JICA study team

**Figure 6-16 The view of Gulf of Aqaba from the slope at Old Town area**

### (2) Mountain range

While Aqaba faces the Red Sea, it is also a city surrounded by mountains with clear ridgelines, and is listed as one of Aqaba's scenic resources along with the Red Sea in the existing D/G. Aqaba is characterized not only by its mountainous landscape, but also by the fact that the city is formed in a limited area between the sea and the mountains, which makes it possible to form viewpoints that take advantage of the sloping topography.

Source: JICA study team

**Figure 6-17 View of the mountain range**

Source: JICA study team

**Figure 6-18 View of the downtown area and with the mountains in the background from Gulf of Aqaba**

### (3) Plantation and greenery

In the existing D/G, the types of plants to be actively planted are specified, and coherent planting strips have been formed along major thoroughfares such as Al-Hussien Bin Ali Street, Al-Farouk Street, King Hussein Street, and Al-Isteqlal Street in the downtown area.

In the hinterland of the public beach, there are small farmlands and planting strips where molokheiya and other crops are grown, providing a buffer between the city and the beach. There are also planned parks and green spaces, such as Princess Salma Park in the center of downtown and two large land abuts inside Al-Hussien Bin Ali Street that are maintained in a park-like setting.

The gradational change of greenery towards the center of the ASEZ coming from Amman to Aqaba via the Desert Highway, is also considered to be one of the characteristics of the urban landscape of Aqaba.

Source: JICA study team

**Figure 6-19 Greenery along the Al Hussein Bin-Ali Street**

Source: JICA study team

**Figure 6-20 Princess Salma Park**

### (4) Desert

In contrast to the central city area, which has a certain degree of greening, much of the land in ASEZ, including unused land, is desert. This is a typical landscape for an arid region, but it is one distinctive landscape resource for visitors from outside the country.

Of the 6 Scattered Areas to be newly incorporated into ASEZ, the desert landscape is already being used as a resource, with the northern part of Wadi Rum Protection Area planned as an ecotourism and filming area.

Source: JICA study team

**Figure 6-21 Dessert at the Wadi Rum Protection Area**

### (5) Wadi

Aqaba faces damage from rainfall several times a year, therefore there are wadis and check dams scattered throughout from the central ASEZ to the outskirts.

Source: JICA study team

**Figure 6-22 Wadi that was creating as a flash flood protection in the urban fringe area**

## 6.2 Urban Design Strategy

The development vision and three basic strategies organized in Chapter 4 and the urban design strategy to realize the urban structure are shown below.

**Table 6-1 Urban Design Strategy**

| Basic Strategy | Urban Design Strategy |
|---|---|
| 【Quality of Life】<br>Full of Smile | ●Diversity of living space and walkability<br>・ Designing diverse spaces according to lifestyles<br>・ Realizing urban space with walkability |
| 【Opportunity of Business】<br>Full of Investment Opportunities | ●Sophisticated urban landscape in accordance with existing urban areas and newly developed areas<br>・ Designing central commercial districts with a sense of liveliness and identity<br>・ Designing symbolic design in newly development areas<br>・ Guiding unique resort landscape |
| 【Value of Environment】<br>Full of Green | ●Preservation of views to the Red Sea and creation of public space with greenery<br>・ Preservation of views to the Red Sea<br>・ Preservation of greenery and natural scenery |

### 6.2.1 【Quality of Life】Strategy and References for "Full of Smile"

#### (1) Designing diverse living spaces according to lifestyles

With a goal to reach a population size of 545,000 going forward, the detail and precision in urban planning must be greater than before, ensuring that the city becomes one which both tolerates and celebrates diverse cultures and lifestyles.

##### 1) Diversification of design image with the subdivision of land use

The existing M/P organizes the architectural design image within the ASEZ into four design

zones: Residential, Tourism, Commercial and Industrial (ASEZ MASTERPLAN 2001-2020, chapter 6.1). For example, in the residential zone, detached houses are designated to have no more than three floors, and even apartment buildings up to a maximum of five floors, and in principle, no mid- to high-rise buildings are allowed.

In contrast, based on the overall urban development master plan strategy, and considering the zoning and land use subdivisions described in the previous chapter, the urban landscape will be diversified by inducing a crisp form and design image for each use, especially for residential and commercial uses.

**a) Low-rise residential**

A zone that guides low-rise, spacious residential design based on villas, single-family homes and small apartment buildings. It is expected to be a residential area that represents a new lifestyle in ASEZ with a relaxed atmosphere, with more space between houses, open spaces, greenery, and no on-street parking. From the residential areas visible from the aforementioned viewpoints to the Aqaba Bay should, as a principle, be designated within these zones to secure the view, and it is desirable to form a streetscape of traditional Aqaba residential architecture that supports the scenic views.

**b) High-rise residential**

A zone that allows for the location of high-rise buildings and relatively large apartment complexes, such as those exceeding 5 stories in height. From the viewpoint of securing the view, it is desirable that the location be based on the mountain side.

Since this form is not envisioned in the existing M/P, it is basically expected to be applied to newly developed residential areas and residential areas where future redevelopment (reconstruction) will occur, and it is assumed that these dwellings will be the main recipients of new residents to support their residential capacity.

As it is expected to be a residential area that represents a new lifestyle in ASEZ, instead of strictly inducing natural colors derived from mountains and deserts, the use of natural materials such as stone, and forms and design images based on traditional Islamic motifs, which have been induced in the M/P and D/G based on it, while taking into consideration harmony with the surrounding nature and views, each district will be allowed a certain degree of freedom and individuality in design image and color, thereby adding value and creating an attractive and competitive residential area with a variety of options for new residents.

**c) Neighborhood commercial**

The existing residential and other areas in Aqaba are dotted with small retail stores, restaurants, and other commercial establishments that are used daily by residents. Such commercial facilities will be classified as neighborhood commercial and will be subject to different guidance and regulations regarding height, scale, color, façade design, etc., compared to commercial buildings that cater to tourists, etc., located in CBDs, etc., as described below, to harmonize them with residential uses.

### (2) Realizing urban space with walkability

As it is defined in the book - System of Civil Engineering Editorial board, ed. by Nakamura, Y. et al.: System of Civil Engineering 13: Landscape Theory, Shokoku-sha, 1977 that “Landscape is nothing more than a view of the environment that surrounds us.”, a landscape

can only be realized when people can look at it with their own eyes and think about their own relationship with the environment by placing themselves in the space.

Therefore, in order to realize an "Aqaba-like urban landscape," it is essential not only to create photo-worthy landscapes and spaces, but also to realize highly walkable urban spaces where people can walk around and experience the urban environment of Aqaba.

Creating a walkable and enjoyable cityscape will also encourage tourists staying at upscale beach resorts along the coastline that offer all-inclusive services to come out into the city and bring more activity to the central city area.

On the other hand, as previously reported, the main transportation in Aqaba is private cars, even in the downtown area. In addition, the overflow from commercial facilities, which can be considered a landscape feature, combined with inadequate sidewalk width and pavement, make it difficult to say that the environment is one that ensures walkability, and the first step is to create a safe pedestrian network.

In addition, to achieve high walkability, urban spaces must incorporate universal design and be easy for everyone to use. In the process of realizing the scenario of a population of 545,000, it is imperative that the city will be able to accommodate an ever-greater variety of residents and visitors. Universal design of pedestrian spaces means not only consideration for people with mobility difficulties such as the elderly and physically challenged, but also designing urban spaces that can be used safely and comfortably by everyone, including not only the existing residents but also visitors from different cultures and new residents, so that "no one is left behind".

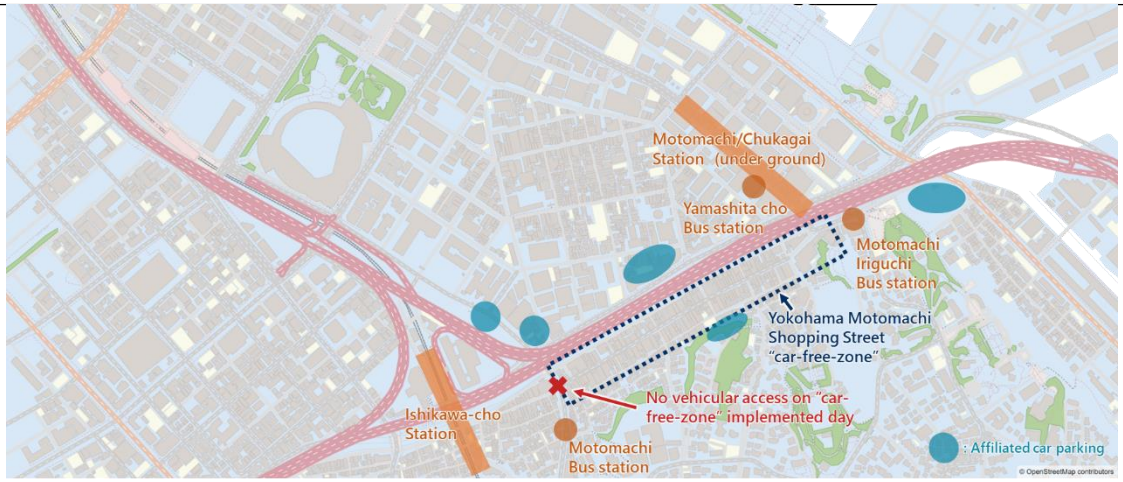
Based on the status of pedestrian space in ASEZ, specific measures proposed to improve walkability and introduce universal design are listed below.

**1) Walkability (Safety)**

**a) Establishment of vehicle regulations and car-free zones**

In a part of the downtown commercial district (CBD), a car-free zone will be established by restricting vehicle entry during the daytime and evening on holidays and weekends when the number of pedestrians increases. During these hours, all vehicles, except emergency vehicles, etc., will be diverted to the outer edge of the zone to create a safe and bustling space for pedestrians only.

*Reference case in Japan: Yokohama Motomachi Shopping Street, Sankita Street, etc.*




Source: JICA study team, based on Yokohama Motomachi Shopping Street Web site （https://www.motomachi.or.jp/access/）

**Figure 6-23 Reference case: Yokohama Motomachi Shopping Street, car-free zone designation**

### b) Reducing the number of lanes and widening sidewalks

In some parts of the Downtown Commercial District (CBD), daily overflows from commercial facilities are occurring on the sidewalks, making it unsafe for pedestrians to pass through. Although ASEZA's department in charge is constantly alerting the shops not to overflow to the sidewalks, the narrow width of the sidewalk itself (2 m in some areas) is also a contributing factor. It would be useful to reduce the number of lanes on the road, allowing the sidewalks to be widen. By cutting down the number of lanes to the least possible, it is expected to eliminate street parking at the same time.

*Reference case in Japan: Redevelopment of National Route 2 around Sannomiya Station, etc.*


East side from the present Sannomiya intersection

Phase 1
10 lanes → 6 lanes
(Target for FY2029)

Phase 2
6 lanes → 3 lanes

Source: Kobe City website
https://www.city.kobe.lg.jp/a55197/shise/kekaku/jutakutoshikyoku/kobetoshin/sannomiyacs_20200225.html

**Figure 6-24 Reference case: Image of roadway reduction and sidewalk widening in the Sannomiya Station area National Highway No. 2 redevelopment project**

### c) Introduction of Woonerf

Streets in commercial clusters and low-density, low-rise residential areas, etc., will be intentionally designed with a meandering woonerf to reduce the speed of passing vehicles, the meandering depressed area will be used as a paid parking lot to discourage on-street parking.

*Reference case in Japan: Yokohama Motomachi Shopping Street, Nagaike Community Road, etc.*


Source: JICA Study Team

**Figure 6-25 Reference case: Woonerf in Yokohama Motomachi Shopping Street**

**2) Walkability (Comfort)**

**a) Development of rest area and spaces on sidewalks**

Furniture for resting, such as benches and semi-outdoor spaces with eaves, will be provided on the main walkways and plazas that form the walkable network. These furnishings can be designed to replace the guardrail as a partition between the road and sidewalk, integrated with the planting strip, or placed in a position where the vista point can be captured just as a viewpoint area, etc. It will be possible to express a micro design image by introducing designs that match the landscape characteristics of the lines and areas while being dispersed throughout the network.

*Reference case in Japan: Yokohama Motomachi Shopping Street, ZOU-NO-HANA Park, etc.*


Source: JICA Study Team

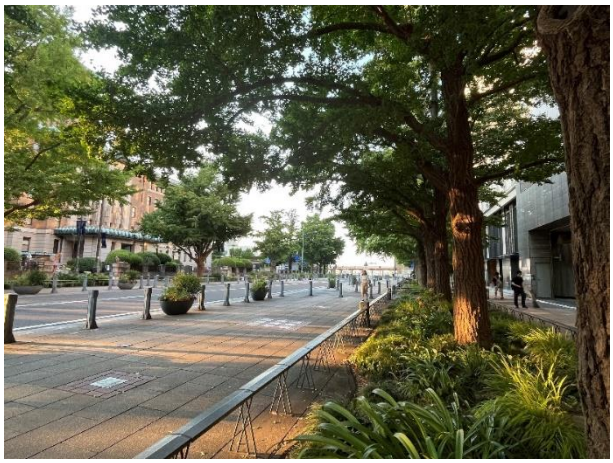
**Figure 6-26 Street furniture on Motomachi Shopping Street**

**b) Formation of green and shaded roads and walking spaces integrated with greenery**

Create green shade on King Hussein Street, etc., which is considered a major wide sidewalk

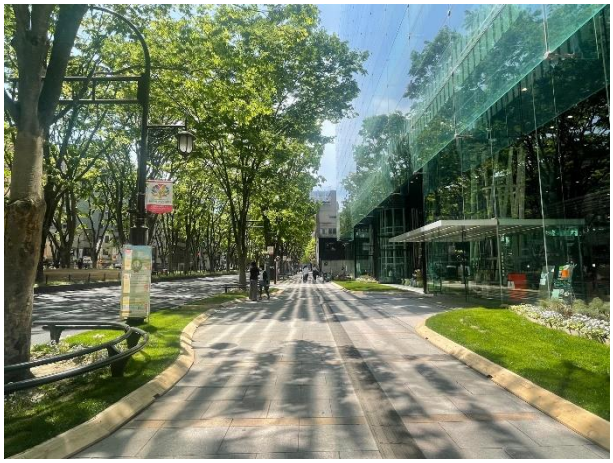
on the walkable network, utilizing existing planting strips, etc. In addition, like the pedestrian space of Al-Hammamat Al-Tunisiyat Street, which is already integrated with the green space of Aqaba Park, Al-Hussein Bin Ali Street and others extending to the northeast will also be integrated with the park and pedestrian space to form a green axis leading to the downtown.

*Reference case in Japan: Yokohama Waterfront Area Green Axis (Japan Uni Avenue), Sendai Jozenji Street, etc.*



Source: JICA Study Team

**Figure 6-27 Reference case: Greenery sidewalks on Nihon Odori (Yokohama, Japan)**



Source: JICA Study Team

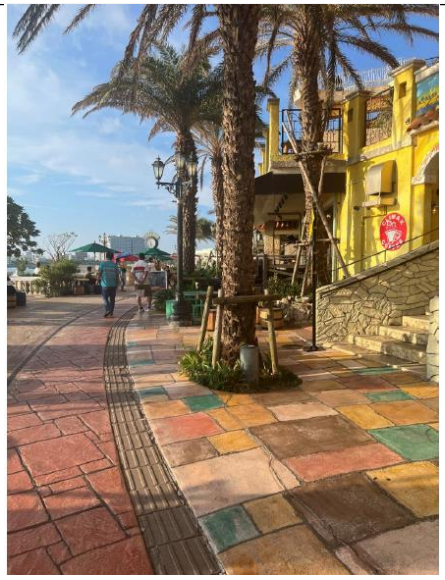
**Figure 6-28 Reference case: Greenery sidewalks on Jozenji Street (Sendai, Japan)**

### c) Formation of a promenade towards the public beach

King Hussein Street and the access road from King Hussein Street to the public beach (including Al Hafayer area) will be used as a promenade to the beach, and the area will be made more colorful and livelier by relaxing color restrictions, setting greening rates, and installing street furniture such as benches and art.

As for the South Beach, it is also necessary to reduce regulations and provide guidance to create a lively atmosphere along South Beach Highway in the vicinity of the beach.

*Reference case in Japan: American village, etc.*



Source: JICA Study Team

**Figure 6-29 Reference case: American Village (Okinawa, Japan)**

**d) Additional pedestrian crossings**

Additional pedestrian crossing will be added to the streets in the Walkable Network to allow flexible crossing between streets, creating a streetscape that is enjoyable to walk through and full of discovery.

**e) Setbacks for walls and retaining walls in residential areas**

Although the existing D/G and other regulations specify the setback distance from the front road for residences, by convention, it is sufficient if the main house meets the specified setback distance. Therefore, most residences in existing residential areas have a fence on all sides of the boundary facing the sidewalk, resulting in a closed street space. Therefore, by specifying the setback distance and retaining walls in residential areas, and providing a planting strip between the wall and the front road, the closed nature of residential areas can be alleviated, and the formation of green residential areas can be promoted.

**Figure 6-30 Reference case: Setbacks along the road in residential area (Kobe, Japan)**

出典：Kobe city landscape guidelines https://www.city.kobe.lg.jp/documents/52545/_kobecity_guideline_220331s.pdf

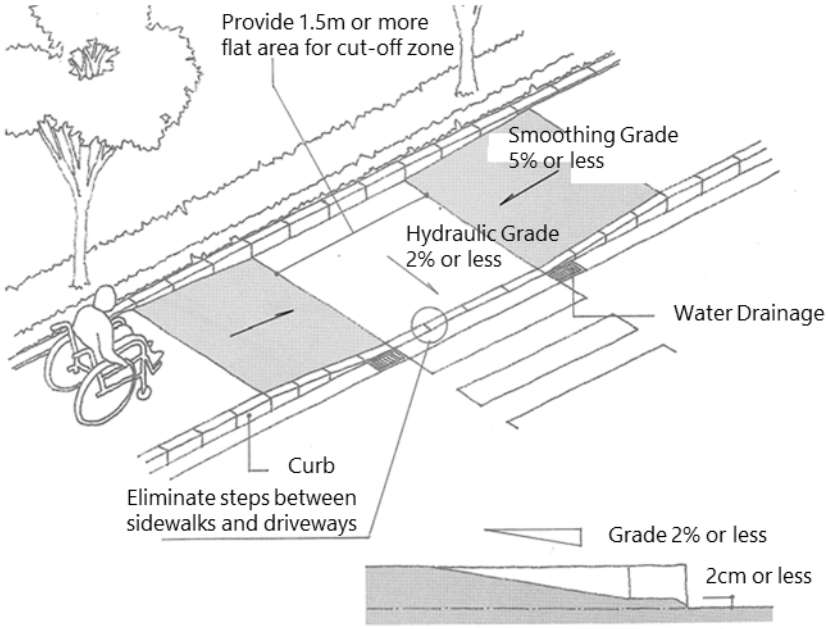
### 3) Universal design

#### a) Scraping of crosswalks

Where a sidewalk crosses a roadway, it should be a standard to install scrabbles instead of steps. The slope of the scouring should be 7-5% to allow for wheelchairs, strollers, etc.

Source: JICA Study Team

**Figure 6-31 Reference case: Scraping crosswalks (Yokohama, Japan)**




Source: Matsue City Universal Design Guidelines,
https://www.city.matsue.lg.jp/soshikikarasagasu/kenkofukushibu_kenkofukushisomuka/kenko_fukushiseisaku/1/3059.html

**Figure 6-32 Crosswalks improvement for universal design**

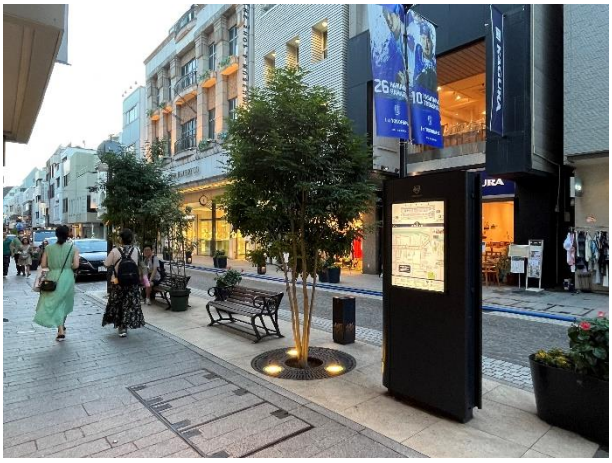
#### b) Sign planning

Multilingual display signs of a unified design should be installed to provide information that enables anyone to stroll and sightsee without getting lost by indicating directions to major public facilities and tourist sites such as public beaches, plazas, archaeological sites, viewpoints (described below), bus terminals, and mosques, at major intersections, roundabout, plazas, and along major streets.

*Reference case in Japan: Yokohama Waterfront Area, Motomachi Shopping Street, etc.*

Source: JICA Study Team

**Figure 6-33 Reference case: Signs placed at intersections (Yokohama, Japan)**



Source: JICA Study Team

**Figure 6-34 Reference case: Information map installed together with benches and plantings (Yokohama, Japan)**

### c) Formation of barrier-free routes to public beaches

Currently, the public beach must be accessed through steps and a revolving gate, and no barrier-free route is provided. The public beach in Aqaba will be upgraded as a public beach open to all by (1) repairing the pavement (unevenness) of the existing walkway, (2) creating a route down to the beach with a 5% slope, (3) eliminating the revolving gate, and (4) partially laying paved areas where people in wheelchairs can enjoy the beach and be close to the surf edge, etc.

*Reference case in Japan: Azama San-san beach, etc.*

Source: JICA Study Team

**Figure 6-35 Current status of access to public beaches of Aqaba Town**

Source: JICA Study Team

**Figure 6-36 Reference case: Universal design walkway of Azama Sansan beach (Okinawa, Japan)**

**d) Development and expansion of safe public playgrounds and gathering places**

The inner circle of the roundabouts of Ayla Circle and Princess Haya Circle have been developed as parks and plazas, and Ayla Circle has become a place to play and relax for many people. On the other hand, these are spaces surrounded by roads with particularly heavy traffic in Aqaba, with no crosswalks with traffic signals or boundary walls with the roads.

For these existing park and plaza spaces, as mentioned above, it is necessary to increase the number of areas that can be accessed by safely crossing the road and to provide buffer strips, fences, etc. between them and the road. In addition, it is required as an urban function to provide public playgrounds and gathering places that can be used safely by everyone, not only in busy areas, but also in residential areas, with parks and plazas at the level of neighborhood blocks.

Outdoor parks and plazas are particularly busy in the evening due to the intense daytime heat. Therefore, it is necessary to provide adequate lighting in parks and plazas so that they can be used safely even after sunset, while maintaining harmony with the surrounding area.

Source: JICA Study Team

**Figure 6-37 Scene in the Ayla Circle before sunset**

### 6.2.2 【Opportunity of Business】 Strategy and References for "Full of Investment Opportunities"

#### (1) Design of a central commercial district with a sense of liveliness and identity

Around the CBD, there will be an area to induce a bustling commercial atmosphere that will be used not only by residents but also by tourists, visitors, etc. In this area, it is envisioned that relatively large and high-rise buildings will be allowed depending on their location, and that a certain degree of flexibility will be applied to outdoor advertising and other regulations. On the other hand, in area that requires securing the aforementioned view landscape/vista line, priority should be given to harmonize with the surroundings in terms of height and installation of advertisements. In addition, as the population increases, it is expected that global chains and other companies will move into the area. One way to harmonize the image of a bustling urban space and urban design is to encourage these commercial buildings to adjust the colors of their logos and signs as necessary.

In addition, when these large-scale commercial facilities are newly developed, it is necessary to consider the need to ensure walkability by preventing on-street parking and improving the landscape, for example by requiring adequate parking spaces to be attached to the facilities.

#### (2) Design with a sense of symbolism in the new development site

For buildings in the new business core that are to be used for mixed commercial and business purposes, it is one idea to allow relatively large, high-rise buildings with innovative designs that will be a symbol of Aqaba's new business center, not limited to the "Islamic design" recommended in the existing D/G. As with commercial facilities, measures such as requiring a sufficient number of parking spaces in proportion to the ratio of tenants should be implemented in conjunction with the development of these complexes.

#### (3) Guidance of unique resort landscape

The public beach in Al Hafayer district and the beach area around South Beach, which is not occupied by the Mega Project, will be a seaside space accessible to all residents and visitors, inducing the formation of a resort landscape with a unique Aqaba character.

As for the Al Hafayer area, it is essential to consider the continuity with the existing city center

and regulate the location of high-rise buildings in order to preserve the view to the Red Sea from the city center. In addition, a pedestrian friendly and accessible flow line for both residents and visitors should be ensured by displaying signs at the entrance from King. Hussein St. to the promenade to the beach, and by maintaining a slope to provide a gentle access. When redeveloping the site, the existing Aqaba streetscape should be carried on by utilizing existing plantings, farmland, and vegetable gardens. In addition, deregulation of coloring, greening ratio, and street furniture should be established to form vibrant tapestry and liveliness.

The South Beach area is an important area to become the new core of the southern ASEZ and has the potential to become a resort area that can transmit a new Aqaba-like atmosphere. Since this is a planned future development site, a new design motif and design code exclusive to this district should be established, to create the new face of ASEZ with design uniqueness. In order to achieve this, it is important for the South Beach area to not be designated as a Mega Project site, or that the design of the project will conform to the design code of the district.

On the other hand, to secure the view of the Red Sea, which is the identity of Aqaba, the South Beach area should also have sufficient height control in planning, for example, only low-rise buildings should be permitted west to the South Beach Highway.

### 6.2.3 【Value of Environment】 Strategy and References for "Full of Green"

#### (1) Scenic views Preservation of views to the Red Sea

As mentioned above, the greatest scenic resource that characterizes ASEZ / Aqaba is the view to the Red Sea. To preserve the scenic view overlooking the sea from the mountain side, it is necessary to establish viewpoints that serve as Vista Points and establish areal regulations and guidance aimed at ensuring visibility and views from the viewpoints. Currently, the existing D/G and Design Standards set height restrictions by zone and neighborhoods, respectively, but these are stand-alone regulations and are not set from the broad perspective of securing views of the landscape.

In addition, by designating the Vista Line as a field of view from the mountain side to the sea, and by setting regulations and guidance for buildings and structures in the area along the Vista Line to secure the view, it is possible to achieve both a static view from the viewpoint and a view that can be experienced dynamically while walking along the Vista Line.

The following is an overview of vista points and vista lines.

##### 1) Vista Point

The vista point site is an open space where people can stop to enjoy the view and have a view of the Red Sea. There may be more than one place. The area between the viewpoint and the sea needs careful planning so that the view from the viewpoint to the sea will not be obstructed by new buildings and structures to be constructed or reconstructed in the future. Planning includes regulating the maximum height of buildings and structures, regulating the installation of equipment, towers and other structures on rooftops, regulating the display of outdoor advertising in the direction from the viewpoint, and establishing standards for the color of buildings and structures to guide their use.

It would also be useful to post signs or information boards at each vista point sites, indicating

that the location has an important scenic view for ASEZ to foster landscape awareness.

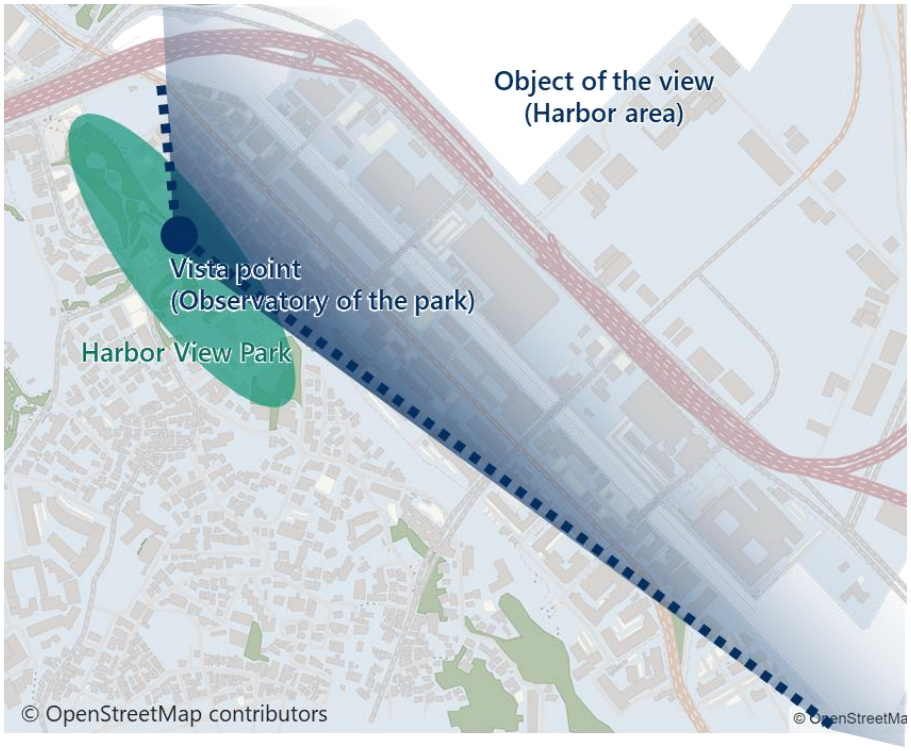
*Reference case in Japan: Yamate urban landscape consultation district, Yokohama City.*

*The concept to "Maintain good views from Yamate Hill to the harbor and city center, creating a landscape that is uniquely Yokohama as a port city." is being set as a policy for creating an attractive urban landscape.*

*Based on this concept, the district has established the following special provisions.*

- *Views from viewpoints shall not be obstructed by buildings/structures.*
- *The design of buildings and structures shall not obstruct the view and shall promote the attractiveness of the view.*
- *The design of buildings and structures shall be considered in the vicinity of viewpoints to enhance the attractiveness of the view.*

*The observatory of "Harbor View Park" located on the hill of Yamate has been set as one of the viewpoints, and it is stipulated that the view from the viewpoints shall be preserved.*




Source: JICA Study Team

**Figure 6-38 Reference case: Vista point of Harbor View Park (Yokohama, Japan)**

Source: JICA Study Team

**Figure 6-39 Observatory of Harbor View Park**

Source: JICA Study Team

**Figure 6-40 Scenic view from a vista point of Harbor View Park**

### 2) Vista Line

Within the Walkable Network, the Vista Line is a street with a clear view from the mountain side to the Red Sea. The maximum height of buildings and structures along the Vista Line will be regulated, wall setbacks will be standardized, outdoor advertising displays will be regulated from the mountain side down to the seaside, color guidance standards will be set, and street furniture design will be standardized, to preserve the clear view and create a pleasant streetscape for walking.

In addition, by placing markers, such as road studs at regular intervals along the Vista Line walkway, it will be useful to raise awareness of the scenic view and at the same time create a mechanism to enjoy the changing view of the sea as you walk along the line.

*Reference case in Japan: View from Daijuji Temple in Okazaki City to Okazaki Castle.*

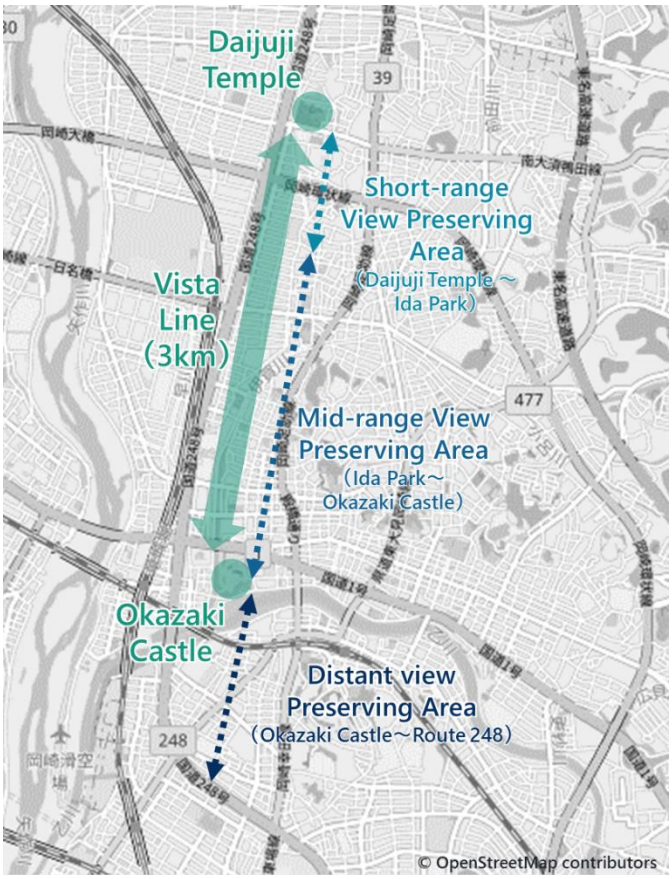
*A 3-km straight line connecting Daijuji Temple, and Okazaki Castle in Okazaki City is designated as the "Vista Line" (historical view). The landscape preservation zones are defined according to the distance from the main gate of Daijuji Temple, which is the viewpoint. At the*

*same time, detailed regulations are established for each zone, such as restrictions on building height and low-colored colors, restrictions on outdoor advertising displays, and the use of flattened forms and tiles to enhance the view of the Okazaki Castle from the viewpoint.*

*In addition, road studs indicating this fact are placed on the axis of the Vista Line, contributing to the cultivation of landscape awareness and civic pride.*

Source: https://www.photo-ac.com/

**Figure 6-41 Scenic view from Daijuji Temple gate to Okazaki Castle**




Source: JICA Study Team

**Figure 6-42 Vista line from Daijuji Temple to Okazaki Castle**

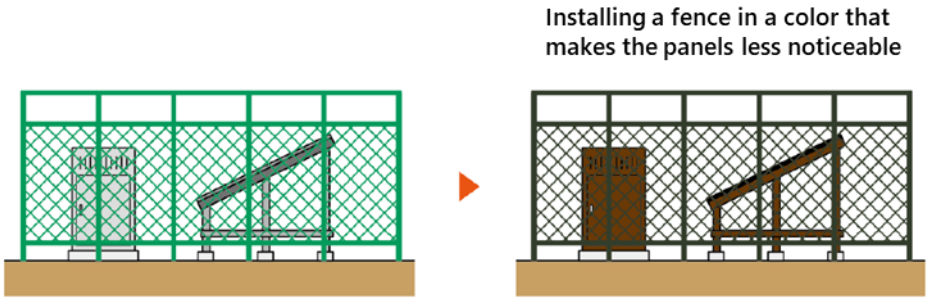
### 3) Regulations for photovoltaic (PV) panel installation

PV panels have been installed on residential and other buildings in the central city area, especially on the rooftops of residences. Its appearance itself and reflected light from the surface of the panel would be an obstruction to the scenic view. It is recommended that measures be taken to minimize the negative impact of the PV panels on the scenic view, such as promoting countermeasures along the Vista Line and in the area from the viewpoint to the Red Sea. Specific measures include the following regulations.

- Permit installation limited to glare-resistant PV panels.
- Permit installation limited to dark-colored (black, brown, or navy blue) PV panels.
- Limit the maximum height of panels to below the height of the parapet of the roof.
- Install screens (plants, fences, etc.) around the perimeter of the panels to make the panels less noticeable.

Source: JICA Study Team

**Figure 6-43 Store and residence with PV panels on the roof**




Source: JICA Study Team, based on “Guidelines for Environmental Considerations in Photovoltaic Power Generation”, Ministry of the Environment, Japan

**Figure 6-44 Store and residence with PV panels on the roof**

## (2) Preservation of greenery and natural scenery

### 1) Preservation of natural landscape and environment

When constructing buildings in coastal resort areas, whether for specific uses or not, it is desirable from the perspective of landscape and urban design to strictly set height restrictions

to ensure views from viewpoints and color restrictions that are consistent throughout the entire area and harmonize with the sea. In addition, from the perspective of environmental preservation, it is proposed that measures such as designating building site limits set sufficiently back from the coastline, establishing vehicle exclusion zones and developing centralized parking lots will be implemented.

**2) Formation of green-shaded roads and walking spaces integrated with greenery (reiterated from 6.2.1 (2) 2) b))**

Create green shade on King Hussein Street, etc., which is considered a major wide sidewalk on the walkable network, utilizing existing planting strips, etc. In addition, like the pedestrian space of Al-Hammamat Al-Tunisiyat Street, which is already integrated with the green space of Aqaba Park, Al-Hussein Bin Ali Street and others extending to the northeast will also be integrated with the park and pedestrian space to form a green axis leading to the downtown.

### 6.2.4 Guiding urban design with individuality by zone/area

As mentioned above, while providing basic design guidance and regulations for each land use, it is important to allow each zone or area to have a diverse design image, rather than setting uniform standards for all buildings of the area. To create a pleasant and varied cityscape that is enjoyable to walk through, each area should have their own identity based on landscape planning, positioning of the district, and the relationship with the surrounding area.

To become a city to attract new residents and visitors from the outside, having a variety of choices in the environment to live and work is an essential element in terms of competitiveness.

In addition, establishing individual landscape plans for the priority districts shown in the next section will lead to the formation of a unique and diverse urban landscape for each location.

### 6.2.5 Urban Design Considerations and References in Priority Districts

#### (1) Selection of Priority Districts

The priority districts for urban design in ASEZ and a summary of these districts are listed below.

**1) Pr. Mohammad St. (Aqaba Town - Existing Town Area)**

Pr. Mohammad St. has a downward slope from the rear of the existing city center to the waterfront, with views of the Red Sea. The street is a key axis in Aqaba's view scape planning.

Source: JICA Study Team

**Figure 6-45 View toward the Red Sea from Pr. Muhamad St.**

### 2) CBD area along K. Hussein St. (Aqaba Town - Existing Town Area)

K. Hussein St. connects the Revolt Plaza/Aqaba Fortress to the area where several large resort hotels are located on the coastline, along the Ayla ruins, Al Hafayer, and the existing city center. It is the main axis of Aqaba's history, tourism, and commerce.

Source: JICA Study Team

**Figure 6-46 Al Hafayer**

### 3) Old Town/ Shallalah

Old Town straddles the east and west sides of Mecca St., with the east side of the street known as the Shallalah neighborhood. Both neighborhoods are not organized into planned blocks and streets like other neighborhoods and are characterized by a dense concentration of low-rise row houses and small stores with winding narrow streets. The east side of the district is high above sea level, and there are no tall buildings, so there are some points where views of the Red Sea can be secured.

Source: JICA Study Team

**Figure 6-47 View of the Shallalah area from Old Town over Mecca Street**

#### 4) New Business Core

New Business Core is a newly planned development area surrounded by Airport St. and Jordan Valley Highway near the ASEZA headquarter. The area is designated as one of the new central districts of ASEZ.

#### 5) New Residential Area

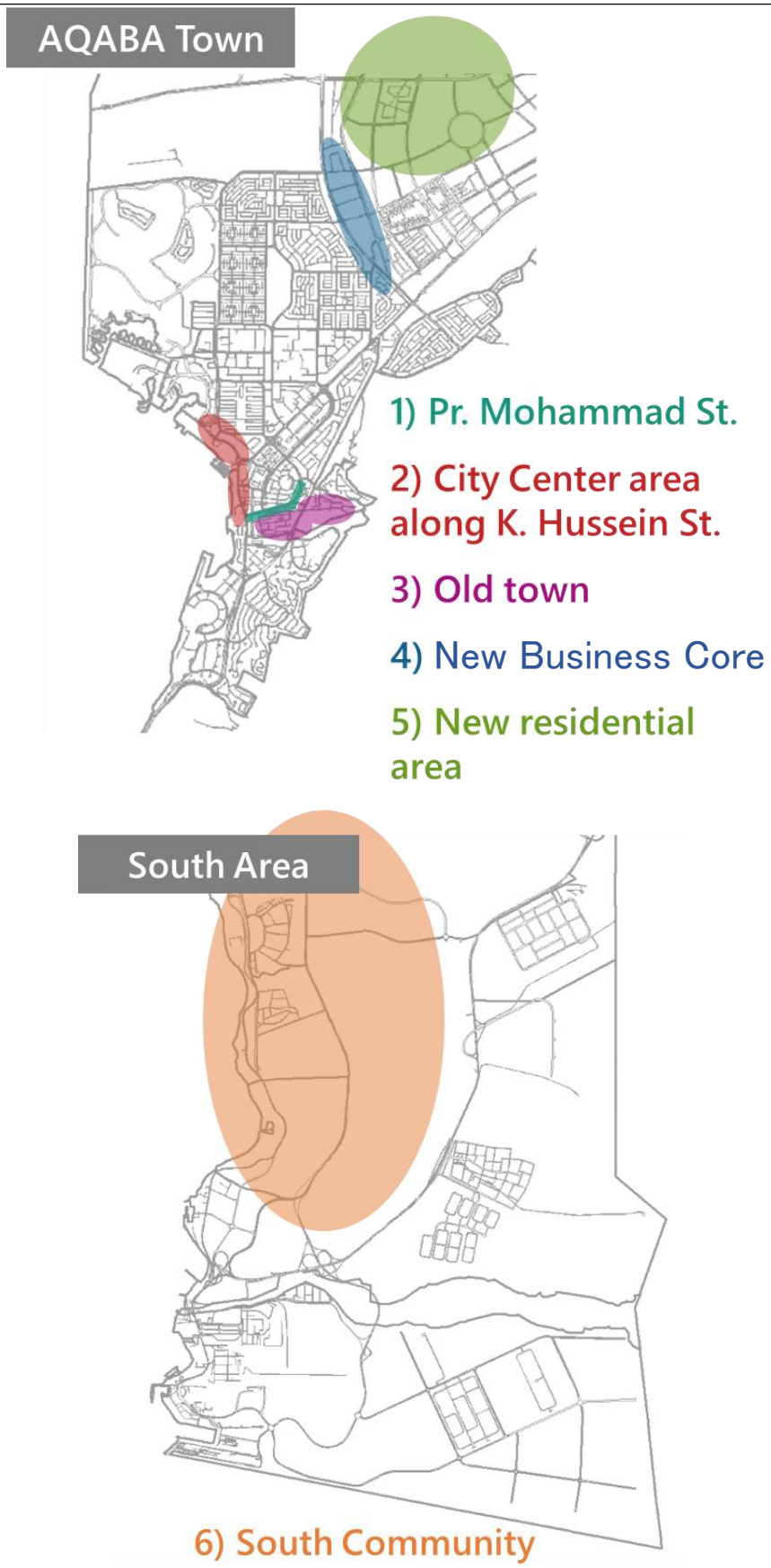
The area northeast of Aqaba Town, between Jordan Valley Highway and the Al-Shamiyah neighborhood, is planned to be developed as a new residential area for future resident growth.

#### 6) South Community

Area behind the public beach located in the southern part of ASEZ, will become the new community center of ASEZ. Currently, the rear portion of South Beach is only partially occupied by residences, and the area will be developed as a new core in the south.

Source: JICA Study Team

**Figure 6-48 View of the Shallalah area from Old Town over Mecca Street**




Source: JICA Study Team

**Figure 6-49 Priority Districts**

### (2) Urban design considerations and references for each priority district

Organize planning considerations and references based on the basic strategies of this M/P for the six priority districts listed above.

#### 1) Pr. Mohammad St. -Formation of roadside scenery with views of the Red Sea-

The Vista Line will be formed along the roadside streets down to the Red Sea, forming a Vista Line with scenic views.

**a) Quality of life: Development of pedestrian spaces that are enjoyable to walk in and provide the highest level of walkability**

- Crosswalks in the middle of the sidewalks will be grated with ramps without steps.
- Benches, rest areas, and planting strips should be provided along the sidewalks to create spaces where people can not only walk but also relax.

*[Reference case: Yokohama Motomachi Shopping St.]*

Source: JICA Study Team

**Figure 6-50 Crosswalks scrubbed with sidewalks (left) and sidewalks with rest areas (right)**

- Provide design-oriented signage and street furniture to encourage the creation of streets that are enjoyable to walk along and have character.

*[Reference case: Zou no hana park.]*

*The area associated with the opening of the Port of Yokohama, facing the wharf in the shape of an elephant's nose, has been developed as "ZOU-NO-HANA Park (Elephant nose park)" and elephants are used as a design motif in the area.*


Source: JICA Study Team

**Figure 6-51 Zou no hana park**


Source: JICA Study Team

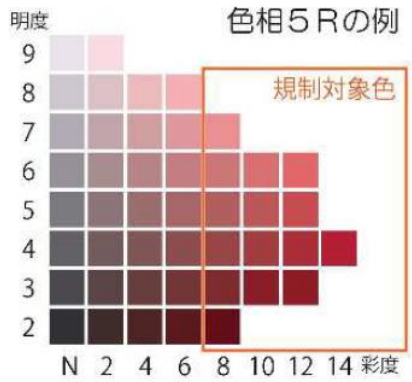
**Figure 6-52 Bollards in ZOU-NO-HANA Park with elephant motif**

**b) Opportunity of Business: Creation of roadside space to enhance the view**

- Outdoor advertisements for roadside commercial facilities, etc. shall be limited in width and use of high color saturation to complement the Red Sea that is the main view object.

*[Reference case: Kyoto City Outdoor Advertising Regulations]*

*The City of Kyoto has established regulations on colors and display methods of outdoor advertisements in accordance with the landscape characteristics of each district and the level of need for landscape formation. In order to harmonize with the landscape of historic shrines, temples, and traditional houses, outdoor advertisements and signboards using highly saturated colors as base colors are not allowed. Therefore, even global chains are required to use lower saturation colors for their store signage logos. The regulated values are based on the Munsell color system, which is the internationally used standard.*




Source: Kyoto City

**Figure 6-53 Example of R (red) regulated colors for outdoor advertising in Kyoto City**


Source: Study Team

**Figure 6-54 Outdoor signage for a fast-food restaurant near Kyoto Station with low red saturation**

- Encourage commercial establishments along the street to install outdoor terraces/outdoor seating and show windows, and to adopt glass facades on the ground floor to create a lively atmosphere to the street.

**c) Value of Environment: Promenade of scenic views to the Red Sea**

- The street from the hilltop of Pr. Muhammad St. to Revolt Plaza will be designated as the Vista Line, with the flag of Revolt Plaza and the Red Sea beyond as the visual target.
- To ensure visibility to the visual target, buildings along the Vista Line will be limited to low-rise buildings, and the planting of trees along the street will be prioritized with medium and low trees instead of tall trees.

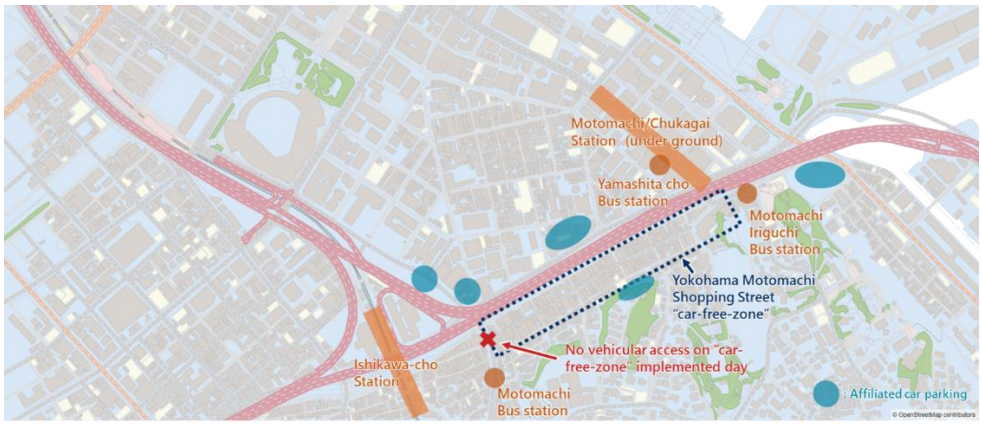
### 2) CBD area along K. Hussein St. -Flexible urban design encompassing diverse urban functions-

Existing town areas already have a certain density of urban setups, and the challenge is how to update and preserve the urban design and realize the urban vision that the new M/P aims to achieve, while utilizing the existing townscape.

**a) Quality of Life: Combination of convenience and comfort**

- Downtown is the heart of Aqaba, where beaches, resorts, commercial clusters, archaeological sites, and tourist hubs such as Revolt Plaza are located, and each area has its own character. Therefore, a detailed area-specific landscape plan will be established as necessary to ensure harmony in the broader area.
- In areas where commercial facilities are concentrated, it should be aimed to reduce passing traffic by establishing temporary car-free zones, increasing the width of sidewalks by reducing the number of lanes, and introducing Bonn Elf.

*[Reference cases: Yokohama Motomachi Shopping Street, San Kita Street, etc.] (reiterate)*




Source: JICA study team, based on Yokohama Motomachi Shopping Street Web site （https://www.motomachi.or.jp/access/）

**Figure 6-55 Reference case: Yokohama Motomachi Shopping Street, car-free zone designation (reiterate)**

- Signs and street furniture will be designed to match the characteristics of each street and area to encourage the formation of streets that are pleasant to walk on.

*[Reference case: Fukuyama City: Street furniture with a rose motif]*

*Fukuyama City is known as the "City of Roses" because of its efforts to restore its beautiful cityscape by growing roses in various parts of the city for postwar reconstruction. Based on this image, the city not only plant roses in public spaces, but has also developed street furniture with rose motifs.*

Source: Study Team

**Figure 6-56 Planting of public space with roses and benches with rose motif in Fukuyama City**

- In areas where buildings are already clustered on an aerial basis, the existing streetscape will be maintained and preserved while sequentially improving walkability as the streets and public spaces are gradually renewed and maintained.

*[Reference case in Japan: Redevelopment of National Route 2 around Sannomiya Station, etc.] (reiterate)*


East side from the present Sannomiya intersection

Phase 1
10 lanes → 6 lanes
(Target for FY2029)

Phase 2
Six lanes to three lanes

Source: Kobe City website
https://www.city.kobe.lg.jp/a55197/shise/kekaku/jutakutoshikyoku/kobetoshin/sannomiyacs_20200225.html

**Figure 6-57 Reference case: Image of roadway reduction and sidewalk widening in the Sannomiya Station area National Highway No. 2 redevelopment project (reiterate)**

**b) Opportunity of Business: Coexistence of history and liveliness**

- The broad commercial zone in the CBD will be guided and regulated by a design that encourages liveliness and intensive land use, and depending on the location, permits for large buildings and high-rise buildings and deregulation of outdoor advertising will be provided.
- Existing major architectural and archaeological sites such as mosques, the Aqaba Fortress, and the Ayla Ruins should be preserved. For development on adjacent sites, restrictions will be placed on the color and illumination of outdoor advertising, the color and finish materials of building facades, and the maximum height of buildings, in order to create a streetscape that makes the most of the historic resources of the area.
- Sign boards will be installed to communicate the value of these historic resources and the urban design features of the surrounding area, in order to pass on the history and foster awareness of urban design.

*[Reference case: Yokohama Waterfront District]*

*Sign boards are installed throughout the district to communicate the history of the district and the current urban design that has been formed by inheriting the history of the district.*


Source: Study Team

**Figure 6-58 Sign board showing the history of urban design around Yokohama Port**

- In Al Hafayer, to create a lively atmosphere around the beach, outdoor advertising with large stakes, high color saturation and illumination should be permitted within a certain height range that does not obstruct the view.

**c) Value of Environment: Creating an environment where everyone can feel close to the beach**

- Al Hafayer is an important hub for providing views and approaches to the Red Sea. In harmony with private development, only low-rise buildings should be allowed to provide views from King Hussein St.
- Develop a barrier-free route to the public beach.

*[Reference case: Azama San San Beach, etc.] (reiterate)*

Source: JICA Study Team

**Figure 6-59 Reference case: Universal design walkway of Azama Sansan beach (Okinawa, Japan) (reiterate)**

- The area east to the Princess Salma Park is a point where views of the Red Sea can be obtained together with the full view of the existing urban area, and in order to preserve the views from this area, height restrictions will be introduced on surrounding buildings.

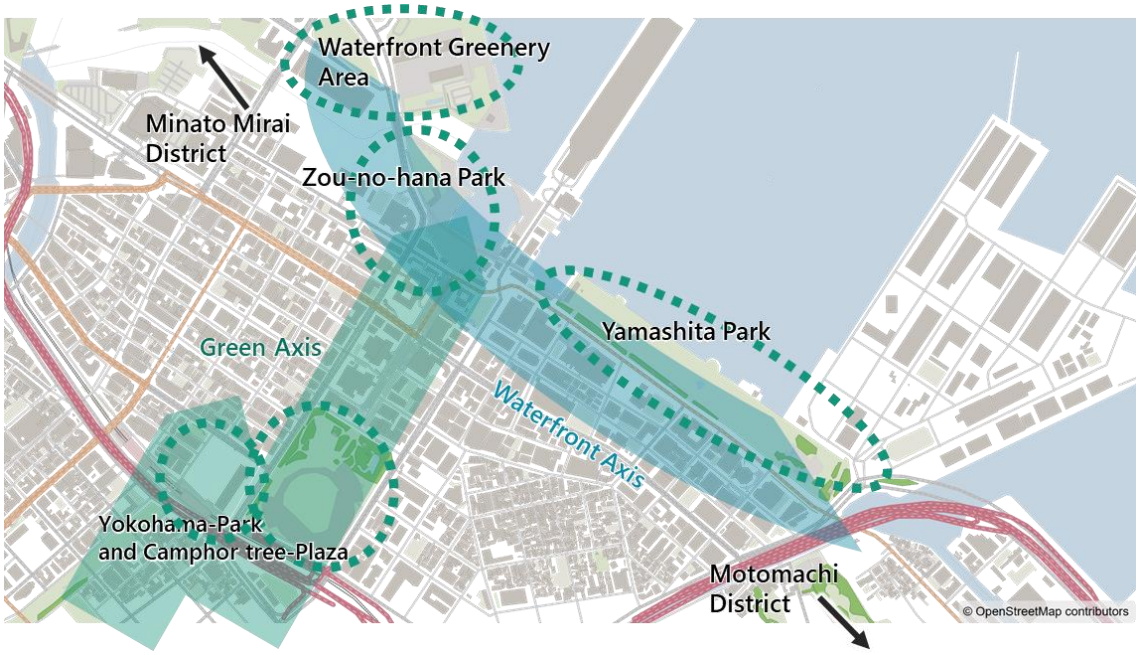
Source: JICA Study Team

**Figure 6-60 View from East side of Princess Salma Park**

- King Hussein St., considered as the main wide sidewalk on the walkable network, will be shaded with greenery utilizing existing planting strips, etc. Al-Hussein Bin Ali St. and King Abdullah Garden, which extend northeastward, will also be integrated with the park and pedestrian space to form a green axis that connects to the downtown area.

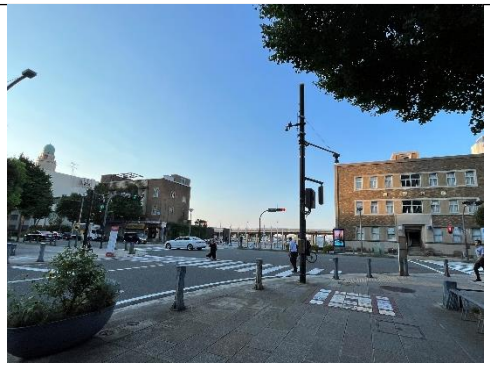
  *[Reference case: Yokohama City Green Axis and Waterfront Axis]*

  *In the waterfront area of Yokohama City, the "green axis" is a network of greenery and parks from the land to the sea, and the "waterfront axis" is a network of green areas, plazas, and waterfront spaces along the waterfront.*




Source: Study Team, https://www.city.yokohama.lg.jp/kurashi/machizukuri-kankyo/toshiseibi/design/mokuhyo/torikumi.files/0007_20230111.pdf

**Figure 6-61 Yokohama City Green Axis and Waterfront Axis**

Source: Study Team

**Figure 6-62 Pedestrian space on the green axis (left) and the intersection of the green and waterfront axes (right)**

### 3) Old Town/ Shallalah - Inheritance of traditional townscape-

The Old Town and Shallalah areas still contain some informal settlements and old residences and buildings, and there are some low-rise row houses in the area. The area is located on a slope to the mountain side, and there are few medium- to high-rise buildings in the district, so there are several points where views of the Red Sea can be obtained.

#### a) Quality of life: respecting the existing urban area and improving accessibility

- Respecting existing settlement patterns and styles, public sidewalk spaces in streets will be developed and expanded in line with the gradual renewal and maintenance of streets and public spaces to provide safe spaces for living.
- Shallalah area is separated from the other neighborhoods in ASEZ by the Mecca Street, which is extremely difficult for pedestrians to cross due to the high volume of traffic. The pedestrian walkway (pedestrian deck/underpass) connecting Shallalah area to the west side of Mecca Street will expand the walkable area for residents and improve accessibility to public services, etc.
- As presented in the current M/P, the old townscape of the area is one of the unique features of Aqaba. For new development, the basic concept is to keep in mind the harmony with existing buildings and to preserve the streetscape, by keeping the height of the buildings low, keeping the differences of the facades (color, finishing material) of the neighboring buildings minimum.

#### b) Opportunity of Business: Landscaping in harmony with the existing streetscape

- Considering the character of the existing streetscape, which consists of narrow alleys and low-rise buildings, only low-rise commercial and business facilities should be allowed to be located.
- In order to provide shaded space even in narrow alleys where it is difficult to locate street trees, commercial facilities should be set back from ground level to provide eaves.

#### c) Value of Environment: Development of spaces with views to the Red Sea

- As mentioned above, the availability of views to the Red Sea is a key feature of these districts. One idea is to utilize publicly owned land in the district to plan an observation plaza or other space where local residents and visitors can enjoy a panoramic view with

the old streetscape as the near view and the Red Sea as the far view.

Source: Study Team

**Figure 6-63 View of the Gulf of Aqaba from an alley in Old Town**

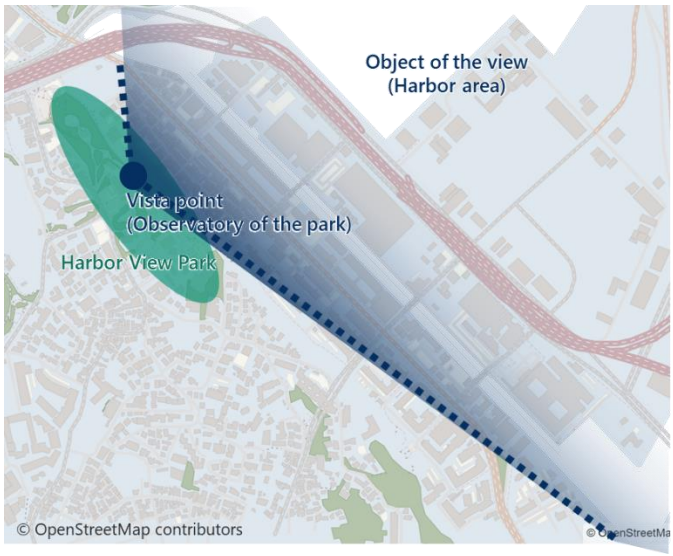
*[Reference case: Yamate urban landscape consultation district, Yokohama City.] (reiterate)*

*The concept to "Maintain good views from Yamate Hill to the harbor and city center, creating a landscape that is uniquely Yokohama as a port city." Is being set as a part of the policies for creating an attractive urban landscape.*

*Based on this concept, the district has established the following special provisions*

- *Views from viewpoints shall not be obstructed by buildings/structures.*
- *The design of buildings and structures shall not obstruct the view and shall promote the attractiveness of the view.*
- *The design of buildings and structures shall be considered in the vicinity of viewpoints to enhance the attractiveness of the view.*

*The observatory of "Harbor View Park" located on the hill of Yamate has been set as one of the viewpoints, and it is stipulated that the view from the viewpoints shall be preserved.*




Source: JICA Study Team

**Figure 6-64 Reference case: Vista point of Harbor View Park (Yokohama, Japan) (reiterate)**

Source: JICA Study Team

**Figure 6-65 Observatory of Harbor View Park(reiterate)**

Source: JICA Study Team

**Figure 6-66 Scenic view from a vista point of Harbor View Park(reiterate)**

#### 4) New Business Core- A new urban design forming a new gateway of ASEZ-

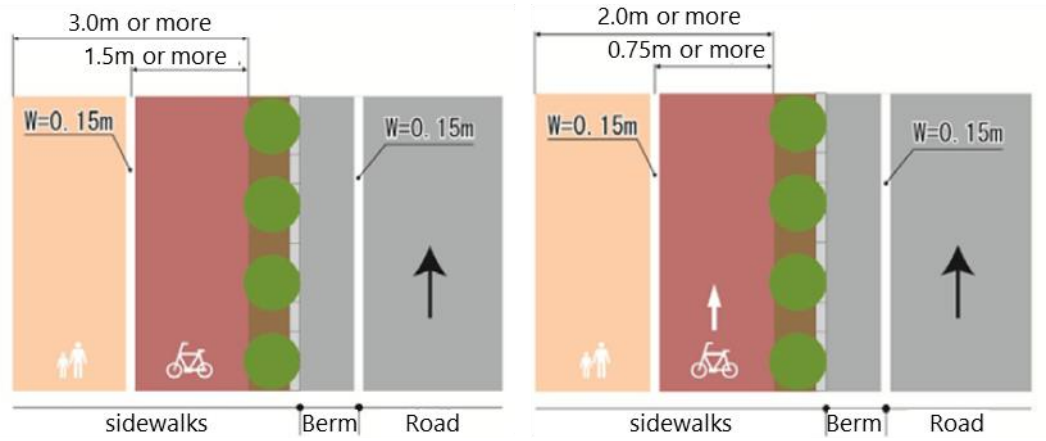
It is a new core that will be one of the centers of the ASEZ and is planned to have a concentration of advanced businesses. It is also an area where two highways intersect, and it is expected to be the gateway to Aqaba for visitors.

##### a) Quality of life: New and comfortable lifestyles

- Creation of a walkable living space through the development of safe and comfortable pedestrian spaces, centered on a walkable network connecting to downtown.
- Eliminate on-street parking by requiring each dwelling unit to have adequate parking attached.
- Develop a walkable network in the district with safe pedestrian paths, etc. that are wide enough to allow for separation of pedestrians and vehicles.

Source：https://www.photo-ac.com/

**Figure 6-67 Reference case: Pedestrian path with bicycle path**




Source: https://www.hrr.mlit.go.jp/kanazawa/douro/bicycle/img/pdf/pdf03.pdf

**Figure 6-68 Width regulations for integrating pedestrian and bicycle paths**

**(Left: Bicycles are allowed to pass in the opposite direction, right: Bicycles are allowed to go one-way in the same direction as motor vehicles)**

- It is also envisioned as a location for mid- to high-rise residential buildings that will accommodate new residents and others engaged in advanced industries. It is necessary to position the site as a center that presents a design image as a new hub, while preserving the view landscape and harmonizing with the existing downtown area. In particular, the north side of the district should be an area where new ways of living can be proposed by allowing the location of high-rise apartment complexes, since there is no risk of obstructing the view to the Red Sea.

**b) Opportunity of Business: Design guidance as a center for advanced industries**

- When developing public facilities that will serve as the symbolic gateway to the New Core, such as the observation facilities shown below, a competition will be held to solicit outstanding new design proposals and names from Japan and overseas.

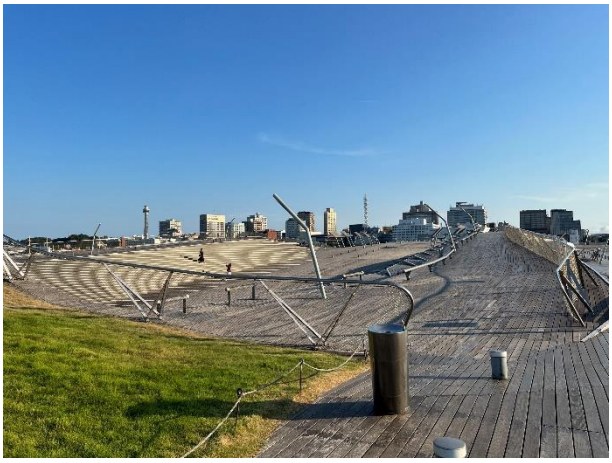
  *[Reference example: Yokohama Osanbashi International Passenger Terminal]*

  *A large-scale international design competition was held for the passenger terminal facility, which will become a landmark of the Port of Yokohama. The design motifs include*

*ships, waves. Each area of the terminal is connected by ramps rather than stairs, providing a continuous spatial experience for visitors. The facility also includes restaurants, hall, tourist information center, and rooftop plaza, making it a base facility that can be freely used not only by cruise ship passengers, but also by tourists and residents.*

Source：https://www.photo-ac.com/

**Figure 6-69 Yokohama Osanbashi International Passenger Terminal**



Source：Study Team

**Figure 6-70 Rooftop Plaza of Yokohama Osanbashi International Passenger Terminal**

- Large-scale business facilities and mixed-use (commercial and business) facilities related to advanced industries are also expected to be located. The location of mid- to high-rise buildings should be allowed, and a modern image should be encouraged in terms of design by inducing facades other than stone, stucco or white paint, such as curtain walls.
- In order to reduce the sense of oppression along the road, for large/mid-rise buildings, a large setback including fences should be secured on the site, and public open space should be provided at the location facing the road.
- Provide an adequate number of incidental parking spaces for large/mid-rise buildings as they are located.
- Establish design rules for buildings located on major streets in the district to create a sense of unity and liveliness by establishing uniform wall lines and design rules.

*[Reference case: Motomachi Shopping Street]*

*In Motomachi Shopping Street in Yokohama City, when constructing buildings along the street, (1) setbacks of at least 1.8 m in width and 3 m in height are secured from the front road, (2) the space in front secured by the setback is used as pedestrian space, and (3) building height is limited to ensure visibility to the sky from the street. (4) the installation of lighting and show windows are encouraged to create a lively atmosphere and (5) mandatory consultation is made with the district's cooperative association regarding the design of the building.*


Source：Study Team

**Figure 6-71 Streetscape Formation of Motomachi Shopping Street**

**c) Value of Environment: Scenic view suitable for the gateway to the ASEZ**

- The area at the intersection of Jordan Valley Highway and Aqaba Highway has an unobstructed view to the Red Sea. A tall observation facility and plaza will be planned in this area to serve as a gate function and symbol of the New Core.

Source：Study Team

**Figure 6-72 View from New Core intersection point**

- While medium- to high-rise buildings are allowed in this district, consideration should be given to the view landscape, for example, by limiting the location to the mountain side.

**5) New Residential Area -Creating a Competitive and Attractive Living Environment-**

Although the New Residential Area is dotted with a few residences that have already been built, full-scale development, including infrastructure, is planned for the future. As Aqaba's population is targeted to grow significantly, it is very important to propose new residential areas that are attractive to residents moving from other cities and countries.

**a) Quality of life: Embraces a variety of lifestyles**

- In addition to providing adequate pedestrian space along existing arterial roads, a walkable network in the district that are wide enough to allow separation of pedestrians and vehicles will be developed through safe pedestrian paths and other means.
- Eliminate on-street parking by requiring each dwelling unit to have adequate parking attached.
- Promote the creation of green residential areas by designating setback distances for walls and retaining walls on residential lots and providing a planting strip between the wall and the front street, thereby alleviating the closed nature of the area and promoting the creation of green residential areas. In addition, by standardizing the setback distance for residential lots along the street, it will lead to the formation of an integrated green belt along the street, thereby improving the comfort and appearance of the landscape.

  *[Reference case: Higashiyama-foothills residential area in Kobe City] (reiterate)*

Source：Kobe city landscape guidelines https://www.city.kobe.lg.jp/documents/52545/_kobecity_guideline_220331s.pdf

**Figure 6-73 Reference case: Setbacks along the road in residential area (Kobe, Japan) (reiterate)**

- New Residential Area will be divided into several districts, and by arranging height restrictions, floor area ratio/building-to-land ratio, color restrictions, etc. for each district, the goal is to create highly competitive residential area in the region that embrace diverse lifestyles and values. In particular, the area will provide a way of living that could not be found in the existing town, such as mid- to high-rise apartment complexes and single-family residential areas.

**b) Opportunity of Business: Development of Commercial Facilities to Support Lifestyle**

- A mid- to low-rise neighborhood commercial zone will be established in the district to induce commercial functions, creating a space that will be the center of activity in the district, thereby encouraging the formation of a well-defined residential landscape. For neighborhood commercial facilities, the design will be guided to bring liveliness by recommending facade design using glass for show windows, etc., and setbacks to secure a generous pedestrian space in front of stores.

- Allow the location of mid- to high-rise and mixed-use (commercial and business) facilities in some areas, along with mid- to high-rise residential complexes, to present a new urban landscape that is not found in existing residential areas.

**c) Value of Environment: Green space arrangement that allows people to feel close to nature**

- It is desirable to develop parks, plaza spaces, etc. in each district within the area, and to develop public playgrounds, gathering spaces and green spaces that can be used by everyone.
- Plant street trees that form green shade along the walkable network in the area and connect parks and plazas to form a green network where people can comfortably walk and move around.

**6) South Community -Creating a new hub connecting the sea and the mountains-**

South Beach and its backlands are positioned as a Regional Interaction Hub, to provide services for residents and visitors in the south of Aqaba. Although a portion of South Beach and a certain number of residences have already been developed, infrastructure improvements have not yet been completed. For future development, it is desirable to establish a unique landscape plan and guide the formation of an attractive center that will be chosen by new residents and visitors.

**a) Quality of life: Providing a rich living environment with variety of options**

- South Beach and the hinterland are divided into east and west by the several horizontal roads and multiple safe highway crossings should be provided to ensure spatial continuity.
- The residential areas in the hinterland are expected to attract new types of residents, such as second homes, vacationers, and workers of high-tech industry. Therefore, the district will be formed to provide a living environment with design diversity and choice by establishing not only low-rise residential buildings that have already been developed, but also medium- and high-rise residential zones and zones that allow mixed uses, such as residential and commercial.
- Plan residential areas with low-rise, low-density detached houses. Designate a high greening ratio for these uses, allow roofs other than flat roofs, encourage natural material finishes, etc., to encourage a unique resort design that differs from the existing urban area.

**b) Opportunity of Business: Induce commercial design with distinctive features for each function**

- Induce low-rise commercial facilities to locate in the vicinity of the beach. Encourage commercial facilities to have sufficient ground-level setbacks to provide continuity with the roadside. Focus on bringing color and liveliness to the area through deregulation of color, high greening rates, and the development of street furniture, etc.
- Allow roadside commercial and public facilities to be mid-rise with a certain separation from the beach. To reduce the oppressive feeling of the roadside, a large site setback, including fences, should be secured for mid- and high-rise buildings, and public open space should be provided at locations facing the road.
- For neighborhood commercial facilities for neighborhoods in the hinterland, guide designs that bring liveliness, such as facade designs with show windows and other glass,

and encourage setbacks to ensure a generous pedestrian space in front of stores.

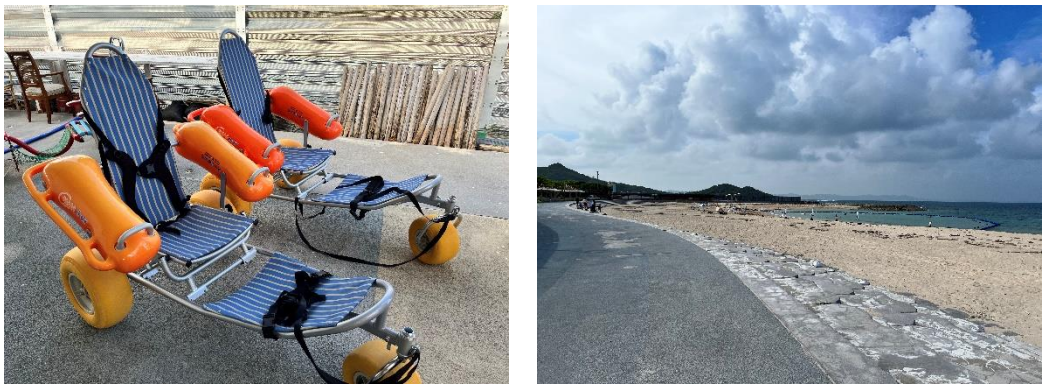

Source：Study Team

**Figure 6-74 Sidewalk design for Motomachi Shopping Street**

**c) Value of Environment: Providing a relaxing and comfortable beach space for all**

- The hinterland is sloped toward the mountain side. It is important to create a viewpoint place to view the Red Sea, and to regulate and guide the height, architectural form and design, and outdoor advertising to preserve the view, in order to create a sense of landscape unity and continuity.
- Barrier-free routes to provide access to the beach should be developed and universal design should be incorporated into the beach.

  [Reference case: Azama sansan beach]



Source：Study Team

**Figure 6-75 Barrie-free equipment(left), path with slopes on the beach(right)**

- Create a green network integrated with pedestrian space that connects the beach to the hinterland, creating a highly walkable neighborhood with green shade. The tree species and plantings used in the green network will be distinctive, creating a green space unique to South Beach and differentiating it from other neighborhoods.

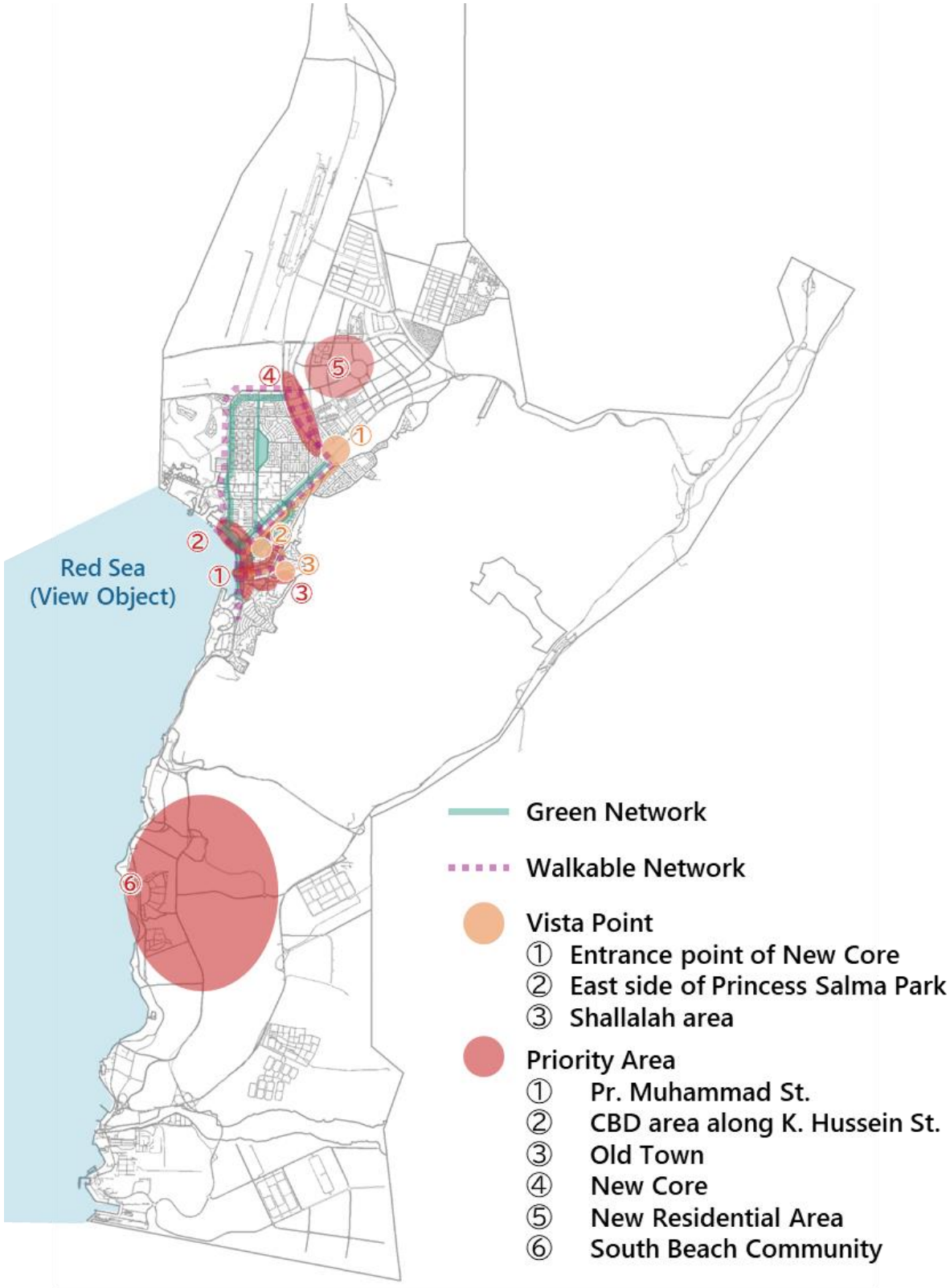
  [Reference case: *Yokohama City Green Axis and Waterfront Axis*](Refer to Figure 6-61)

The next page lists the urban design strategies for the priority districts.

| | 1) Pr. Mohammad St. | 2) CBD area along K. Hussein St. | 3) Old Town/ Shallalah | 4) New Business Core | 5) New residential area | 6) South Community |
|---|---|---|---|---|---|---|
| Concept | **Formation of roadside scenery with views of the Red Sea** | **Flexible urban design encompassing diverse urban functions** | **Inheritance of traditional townscape** | **A new urban design forming the new gateway of ASEZ** | **Creating a Competitive and Attractive Living environment** | **Creating a new hub connecting the sea and the mountains** |
| a)<br>Quality of Life | **Development of pedestrian spaces that are enjoyable to walk in and provide the highest level of walkability**<br>・Crosswalks in the middle of the sidewalks will be grated with ramps without steps.<br>・Benches, rest areas, and planting strips should be provided along the sidewalks.<br>・Provide design-oriented signage and street furniture. | **Combination of convenience and comfort**<br>・In areas where commercial facilities are concentrated, reduce passing traffic by establishing temporary car-free zones, increasing the width of sidewalks by reducing the number of lanes, and introducing Bonn Elf.<br>・In areas where buildings are already clustered on an aerial basis, the existing streetscape will be maintained and preserved while sequentially improving walkability as the streets and public spaces are gradually renewed and maintained.<br>・Provide design-oriented signage and street furniture. | **Respecting the existing urban area and improving accessibility**<br>・While respecting existing settlement patterns and styles, public sidewalk and public spaces on streets will be developed and expanded in line with the gradual renewal and maintenance of streets to provide safe spaces for living.<br>・Improve walkability by creating pedestrian paths connecting Shallalah to the west side of Mecca St.<br>・To harmonize with existing buildings and preserve the streetscape, any new building should be designed with low height and the facade should be finished to minimize differences in hue and materials from neighboring buildings. | **New and comfortable lifestyles**<br>・Eliminate on-street parking by requiring each dwelling unit to have adequate parking attached.<br>・Develop a walkable network in the district with safe pedestrian paths wide enough to allow the separation of pedestrians and vehicles.<br>・The north side of the district will be an area where new ways of living can be proposed by allowing the location of high-rise apartment complexes. | **Embraces a variety of lifestyles**<br>・Eliminate on-street parking by requiring each dwelling unit to have adequate parking attached.<br>・Develop a walkable network in the district with safe pedestrian paths wide enough to allow the separation of pedestrians and vehicles.<br>・A planting strip between the fence of the house and the front street will promote the formation of a green residential area. Residential lots along the same street will have a unified setback distance to form a green belt.<br>・The area will offer a living environment that is different from the Existing Town, such as mid- to high-rise apartment complexes and single-family residential areas. | **Providing a rich living environment that can present a variety of options**<br>・Provide safe crossings of South Beach Highway separating South Beach from the hinterland at multiple locations to allow pedestrian traffic to and from the area.<br>・The plan is to develop residential area with mainly low-rise, low-density detached houses. For these sites, we recommend a resort-like design that differs from existing urban areas by 1) specifying a high greening ratio, 2) allowing roofs other than flat roofs, and 3) encouraging finishes using natural materials. |
| b)<br>Opportunity of Business | **Creation of roadside space to enhance the view**<br>・Outdoor advertisements for roadside commercial facilities, etc. shall be limited in width and use of high color saturation to complement the Red Sea that is the main view object.<br>・Encourage commercial establishments along the street to install outdoor area and show windows, and to adopt glass facades on the ground floor to create a lively atmosphere to the street. | **Coexistence of history and liveliness**<br>・The broad commercial zone in the CBD will be guided and regulated by a design that encourages liveliness and intensive use, and depending on the location, permits for large buildings and high-rise buildings and deregulation of outdoor advertising will be permitted.<br>・For development on adjacent sites of historical sites, restrictions will be made on the color and illumination of outdoor advertising, the color and finish materials of building facades, and the maximum height of buildings, in order to create a streetscape that makes the most of the historic resources of the area. | **Landscaping in harmony with the existing streetscape**<br>・Only low-rise commercial and business facilities should be allowed to be located, and facades should be finished in a manner that minimizes differences in hue and materials from neighboring buildings.<br>・In order to provide shaded space even in narrow alleys where it is difficult to locate street trees, commercial facilities should be set back from ground level to provide eaves. | **Design guidance as a center for advanced industries**<br>・For the development of the public facilities that will serve as the symbolic gateway of the area, a competition will be held to solicit outstanding new designs from around the world.<br>・Large-scale business/mixed-use facilities related to advanced industries should be permitted to be mid-rise, and a modern image should be encouraged by inducing curtain wall facades, etc.<br>・When constructing large/medium high-rise buildings, ensure the following items. 1)provide open space at street-facing locations. 2)provide enough parking.<br>・Design rules will be established for buildings located on major streets in the district to create a unified streetscape. | **Development of Commercial Facilities to Support Lifestyle**<br>・Establish a mid- to low-rise neighborhood commercial zone to guide commercial functions within the district.<br>・Neighborhood commercial facilities should be encouraged to use glass facade design and setbacks to provide ample pedestrian space in front of stores.<br>・Allow the location of mid- to high-rise, mixed-use facilities in some areas in conjunction with mid- to high-rise multi-family residential buildings. | **Induce commercial design with distinctive features for each function**<br>・Low-rise commercial facilities should be encouraged to be located in the vicinity of the beach. Commercial facilities are encouraged to have sufficient ground level setbacks to create continuity with the street. Relax color restrictions and set high greening rates to create a lively district.<br>・Roadside commercial and public facilities will be allowed to mid- to high-rise as long as they are located away from the beach. Public open space shall be provided at the street front of the site.<br>・Neighborhood commercial facilities should be encouraged to use glass facade design and setbacks to provide ample pedestrian space in front of stores. |
| c)<br>Value of Environment | **Promenade of scenic views to the Red Sea**<br>・The street from the hilltop of Pr. Mohammad St. to Revolt Plaza will be designated as the Vista Line, setting the flag of Revolt Plaza and the Gulf of Aqaba beyond as the main visual target.<br>・To ensure visibility to the visual target, buildings along the Vista Line will be limited to low-rise buildings, and the trees planted along the street will be prioritized with medium and low trees instead of tall trees. | **Creating an environment where everyone can feel close to the beach**<br>・In Al Hafayer area, only low-rise buildings should be allowed to secure the view of the Red Sea.<br>・Develop a barrier-free route to the public beach.<br>・In order to preserve the views from east side of Princess Salma Park, height restrictions will be placed on surrounding.<br>・A network of pedestrian paths will be developed to connect the beach, park, and plaza spaces, creating a green shade provided by street trees. | **Development of spaces with views to the Red Sea**<br>・Utilize publicly owned land in the district for an observation plaza where local residents and visitors can view the Red Sea in the distance, with the old townscape in the near distance. | **Vista point suitable for the entrance of ASEZ**<br>・A tall observation tower is planned at the intersection of Jordan Valley Highway and Aqaba Highway to serve as a gateway and symbol of the area. | **Green space arrangement that allows people to feel close to nature**<br>・Develop parks/plaza in each district within the area, and develop public playgrounds, gathering spaces and green spaces that can be used by everyone.<br>・Plant street trees that form green shade along the walkable network in the area and connect parks and plazas to form a green network where people can comfortably walk and move around. | **Providing a relaxing and comfortable beach space for all**<br>・Barrier-free routes to the beach should be developed and universal design should be incorporated into the beach.<br>・Create a green network within the district. Differentiate the district by creating a green space unique to South Beach through the use of distinctive tree species and plantings. |

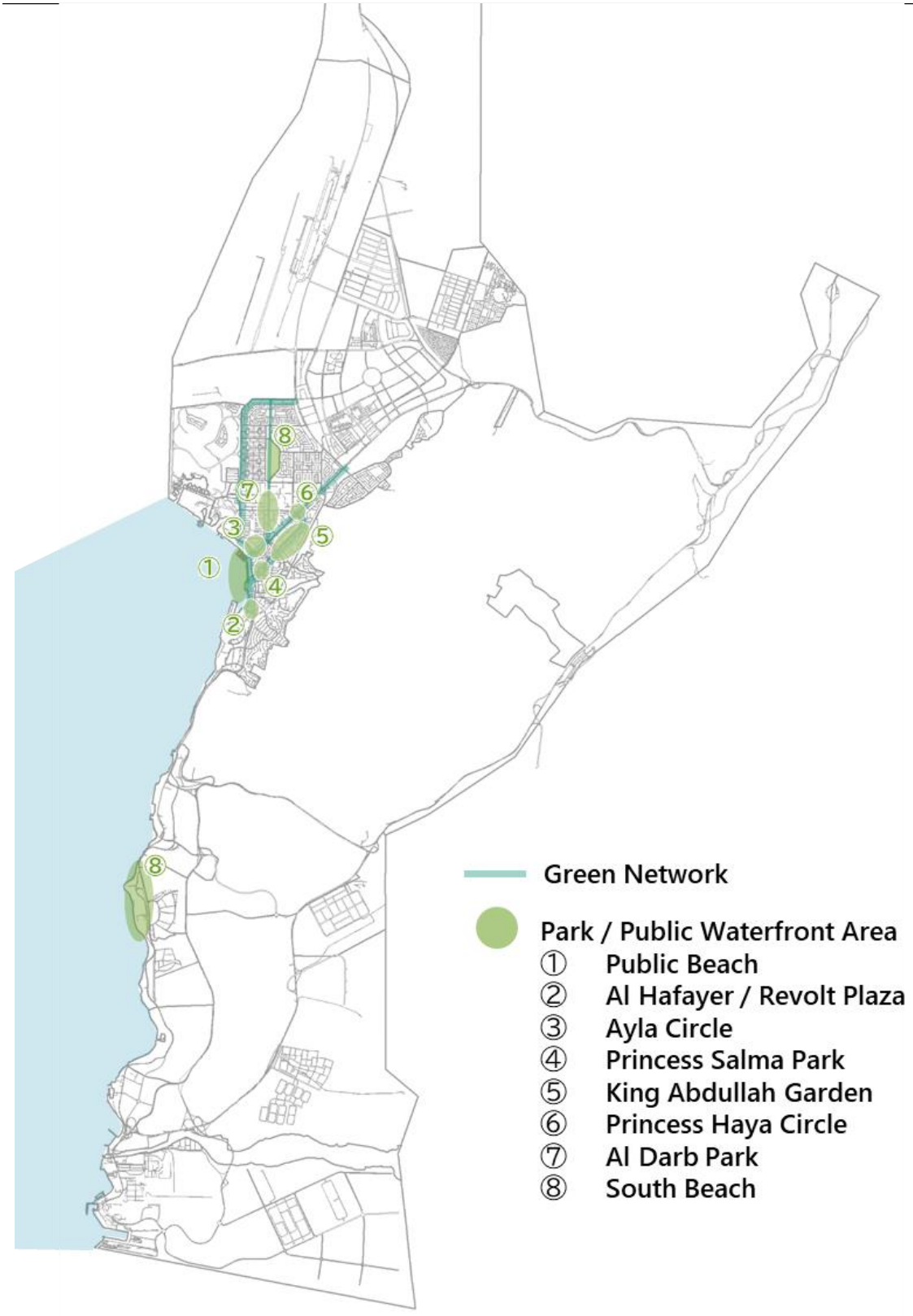
### 6.2.6 Urban Design Strategy Map

The urban design strategy map created based on the recommendation in this chapter is shown below.



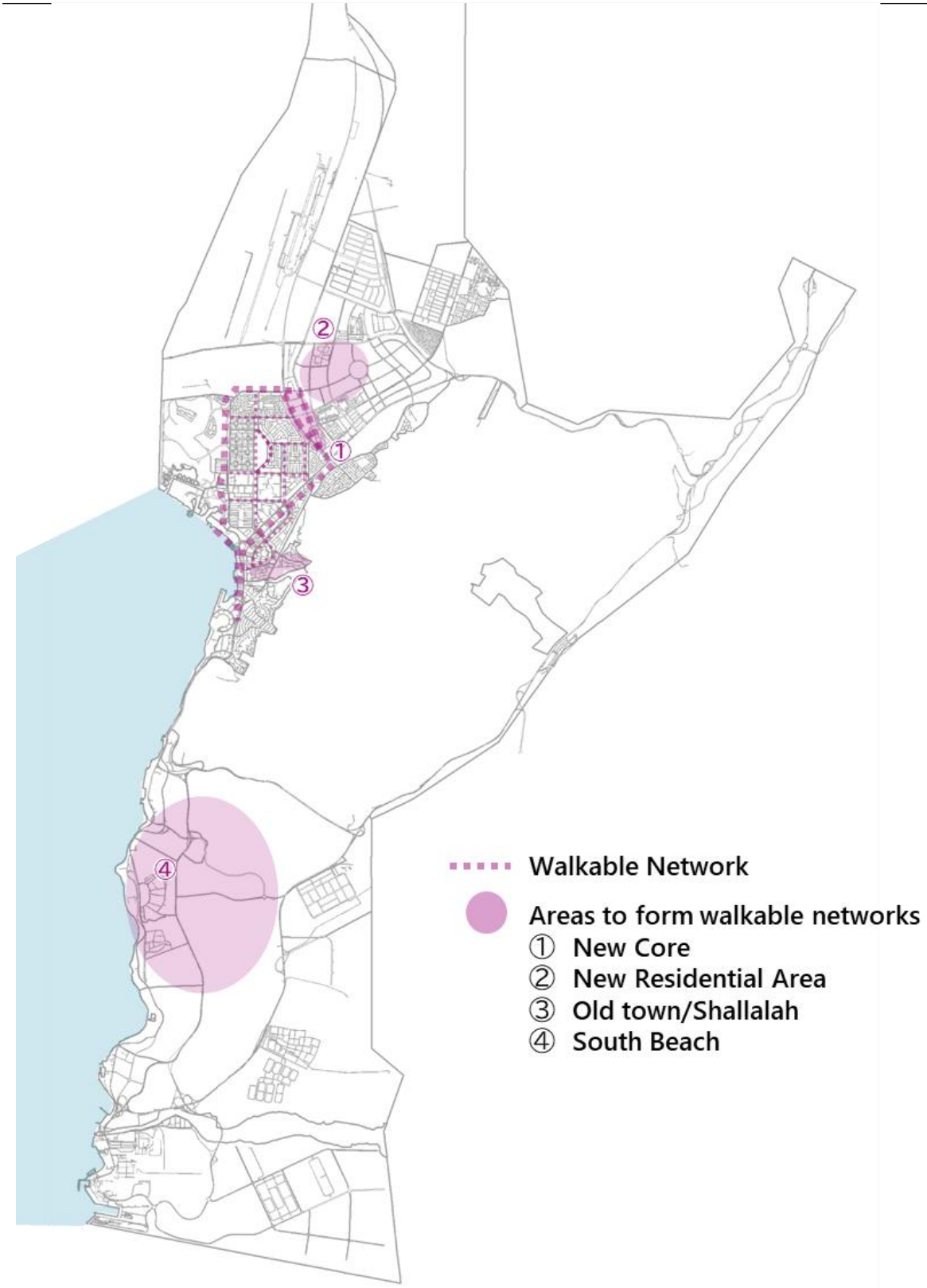

Source：Study Team

**Figure 6-76 Urban Design Strategy Map (Integrated)**




Source：Study Team

**Figure 6-77 Urban Design Strategy Map (Green)**




Source：Study Team

**Figure 6-78 Urban Design Strategy Map (Walkability)**

## 6.3 Work Items Needed for Updating Design Guidelines/Manual

### 6.3.1 Review of existing D/G

#### (1) Positioning of existing D/G

As previously reported, ASEZ has already developed a D/G based on the ASEZA Master Plan 2001-2020. Although the ASEZA Master Plan 2001-2020 has expired, the D/G is still in use by the building administration in ASEZ.

The existing D/G is not merely a guideline for landscape and urban design but covers a wide range of topics as shown below, and can be regarded as a collection of regulations for the planning, design, and construction of various facilities and spaces in ASEZ.

- Role of organizations that serve as review bodies in ASEZA
- Procedures and flow at the time of construction
- Quantitative regulations for building design in general and by district
- Designation of tree species that can be planted
- Road configuration, structure, and design guidelines
- Designation of conservation areas
- Provisions for the maintenance of street lighting
- Regulations on construction and installation
- Provisions for signage, etc.

On the other hand, it should be noted that the D/G is not structured in a way that the direction of the master plan, future image of the city and the policies on landscape planning that ASEZ should aim for can be understood and shared in a unified manner.

TABLE OF CONTENTS



Source: ASEZ Design Guidelines

**Figure 6-79 Table of contents of existing ASEZ Design Guidelines**

This section summarizes items and procedures that may need to be considered as guidelines for "Landscape and Urban Design" (hereinafter referred to as "Urban Design Guidelines") when updating or revising a new D/G.

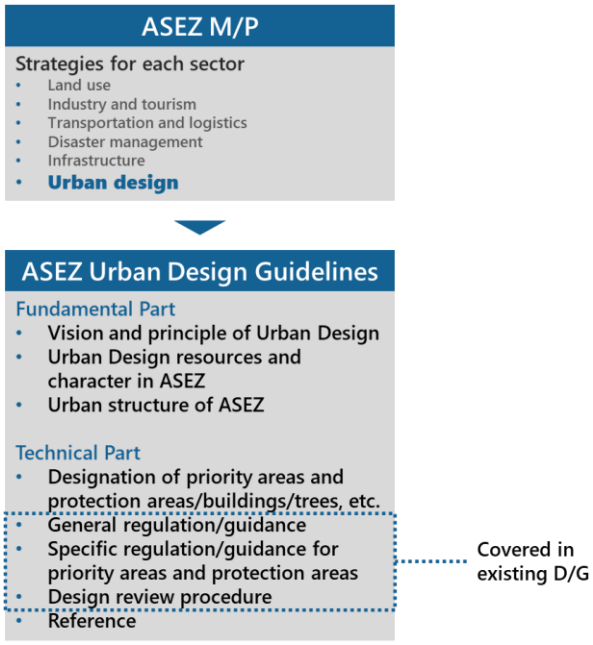
### (2) Approach to updating and revising urban design guidelines

As the city develops in the future, it is expected that an even greater variety of businesses, investors, and designers will be involved in development of ASEZ. It is essential to have the stakeholders with various backgrounds and values to understand the vision and policy of urban landscape formation, landscape resources and urban structure that form Aqaba's uniqueness to form a city of 545,000 people with excellent urban design.

Therefore, it is recommended that the updated urban design guideline should have a chapter in the first part that serves as a general introduction to organize the ideas underlying the

landscape and urban design of ASEZ based on the updated M/P, followed by chapters that present specific and technical details of each field.

During the implementation of the urban development, when questions arise during the review of each plan, or when it becomes necessary to change or add specific regulations, guidance, and specially designated areas, or when exceptional measures are required, these basic ideas will serve as the basis for monitoring and judgment, and will enable consistent and convincing operation.




Source: JICA Study Team

**Figure 6-80 Relationship between urban development M/P and Urban Design Guidelines and proposed structure of Urban Design Guidelines**

### (3) Work items for updating and revising the urban design guidelines

#### 1) Fundamental Part

#### a) Formulation of vision and principles in landscape and urban design

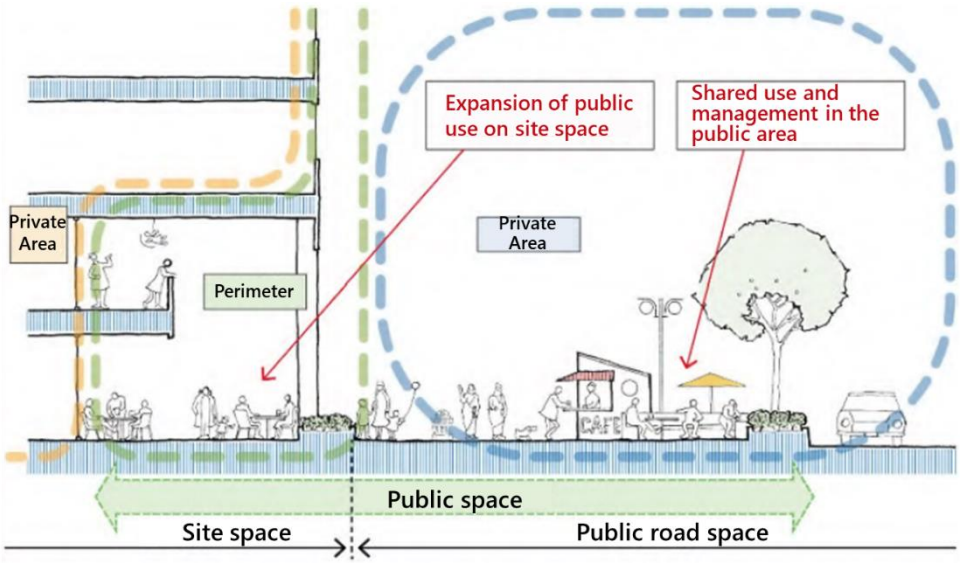
Based on the vision of the new urban development M/P and the three basic strategy in the M/P: Quality of Life, Opportunity of Business, Value of Environment, the vision and policies for landscape and urban design goals in the ASEZ will be organized.

This item is a fundamental part of the guidelines, and the content must be convincing to local residents. Therefore, one option for vision development is to develop a draft within ASEZA, followed by workshops, questionnaires, etc. to exchange opinions with local residents, and to develop the vision with their participation. Another effective way to improve the recognition and understanding of the formulated vision is to create a slogan for the urban design guidelines.

The policy is to present ASEZA's approach (scope of the regulations, perspective, etc.) to landscape and urban design administration, and to provide guidelines for future review of individual plans and further updating and revising urban design guidelines, aiming to make the guidelines monitorable in the future.

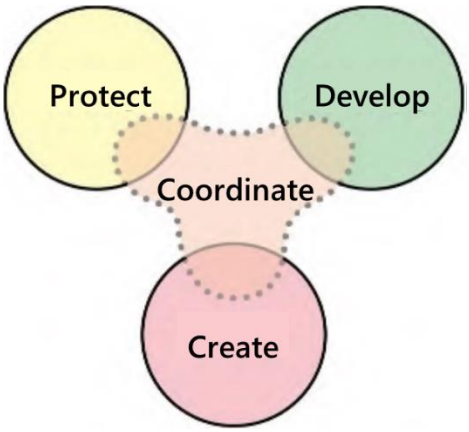
Moreover, these guidelines will be clarified for all stakeholders not just through written text but also by including conceptual diagrams and similar explanatory elements wherever possible.

In addition, this item should be provided to investors and designers at the beginning of the planning process as a document showing the basic items to be complied with and applied to Mega Projects, which are not covered by the current D/G. At the same time, this item should be used as clear criteria for reviewing and monitoring the contents of plans of each Mega Project.




Source: Kobe City Basic Policy for Urban Landscape Formation,
https://www.city.kobe.lg.jp/documents/49368/kihonkeikaku_gaiyoban.pdf

**Figure 6-81 Example of presenting the area of urban space subject to landscape formation as a basic policy for urban design planning (Kobe City)**




Source: Kobe City Basic Policy for Urban Landscape Formation,
https://www.city.kobe.lg.jp/documents/49368/kihonkeikaku_gaiyoban.pdf

**Figure 6-82 Three directions of landscape planning and images of their coordination (Kobe City)**

### b) Resources of landscape and urban design

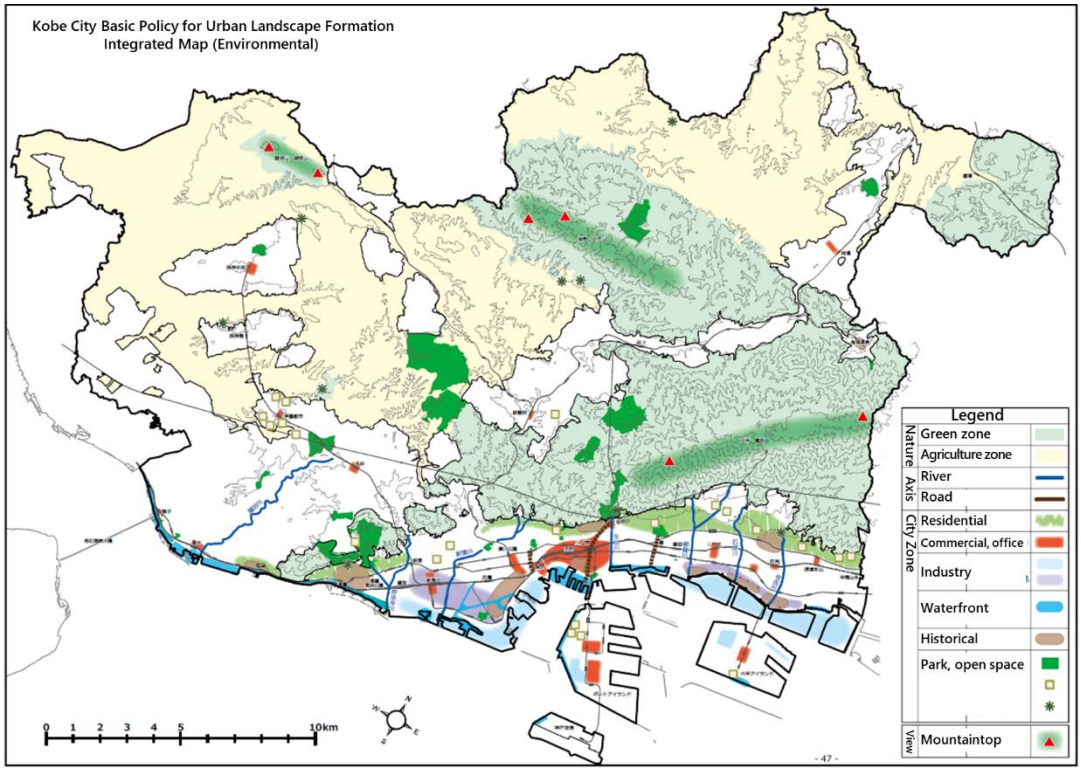
In addition to the contents organized in the design reference, it is considered that the consultation with the residents again at the stage of urban design guideline formulation will enable the urban design guidelines to be more attached and familiar to the community.

For example, multiple community workshops could be held by residential area to freely exchange opinions on Aqaba's landscape, urban design resources and features, as well as to ask local residents to provide photographs of their own design resources and features to be included in the guidelines.

This type of participatory urban design planning has been adopted in Japan, and it is an effective means of fostering civic pride and raising awareness of community development.

**c) Urban structure**

Based on the urban structure, land use, zone classification and urban design strategy in the updated urban development M/P, the urban structure from the landscape plan perspective should be organized and presented as a diagram with a list.




Source: Kobe City Basic Policy for Urban Landscape Formation,
https://www.city.kobe.lg.jp/documents/49368/kihonkeikaku_gaiyoban.pdf

**Figure 6-83 Kobe City Basic Policy for Urban Landscape Formation Integrated Map (Environmental)**

## (4) Technical Part

The contents of this item are likely to be revised according to actual conditions and demands even after the new urban design guidelines are established and enforced. Therefore, it is very important to clearly state the policy for selection and judgment in each item, as it will serve as the basis for monitoring and judgment.

**a) Designation of priority areas and protection areas/buildings/trees, etc.**

In addition to the priority districts identified in the Design Reference, additional priority areas will be considered in the process of public participation.

For conservation areas, review and consideration of adding new areas will be made based on the areas designated in the existing D/G.

In addition, buildings and trees that have been suggested to have high historical and scenic preservation value in the process of studying landscape and urban design resources will be designated as preservation objects to prevent demolition and cutting down due to new development.

When designating these areas, etc., the policy for designation should be clearly stated, based on the ideas following the "Vision and Policy in Landscape and Urban Design" in order to monitor future increases or decreases in designation and to enable consistent decisions.

Source: JICA Study Team

**Figure 6-84 Example of a possible conservation building: remains of the oldest building in Aqaba**

**b) General regulation/guidance**

The existing D/G description should be updated based on the development zones, land use, road network, and current conditions by zone, as indicated in the new M/P.

New regulations and guidance should be proposed for the new building types proposed in the updated M/P, such as low-rise residential, high-rise residential, neighborhood commercial, commercial, and mixed-use areas. Since there are already many buildings that have been developed based on the existing D/G, it is important to set values and standards that are in harmony with these existing buildings.

In addition, the content of the regulations should be organized as easy-to-understand documents for wide range of business operators and designers, not only with text but also with explanatory diagrams with dimensions, image diagrams, and color guides such as RGB value, which are quantitative judgment criteria.

**c) Specific regulation/guidance for priority areas and protection areas**

For each of the urban design priority districts, the characteristics and positioning of the district, landscape planning strategies, and regulations and guiding items necessary to realize these strategies will be organized.

For those items that are to be made stricter or more relaxed based on the characteristics of the district in comparison with general regulations and guidance items, it is necessary to describe the intent and policy of the establishment of such items so that the purpose can be easily understood by everyone, and so that it can serve as a basis for judgment when changing values, etc. in the future.

In addition, since these intensive regulations and guidance may lead to infringement of private rights, it is necessary to conduct a survey of the ownership status of each land within the designated priority landscape district, and to set up opportunities for briefings and opinion exchange meetings with residents and landowners, as necessary.

**d) Design review procedure**

It is desirable to update the descriptions in the existing D/G to the current organization and system, and to organize the flow of the examination with schematic diagrams, etc.

In addition to organizing the specific contents of application documents that need to be submitted for review, it would also be effective for ASEZA to develop and provide drawing frames and formats of documents to be submitted, in order to facilitate the application process for everyone.

In the event of reorganization of ASEZA or changes in the format, it would be necessary to update this item as well, so it would be one option to not include procedural methods and formats in the guidelines, but to consolidate the information on the official ASEZA website along with the pdf data of the guidelines, and update it as needed.

**e) References**

In addition to the existing D/G, the current ASEZA design and construction review process requires compliance with detailed land use plans for each neighborhood in ASEZ, as well as individual bylaws such as Design Standards, which are a compilation of building regulations. However, the relationship between these and D/G has not been organized at this time.

When updating the Urban Design Guidelines s, it is necessary to organize the relationship, outline, and sources of the plans and regulations to be referred to in order to ensure consistent landscape community planning without rework, and to establish a situation in which necessary information on design can be obtained centrally by reading the Urban Design Guidelines.

It should be noted that this item also needs to be revised whenever related rules and regulations are updated, changed, or added, and cooperation with related departments is essential.

**f) Preparation of a summary**

In order to disseminate the updated/revised guidelines to a wide range of stakeholders, it is desirable to prepare a summary version of the updated/revised guidelines that briefly summarizes the contents in few pages, and to publish it together with the main body of the guidelines on ASEZA's official website, etc.

### 6.3.2 Points to note regarding updating and operating urban design guidelines

**a) Formulation phase**

As mentioned above, the current D/G covers a wide range of areas, and it is likely that the guidelines will need to be updated and revised for areas other than landscape and urban design. Therefore, it is necessary to establish a guideline update working group not only in the Directorate of Urban Studies and Planning, Licensing Directorate, which is responsible for the current D/G, but also for ASEZA as a whole, to promote cross-disciplinary collaboration.

In particular, with regard to the Public Works directorate, Environment directorate, etc., which have jurisdiction over roads, natural environment conservation, construction, etc., it is

necessary to discuss the structure of the updated guidelines, such as whether the contents of each field should be provided in separate volumes for each field, or whether chapters should be separated in the same book as in the existing D/G. The cooperation of the local community development directorate is indispensable in conducting participatory workshops and public information meetings. It is also necessary to establish an organization within ASEZA that oversees these multiple areas and takes the lead in updating the guidelines (hereafter referred to as the "Guideline Update Unit").

For example, in Japan, when each landscape administration organization formulates a "landscape plan," which is equivalent to an urban design guideline, it generally takes one to three years from the start of consideration to the formulation and implementation (Ministry of Land, Infrastructure, Transport and Tourism, March 2022, Guidance for Formulation and Revision of Landscape Plans, Formulation Edition). Landscape plans in Japan are positioned within the framework of the Landscape Law, and there are many precedents in Japan for the formulation of such plans, but approximately 29% of organizations require more than three years to formulate their plans. Given these circumstances, the project to update and revise the urban design guidelines in ASEZ is expected to be a yearly effort.

Therefore, it is essential to create an environment that allows the organization to share and update information at all times, without making the task of updating and revising the guidelines belong to limited person. Specifically, first of all, it is necessary to set up a cloud server within ASEZA to consolidate data related to guideline updates and revisions, and to grant access and writing privileges to relevant personnel. In addition, some regulations and deliverables of past projects and plans may be available only in hard copy in the possession of each ASEZ staff member, as no one knows where soft copies are stored. It is necessary to first consolidate all these items related to the update and revision of the guidelines and convert them to electronic data. In Japan, there have been many cases where outsourcing orders to local companies or temporary employment has been implemented for the digitization of hard-copy-only data, leading to the creation of local employment.

The development of these databases can be considered as part of the Smart City initiative, and it is essential to work with the Smart City Unit within ASEZA.

Upon completion of the formulation of the updated/ revised version of the guidelines, both the Arabic and English versions will be published on ASEZA's official website, as the current D/G. In addition to the main document and its summary, it is desirable to post on the same page the forms required for application and data on relevant regulations and plans, so that developers and designers can obtain the necessary information in an independent and centralized manner in the early planning stages.

**2) Operating Phase**

Guidelines are not just updated and revised once and then completed. Even after entering the operational phase, it is necessary to continue to monitor their effectiveness and consider adding necessary provisions or revising provisions that do not match the actual situation. Therefore, it is recommended to rearrange the guideline update unit into a guideline monitoring unit and act as a coordinator with the that departments cooperated in the update, to ensure the continuous review of the guidelines.

In these monitoring activities, it is important to database all the application documents submitted throughout the process in accordance with the design guidelines, as well as the

minutes of discussions with the building owner and designer, and to accumulate information continuously and centrally. In addition, during the examination of the plan, it is considered that there are many situations where it is difficult to make judgments based solely on quantitative criteria or where exceptional situations occur. In such cases, not only the vision of urban design in ASEZ stipulated in the preface of the guidelines, but also the accumulation of past application data can be useful as a tool for making consistent and rational judgments.

In ASEZ, which is rapidly developing, new development projects are assumed to be planned one after another after the guideline is updated. It is expected that new landscape resources will be discovered and the need for designation of new priority areas will arise. Based on these new developments, it is necessary to consider updating and revising the guidelines again as needed.

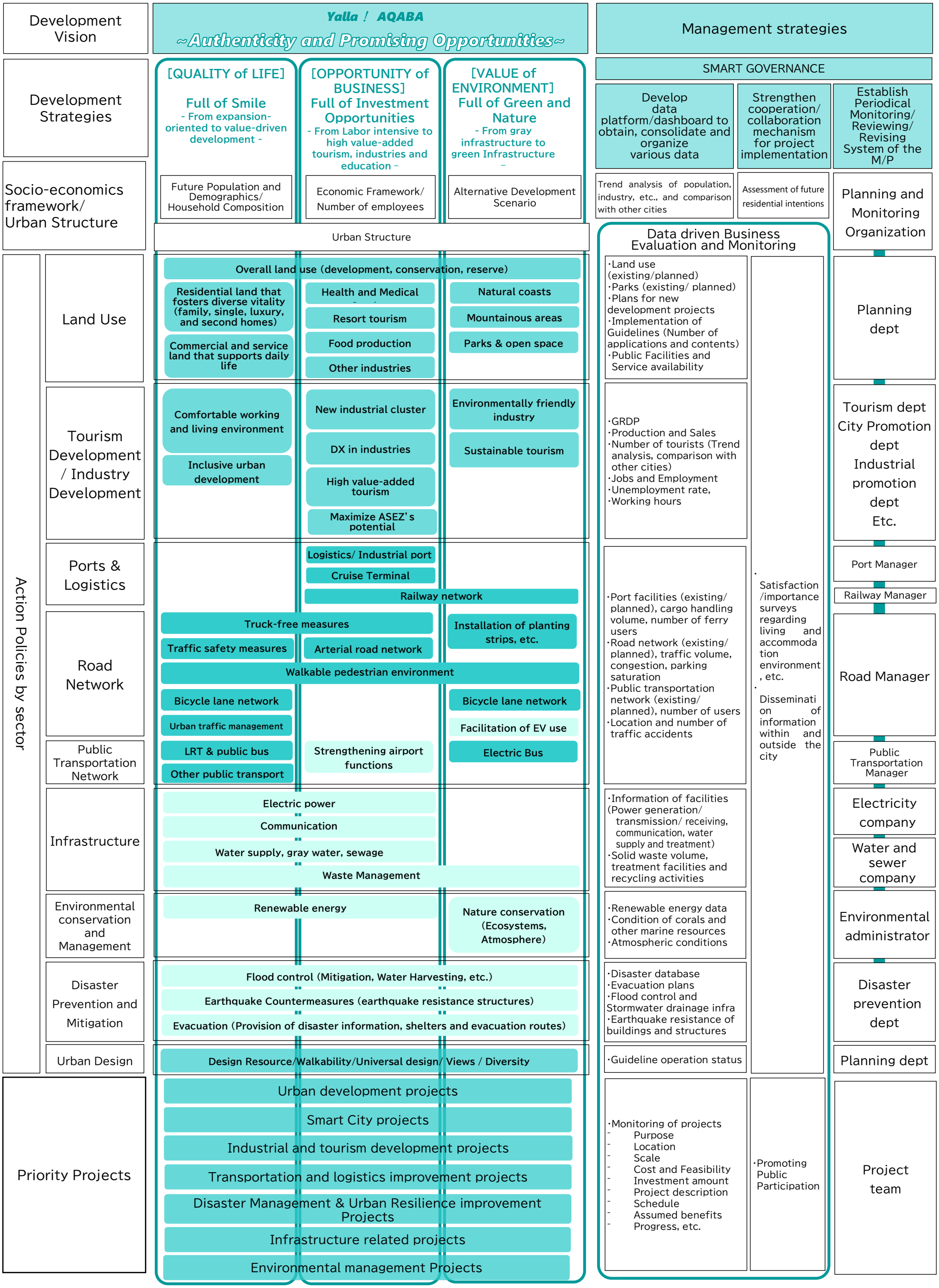
On the other hand, it is important to note that updating guidelines frequently could give less reliability of the regulation. The guidelines should only be updated when deemed necessary by comparing them with the vision of urban design and the vision of the urban development M/P. Therefore, it is desirable to comprehensively determine the need for guideline re-updates by a working group organized across multiple fields in ASEZA, as was done during the development of new guidelines, after the guideline monitoring unit has considered it.

From the above, it is clear that the work from guideline formulation to operation and monitoring should not be left to individual staff. On the other hand, for sustainable operating of the guideline, it is important to build a capacity of human resources within ASEZA with specialized knowledge regarding the relevant work and to form a sustainable organization.

# Chapter 7 Development Strategies by Sector

In this chapter, we organize the status and the proposed content for the development strategies for each major sector, based on the current status and issues of each sector, urban development vision and basic strategies written in chapter 3.

The overall picture is shown below.




Source: JICA Study Team

**Figure 7-1 Strategy Planning System**

## 7.1 Industrial development

As per the cluster analysis mentioned before, industrial cluster with a wide range of supporting industries has not been developed in Aqaba except the tourism sector.

Based on this understanding, the following industrial development strategies are proposed for industrial development in ASEZ, including the formation of new industrial clusters, under the three development strategies of the master plan.

**Table 7-1 Development Strategy for Industrial Development**

| Development Strategy | Development Strategy for Industrial Development |
|---|---|
| **[Quality of life]**<br>**A life full of smiles**<br>**~Toward a more diverse industry~** | ・ Attract new industries by creating a comfortable working and living environment<br>・ Attract new industries by promoting Inclusive urban development |
| **【Business Opportunities】**<br>**An industry full of investment opportunities**<br>**~Toward a higher value-added industry~** | ・ Develop a new industrial cluster with wide supporting industries.<br>・ Increase value-added in industries through DX<br>・ Develop high value-added and diversified tourism products.<br>・ Maximize Regional Potential |
| **[The power of the natural environment]**<br>**An environment full of greenery and nature**<br>**~Toward a more sustainable industry~** | ・ Develop environmentally friendly industries<br>・ Develop sustainable tourism |

Source: JICA Study Team

### 7.1.1 Growth Scenarios

#### (1) Short Term

The formation of new industrial clusters will not be realized overnight but will basically be realized on medium- to long-term initiatives. Therefore, in the short term, the existing tourism sector will continue to be the driving industry of the ASEZ's economy. During this period, the strategy to promote sustainable tourism through creating high value-added tourism products and diversify tourism products and segment through DX will be implemented.

Furthermore, in industrial parks where new construction is underway, ASEZA will continue to leverage the strengths of SEZs and FTAs to attract export processing industries such as clothing, food, and building materials for Europe, America, and Gulf countries.

#### (2) Medium- to Long-Term

In order to accept the future population (545,000) and employments (168,000) indicated in the socio-economic framework in 2040, medium- to long-term efforts will be made to attract new industries and form industrial clusters.

Considering ASEZ's geographical conditions and Jordan's human resources, promising new industries include the medical and welfare industry, wellness industry, IT-related industry, and smart agriculture/fisheries. In addition, environment-related industries such as solar power generation-related industries and smart mobility are also cited as promising industries.

The initiatives considered necessary to support the attraction and development of these new industries are outlined below.

**1) Development of infrastructure**

The infrastructure includes not only roads, water and waste treatment and power generation facilities, but also public transportation for commuting purposes and tenant offices. As shown in the SWOT analysis, basic infrastructure necessary for industrial development has not been well developed in ASEZ, and they are not expected to attract companies in areas where infrastructure is not developed.

In particular, foreign companies put importance to environmental sustainability, and since the development of waste treatment facilities and sewage facilities is directly linked to the attraction and investment of foreign companies. Thus, infrastructure development is the priority.

**2) National-level policy initiatives**

In the ASEZ, the high cost of electricity is cited as a weakness in industrial development. In order to promote large-scale projects such as the construction of large-scale solar power generation plants and the development of complexes in the North Business District, which are proposed in the development strategy, national-level investments and initiatives are required in terms of funding, policy, and institution (prepare a regulation of feed-in tariffs, etc.).

In addition, the development of medical institutions that serve as core facilities for the medical and welfare industries, as well as higher education institutions such as universities and incubation centers that serve as core facilities for the development of industrial human resources, can also be considered as an infrastructure development. These will be concretely developed under national-level policy initiatives (such as the special zone system), and infrastructure development and human resource development will be promoted in parallel.

**3) ASEZ-level policy initiatives**

After infrastructure is developed through policy initiatives at the national level, policy initiatives at the ASEZ level to attract related companies will be required.

In terms of software development, the ASEZA will provide incentives, such as subsidies and corporate tax exemptions, to attract companies engaged in industries targeted.

In terms of hardware, if there are no attractive offices and commercial facilities, it will not be possible to attract companies as tenants. Since companies engaged in knowledge industries, such as IT-related companies have relatively small companies with less than 100 employees, venture companies, and start-up companies, ASEZA will develop comfortable offices and commercial facilities as part of infrastructure development.

### 7.1.2 Development Strategy for Industrial Development

Under the above growth scenario, the specific initiatives for each strategy in the industrial development sector are as follows.

#### (1) Quality of Life: Strategies in line with a life full of smiles (toward more diverse industries)

##### 1) Attract new industries by creating a comfortable working and living environment

Currently, garment factories are in the AIIE industrial zone of ASEZ, and although the garment industry is listed as one of the promising industries in the BCG report, as mentioned above, 70~80% of the workers working in garment factories are migrant workers from other Islamic countries with low labor costs such as Egypt, Pakistan, and Bangladesh. It cannot be an industry that generates employments for Jordanian.

As mentioned above, highly educated Jordanians in quasi-English-speaking countries are currently flowing out to Europe and the United States, as well as countries with high salaries such as Israel, Saudi Arabia, Qatar, and the UAE, and Saudi Arabia is actively acquiring Jordanian human resources.

In addition, employment is hollowing out in Aqaba not only in the tourism sector but also in other industries, around 2,000~3,000 Jordanians living in Aqaba commuting every morning across the border to Eilat for working in Israel to search well-paid jobs.

Therefore, in order to create jobs for Jordanians in the future in the industrial development of Aqaba, it is necessary to develop knowledge industries[1]that can receive such high-skilled industrial human resources, in addition to labor-intensive industries that are covered by foreign workers with low labor costs. It will be the basic strategy for the growth of the ASEZ industry as a whole.

Furthermore, in order to develop knowledge industry, a paradigm shift is required to attract foreign companies and foreign human resources with advanced skills and reposition foreign high-level industrial human resources as leaders who will drive industry in Jordan rather than low-cost labor force.

ASEZ is currently constructing the Aqaba Digital Hub facility in the hinterland of South Beach. Among knowledge industries, one option could be a strategy to attract IT-related companies such as content development, AI development, and software development. However, it is not possible to attract these companies just by wait and see; policy efforts are needed in combination with some incentives such as corporate tax exemptions for IT-related companies.

##### 2) Attract new industries by promoting Inclusive urban development

Aqaba is the only city in Jordan that faces the open ocean, enjoys a warm climate throughout the year, and is Jordan's largest beach resort that attracts many vacationers from Europe and

[1] Knowledge industries: Fine Chemicals, Functional Polymers, Pharmaceutical Development, Aerospace Development, Content Development, AI Development, Software Development, Semiconductor Development, Marketing, Design, Engineering, Consulting, etc.

other countries. Taking advantage of these urban characteristics, the city is able to provide a comfortable work environment on weekdays and a lush, green living environment by the beach where you can enjoy a peaceful time on weekends. Aqaba has a different appeal from futuristic cities like NEOM in Saudi Arabia or cities in the Gulf area like Dubai, Doha, and Abu Dhabi.

Urban development requires inclusiveness that accepts people of various generations and genders, from children to seniors. If we do not ensure an adequate educational environment for young people without regional disparities, an advanced business environment for the working generation, and a living environment where seniors can live with peace of mind in terms of medical care, we will not be able to attract new people to the ASEZ.

In particular, there are many wealthy seniors after retirement, and they represent a large market for the creation of new industries such as the medical and welfare industry and wellness tourism. In Spain, there are cities such as Alicante, where the medical and welfare industries have become core industries in the region by creating a city for such seniors.

In addition, in order to foster new industries and create jobs for Jordanians, it is necessary to create a work environment that is comfortable for women.

As for the tourism sector, Jordan's Ministry of Tourism and Antiquities (MoTA) stated in its Gender and Inclusion Project Plan (2021-2025) that the main cause for the low employment rate of women in Jordan's tourism sector are lack of adequate 1) public transportation and 2) childcare facilities, and the development of an environment where women can work comfortably is an urgent issue to increase the employment rate of women.

There is also a need for commercial and entertainment facilities where local people, especially young people, can enjoy shopping and entertainment.

### (2) Business Opportunities: Strategies in line with industries full of investment opportunities (toward higher value-added industries)

#### 1) Develop a new industrial cluster with wide supporting industries

As shown in the cluster analysis in Chapter 3, there are no industries in Aqaba with broad clusters other than tourism. To foster knowledge-intensive industries that will serve as the basic scenario for Aqaba's industrial development, which will serve as a source of highly skilled human resources, it is necessary to develop new industries from zero basis.

In order to create number of jobs in ASEZ, it is necessary to attract an industry that formulates an industrial cluster with wide support industries.

In addition to efforts by the private sector and ASEZA, strong initiatives at the national level are required, and it is necessary to support the formation of clusters under long-term development plans, including infrastructure related to human resource development such as education and research institutions.

#### 2) Increase value-added in industries through DX

#### a) Utilization of DX in the agriculture and fisheries sectors

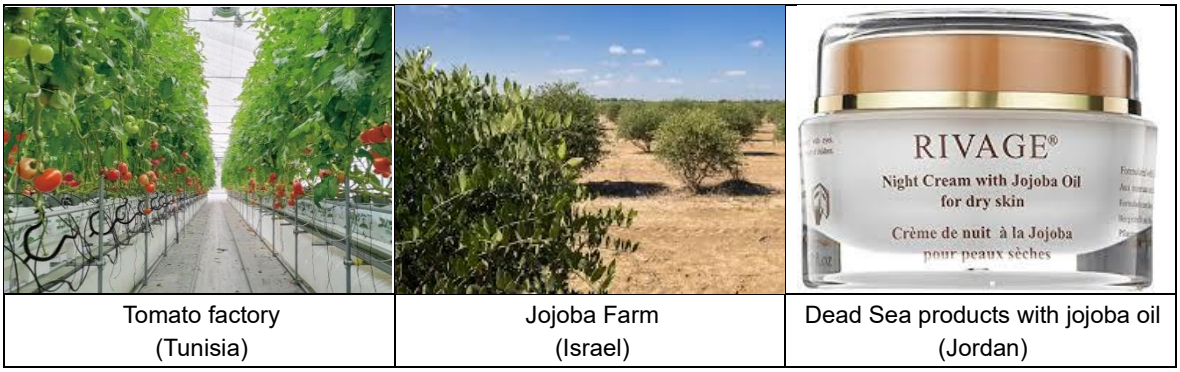
As mentioned in Chapter 3, although some agriculture using rich groundwater can be seen near Disah which is located outside of ASEZ, there is no industrial-level agriculture or

fisheries in ASEZ which is in a semi-arid area, and the Jordanian government's “Economic Modernization Vision" does not position these sectors as a priority.

Although Aqaba is the only area in Jordan facing the open sea, Aqaba does not have a fishing port or market facilities, except the small pier for the glass boats. The trade of marine products is also limited to the extent that small fishermen wholesale to local restaurants, and fishing as an industry has already completely declined and is not positioned as one of the Aqaba industries.

Under these circumstances, there is no basis for setting a development scenario for agriculture and fisheries based on past statistical data, and the development of the agriculture and fisheries sector literally starts from zero basis. Agriculture and fisheries are typical labor-intensive industries. Promoting conventional agriculture and fisheries with relatively low wage cannot generate employments for Aqaba's industrial human resources.

Under these contexts, the basic strategy for the development of the agriculture and fisheries sector is to promote the digital transformation of industries and develop them as a new high value-added industry, such as smart agriculture and smart fisheries.




| Tomato factory (Tunisia) | Jojoba Farm (Israel) | Dead Sea products with jojoba oil (Jordan) |
|---|---|---|

**Figure 7-2 Potential Agricultural Products in Aqaba**

Under this strategy, tomato is a high value-added commercial crop adapted to the climatic conditions of Aqaba, which is classified as a semi-arid area, by performing drip irrigation using IT technology without requiring a large amount of agricultural water. Tomato factories as smart agriculture have already been introduced in Tunisia and other countries in North Africa and are not only creating many jobs in the region as a new industrial cluster that replaces conventional labor-intensive agriculture, but also serving jobs for high-level industrial human resources by turning them into high-tech industries by introducing IT technology.

This kind of smart agriculture is a field where IT companies have begun to enter agriculture in Japan in recent years, and it is an industry with great potential for ASEZ.

In addition, jojoba oil, which can be grown in semi-arid areas, is used as a raw material for cosmetics manufacturers around the world, and is also widely used in Dead Sea products, one of Jordan's export industries, and has great potential in the future because it is a commercial crop that can form clusters with wide support industries.

Jordan relies on imports for most of its domestic consumption of fish. Under these circumstances, neighboring Egypt has established large-scale aquaculture farms along its

coast in response to the high domestic demand for fish.

Jordan also has high domestic consumption demand of fish, so Aqaba, which faces the open sea, has the potential to promote smart fisheries using seawater.

Grouper and shrimp, which are regarded as a luxury fish in the Islamic world, are also farmed in countries such as Taiwan, Indonesia, and Singapore as a fish suitable for aquaculture, and the cultivation of such high value-added luxury fish has great potential in the future.

| Smart Agriculture (Tunisia) | Smart Fisheries (Egypt) | Luxury fish Galupa |
|---|---|---|

**Figure 7-3 Examples of Knowledge-Based Industries in Agriculture and Fisheries through Digital Transformation**

**b) Utilization of DX in the tourism sector**

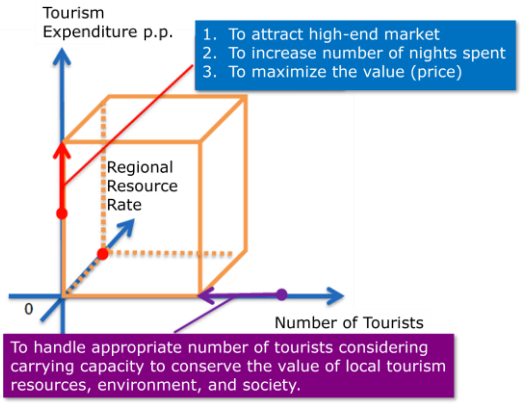
The occupancy rate of hotels below 3-stars is less than 50% throughout the year, and it is below the break-even point of the profitability of hotel (around 50-60%). The data shows that for hotels below 3-stars, the number of rooms is already enough, and to increase occupancy rate rather than the number of rooms shall be an adequate strategy for these classes.

Many of the managers of hotels below the 3-stars are local people and do not have enough capacity for marketing comparing with international hotel chains such as 4- and 5-stars hotels. To increase the occupancy rate, to promote the digital transformation of existing hotel industries and to increase market accessibility through digital marketing shall be a key strategy.

**3) Develop high value-added and diversified tourism products**

**a) High value-added tourism products**

As shown in the Figure, regional tourism receipts (TR) consist of 1) number of tourists (A), 2) tourism expenditure per person (B), and 3) Regional resource rate, and it can be modeled by volume (TR=A*B*C) based on these three axes. From the viewpoint of sustainable tourism, applicable strategy will target to shift tourism from quantity to quality by increasing tourism




Source: JICA Study Team

**Figure 7-4 Three elements of tourism receipt**

expenditure per person (A) and regional resource rate (B).

The measures to increase tourism expenditure per person (B) mainly consists of 1) to attract high-end market, 2) to increase number of nights spent, and 3) to maximize the value (price) of tourism products, and to increase the value-added of tourism products, it is essential to improve the quality of products and services above all else.

In addition, it is evident that more than 90% of the souvenirs sold not only in Aqaba but also in souvenir shops in Jordan are foreign products such as China, India, Turkey, Pakistan, Syria, Iran, etc., and many of the human resources engaged in the tourism industry are also served by migrant foreign workers from Egypt, the Philippines, and Bangladesh. The regional resource rete (C) of Jordanian tourism is relatively low in terms of material and human resources, and much of the tourism revenue is leaking to outside.

To improve this situation and increase the regional resource rate (C) of material and human resources, to increase the value (price) of tourism products and consequently raise the wage of human resources engaged in the tourism sector shall be the main strategy.

As part of the diversification of tourism, a strategy is proposed to shift from quantity to quality of tourism in the Disah area, which is included in the Major Zone of this M/P and is expected to be developed for tourism purposes, and to promote the development of tourist destinations specializing in luxury customers as a high value-added tourism product that has not been developed in Aqaba yet. As a business model for tourism development, the case of AlUla in Saudi Arabia can be a reference.

Habitas
(Al Ula, Saudi Arabia)

**Figure 7-5 Habitas (Al-Ula, Saudi Arabia) Example**

**b) Diversified tourism products**

As mentioned in Chapter 3, there are three main peak seasons for tourism in Aqaba. While the occupancy rate of 4- and 5-stars hotels has risen to almost full in spring and autumn by the tourists from source markets, mainly in Europe, the occupancy rate is relatively low during summer.

On the other hand, the occupancy rate of the hotels lower than 3-stars has risen during summer by Jordanians and tourists from neighboring countries in the Middle East.

From the viewpoint of regulating such seasonality, to grasp the characteristics of seasonality in each source market and to diversify tourism product which attracts each source market in the low season shall be the main strategy.

Especially in summer, when the occupancy rate of 4- and 5-stars hotels decreases, to create new cluster in the tourism industry by introducing MICE, and to increasing the value-added

of tourism products by targeting luxury people with high tourism expenditure per person shall be an important option.

The Ministry of Tourism and Antiquities (MoTA) and JTB have a strategy to promote the Dead Sea and Amman as MICE destinations other than Aqaba. In fact, the Dead Sea and Amman are about 30 minutes by car, and by introducing MICE in the Dead Sea combined with Amman with huge number of rooms, MICE can be conducted without affecting the accommodation demand of resort tourists staying at the Dead Sea.

While BCG's report also identified MICE as one of Aqaba's promising industries, the number of rooms of 4- and 5-stars hotels in Aqaba is limited about 3,000 and Aqaba does not have enough capacity to accept large-scale international conferences and exhibitions with more than 10,000 visitors without affecting the accommodation demand of resort tourists staying in Aqaba.

Considering above capacity, it is a reasonable strategy that MICE tourism in Aqaba shall target incentives (reward trips) for companies with less than thousand guests.

Therefore, since there is no guarantee that the construction of international conference centers and exhibition centers will be profitable throughout the year considering Aqaba's carrying capacity, it is necessary to develop a more in-depth strategy, and in this regard, the strategies of MoTA and JTB seems to be quite reasonable.

**4) Maximize Regional Potential**

**a) Export Processing Industry**

Currently, ASEZA is planning to develop five industrial zones, including the Quwaira Industrial Zone outside the ASEZ along the Desert Highway.

In the Quwaira Industrial Zone, which is about 50 km from Aqaba city, the development of a new industrial park with a total area of 1,839,000 m2 is already underway through PPP from ADC and AIIE developer PBI with in total 1 billion USD in investment over the next 15 years, and about 6,500 jobs is planned to be generated.

For these five industrial zones, it is appropriate to develop industrial zones as export processing zone (EPZ) targeted to manufacturing and processing industries by taking advantage of the tax incentives of SEZ.

In particular, NEOM in Saudi Arabia has the potential that ASEZ's Export Processing Zone (EPZ) contribute to develop a supply chain that ASEZ supplies the building materials necessary for the construction of NEOM where are plans for large-scale urban development in the future.

In addition, although the sector has not been well developed, the area along the Desert Highway around Quwaira produces high-quality silica sand, which is a raw material for glass, and building materials such as lighting, FRP products[2]using glass fiber, and solar panels. There will be a certain amount of demand of construction materials for exports to gulf

[2] FRP: Fiber Reinforced Plastic, used as a building material for bathroom bathtubs, washbasins, interior and exterior panels, etc.

countries in the Middle East, where urban development including NEOM is progressing rapidly.

On the other hand, regarding the garment industry, which is listed as a promising industry in the BCG report, according to interviews at the AIIE, it is difficult to procure high-skilled workers with sewing skills in Jordan that meet the high-quality standards required by clothing brands. Jordanian labor costs are also high, so the reality is that foreign workers from countries with low labor costs in the Islamic world, such as Pakistan, Bangladesh, and Nepal, where textile industries are already well-developed, are working in the garment industry.

Since the garment industry is an industry that constantly selects countries with low labor costs, it cannot be said that it is an industry that contributes to the creation of employments for Jordanian, where labor costs are already relatively high. In addition, it would take a long time, on the order of 10 years, to train high-skilled workers in Jordan.

**b) Logistics industry**

The logistics industry is an industry that can create many employments. On the other hand, in the area of the industrial zone of Rachidia, although roads and tenant land have been prepared, and some land transport truck gate facilities have been developed, this zone has not been well operated.

In the future, it has the potential to attract fulfillment centers for e-commerce[3] businesses by taking advantage of its location adjacent to the Desert Highway that connects Aqaba and Amman and its existing infrastructure.

**c) Agriculture & Fisheries**

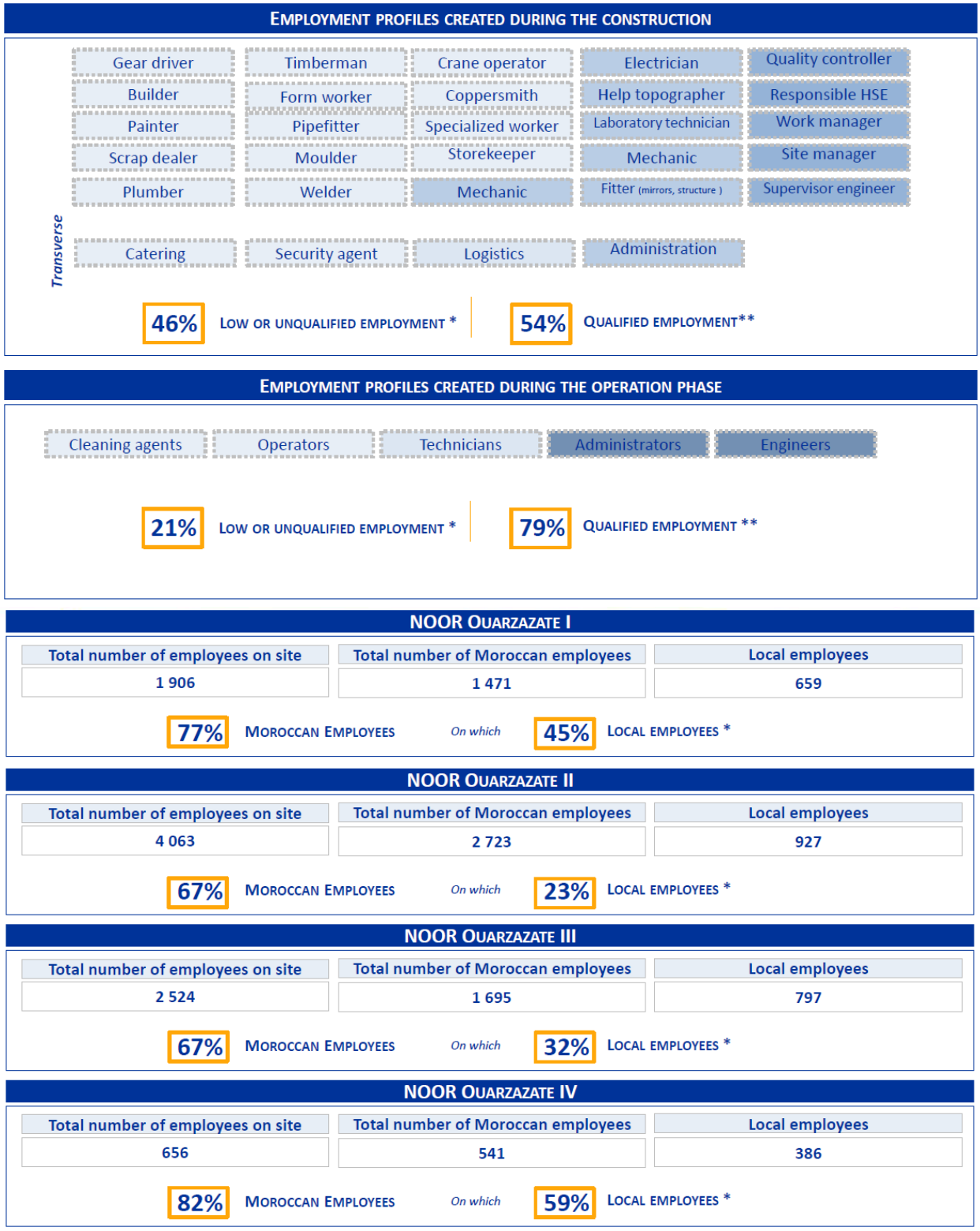
Wadi Araba has a large area of undeveloped land, so it will be possible to produce high value-added agricultural products and fish that are suitable for the semi-arid climate and geographical conditions of the Red Sea coast. The area is ideal for attracting new industries such as smart agriculture and smart fishery.

**d) Photovoltaic Industries**

As mentioned in Chapter 3, since high electric price affect the financial management and price competitiveness of tourism industries such as hotels, an initiative for building renewable energy power generation facilities and reducing electricity rates are also effective from the perspective of industrial development.

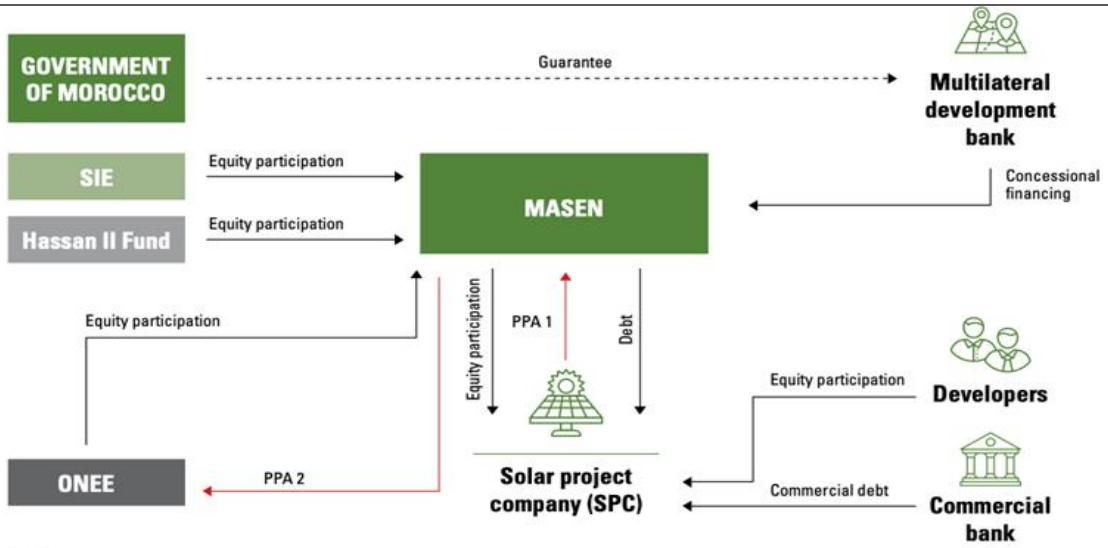
Since Aqaba has more than 300 sunny days throughout the year, there is greatest potential for solar power generation as a renewable energy. As the case of Morocco (Figure 7-6) shows, the construction of photovoltaic power generation plants is effective not only in the construction of power generation facilities but also in forming new industrial clusters with wide supporting industries.

[3] e-commerce: online shopping businesses such as AMAZON




Source: MASEN

**Figure 7-6 Photovoltaic industry cluster in Noor Complex, Ouarzazat, Morocco**




Source: MASEN

**Figure 7-7 Noor Complex's business model in Ouarzazat, Morocco**

| Photovoltaic power plant (Ouarzazate, Morocco) | Smart Agriculture (Gabes, Tunisia) | Jojoba Farm (Israel) |
|---|---|---|

**Figure 7-8 Examples of industries that utilize the potential of the region**

### e) Commercial Development

In the North Business District, by taking advantage of the location near the airport and the location of a general hospital that has already been constructed on the adjacent area, this area has a huge potential for large-scale commercial development to create a complex that includes offices, residences, hotels, medical facilities.

As a business model, the business model of the Abdali district of Amman could be applicable, which is being developed under a PPP.

| Abdali District (Amman, Jordan) |
|---|

**Figure 7-9 Location of individual project ideas**

### (3) 【The Power of the Natural Environment】Strategies in line with the environment full of greenery and nature (towards a more sustainable industry)

#### 1) Develop environmentally friendly industries

#### a) Photovoltaic power generation related industries

As mentioned above, photovoltaic power generation related industries are not limited to the construction of photovoltaic power plants but are also effective in forming new industrial clusters with a wide supporting industry.

Aqaba is blessed with more than 300 days of sunny weather a year, and by promoting the introduction of solar power generation systems not only for large-scale solar power plants but also for various buildings such as factories, offices, hotels, and houses in ASEZ, it will contribute to the reduction of greenhouse gases, the reduction of the burden of high electricity bills, and the development of solar power generation-related industries.

#### a) Smart Mobility Related Industries

The concept of Smart Mobility includes not only eMobility (vehicles powered by electricity), but also includes the concept of MaaS (Mobility as a Service), which enables new mobility for people, such as on-demand taxis, which are already popular in Dubai, UAE, and electric bikes (bicycles) operated in Paris, France, and Tokyo which is operated by NTT Group, under subscription service (monthly flat rate service).

The introduction of smart mobility is attracting attention as an industry that not only contributes to the reduction of greenhouse gases at the city level, but also contributes to the creation of new jobs through the introduction of new industries (green businesses).

| Electric car | Electric Bicycle (Paris, France) | Electric Kickboard (Tokyo, Japan) |
|---|---|---|

**Figure 7-10 Examples of smart mobility**

#### b) Other

In addition, there are plans to build a factory in the South Industrial Zone to produce liquid hydrogen used for fuel cells used in smart mobility and for various industries. It is noteworthy as a new environmentally friendly industry.

#### 2) Sustainable Tourism Development

The competitiveness of Aqaba's tourism depends entirely on the Red Sea, and it is no exaggeration to say that if this tourism resource were lost, tourism in Aqaba would disappear definitively.

To protect the beaches where beautiful coral reefs remain, which are Aqaba's unique tourism resource, from urbanization and development activities, the coastline of South Beach shall be designated as a nature reserve, and the strategy to restrain development shall be needed.

In terms of planning, while the facilities necessary to maintain a beautiful beach, such as restaurants and cafes for beach services, beach promenades, parking lots, and green belts as interference zones (buffer zones), are required, sensitive intervention is required so that no changes are made to a certain distance from the coastline.

It is evident that if large-scale resorts development continues in ASEZ, which does not have sufficient waste treatment and sewage treatment facilities, and tourism development targeting only an increase in the number of tourists is conducted, a high environmental impact will be imposed, and environmental destruction will occur.

As shown in Figure 5.1, regional tourism receipts (TR) consist of 1) number of tourists (A), 2) tourism expenditure per tourist (B), and 3) Regional resource rate (C) and it can be modeled by volume (TR=A*B*C) based on these three axes. From the viewpoint of sustainable tourism, applicable strategy will target to shift tourism from quantity to quality by increasing tourism expenditure per tourist (A) and regional resource rate (B).

## 7.2 Transport and Logistics

Table 7-2 shows the Land Use Policies to realize the development vision and the three development strategies and urban structure organized in Chapter 4.

**Table 7-2 Transport & Logistics Policies to Realize the Development Vision**

| Development strategies | Transport & Logistics Policies |
|---|---|
| **[QUALITY of LIFE]**<br>**Full of Smile**<br>**- From expansion-oriented to value-driven development -** | ・ Minimizing the impact of heavy trucks in the ASEZ city center (improvement of intersections on truck routes, countermeasures for truck routes, etc.)<br>・ Strengthening the public transport system (strengthening public bus services, introducing new public transport modes such as LRT, etc.)<br>・ Ensuring traffic safety (traffic safety measures for accident-prone locations and road sections)<br>・ Realizing smooth road traffic by urban traffic management (improving intersection operations, establishing a traffic control center, implementing parking measures, etc.) |
| **[OPPORTUNITY of BUSINESS]**<br>**Full of Investment Opportunities**<br>**- From Labor intensive to high value-added tourism, industries and education -** | ・ Strengthening the regional arterial road network that allows logistics vehicles to travel safely and smoothly<br>・ Improving airport functions for the improvement of convenience for domestic/international tourists and visitors and developing commercial facilities for the improvement of airport operation & management<br>・ Contributing to high-value-added tourism (development of Aqaba Cruise Terminal as a marine transport hub and its surrounding areas, etc.)<br>・ Strengthening port functions that contribute to the national economy and ASEZ regional development (Aqaba Container Terminal, Ferry Terminal, Aqaba New Port, etc.)<br>・ Introduction of economical and highly efficient freight transport modes (revival of cargo railways and strengthening of the national railway network) |
| **[VALUE of ENVIRONMENT]**<br>**Full of Green and Nature**<br>**- From gray infrastructure to green Infrastructure -** | ・ Securing a bicycle-use environment and promoting bicycle use that contributes to $CO_2$ emission reduction and public health (reallocation of road space for bicycles, development of bicycle lane network, securing bicycle parking spaces, promoting bicycle rental services, etc.)<br>・ Promotion of EV use (strategic implementation of EV charging stations) |

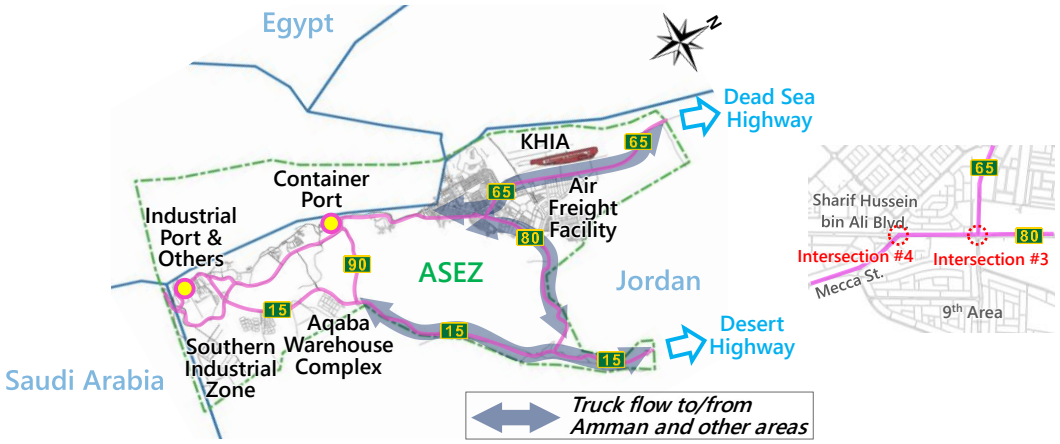
Source: Created by the JICA Study Team

### 7.2.1 Transport and Logistics Contributing to "Quality of Life"

#### (1) Truck-Free Measures for the City Center of Aqaba

It is considered that the major road network proposed in the previous ASEZA Master Plan has been well implemented, and it is highly evaluated to construct roads for trucks and realize the heavy-truck-free roads in the city center. However, the city center area is continuously expanding. Because it will be more expanded in the future, it is concerned that heavy trucks would traverse the expanded city center area.

Figure 7-11 shows major truck routes in ASEZ. There are only two routes, the Dead Sea Highway and the Desert Highway, which connect ASEZ, Amman, and other Jordanian area. Therefore, all trucks for domestic transport of cargo to/from Aqaba Ports use those two routes. The issue mentioned above is that trucks to/from the Dead Sea Highway traverse the city center. In addition, there are trucks to/from the Desert Highway that do not use the Back Road but traverse the city center to avoid the steep vertical grade of the Back Road. Currently, many of the heavy trucks that use the Dead Sea Highway to travel to and from Aqaba Port are operated by Arab Potash Company (APC), which has three plants near the Dead Sea. According to an interview with APC, the production volume of potash by APC in 2022 was approximately 2.7 million tons, and 100 to 120 50-ton trucks were operated daily to transport it to Aqaba Port (at peak times, approximately 180 trucks per day). Its operating route is the Dead Sea Highway. APC plans to build another plant near the Dead Sea, so production in 2040 is expected to be about 3.5 million tons, about 1.3 times of the volume in 2022. This means that at peak time in 2040, approximately 10 50-ton trucks will be passing through the city center every hour.

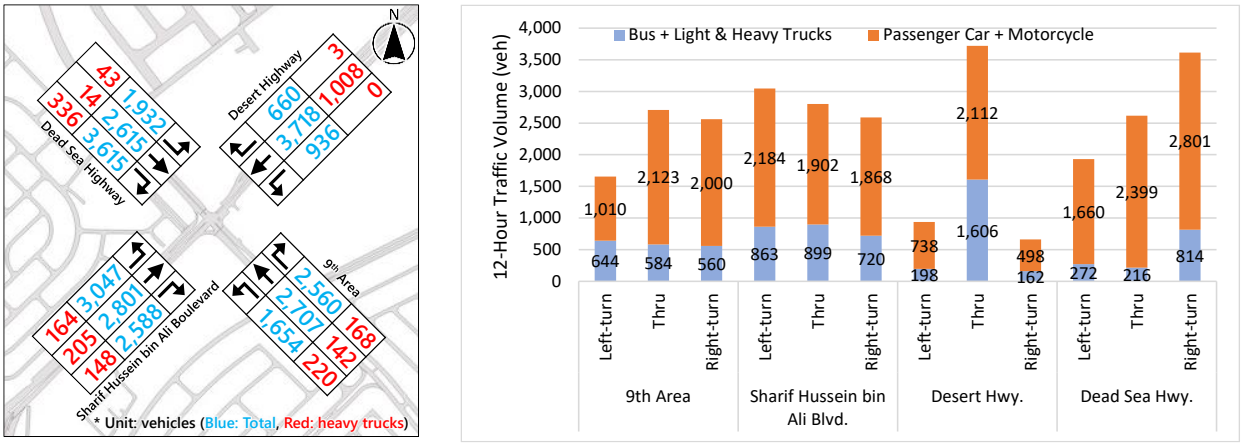



Source: Created by the JICA Study Team

**Figure 7-11 Major Truck Routes in ASEZ**

Trucks of these two routes merge at the intersection of Sharif Hussein bin Ali Boulevard, the Dead Sea Highway, and Highway 80 (from the Desert Highway), which is called as Intersection #3 in the traffic survey in 2023, and they flow to Mecca Street. Therefore, Intersections #3 and #4 are the intersections where trucks pass the most in the city center, and it is obvious that the road section of Sharif Hussein bin Ali Boulevard between Intersections #3 and #4 has the most truck traffic in ASEZ.

The directional 12-hour traffic volumes in daytime (7:00-19:00) are shown in Figure 7-12. It should be noted that, as mentioned in Chapter 3, the truck traffic volume of Intersection #3 from the Desert Highway was increased due to the road closure of the Back Road when the traffic survey was conducted. However, it can be inferred that the traffic volume of that approach and the traffic condition of this intersection could be the same level when the same event (road closure of the Back Road) occurs again due to a road maintenance work or an accident.




Source: Created by the JICA Study Team

**Figure 7-12 Traffic Volume at Intersection #3 Counted in July 2023**

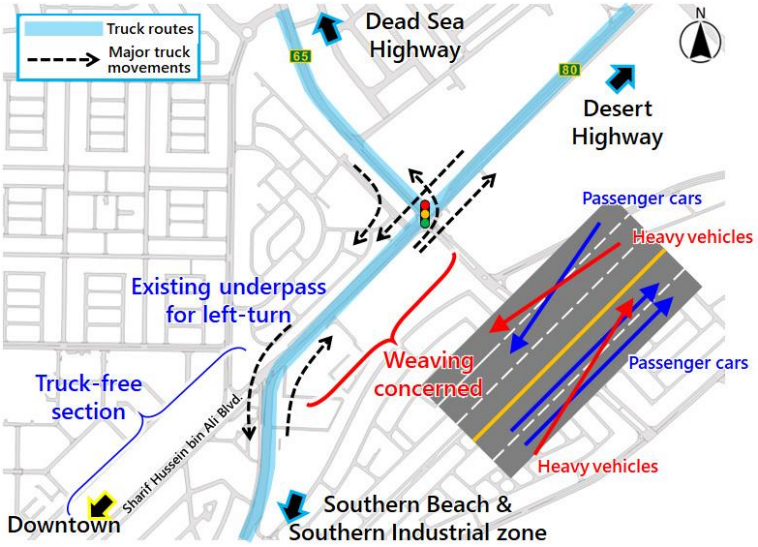
Two strategies are proposed as measures for truck-free city center. One is a traffic safety measure for Intersection #3 and the road section of Sharif Hussein bin Ali Boulevard between Intersections #3 and #4, which might be a short-term measure. The other is to construct other truck routes in or out of ASEZ area to enhance the separation of heavy trucks from the road traffic in the city center, which might be a long-term measure.

### 1) Short-Term Measure

#### a) Current Issues

As mentioned above, the road section of Sharif Hussein bin Ali Boulevard between Intersections #3 and #4 and those intersections are used by heavy trucks the most in the city center. Concerns on the road section and the intersections are as follows (also see Figure 7-13).

- Intersection #3: high thru, right-turn, and left-turn traffic volume of heavy trucks from three approaches
- Intersection #4: high left-turn traffic volume of heavy trucks from the Truck Bypass
- Road section between Intersections #3 and #4: decreased traffic safety and capacity due to weaving of the traffic including heavy vehicles

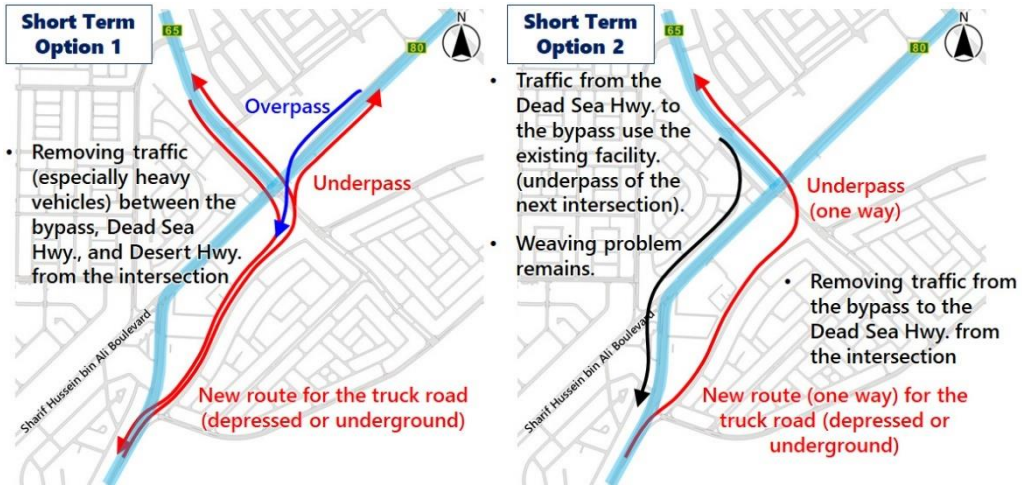



Source: Created by the JICA Study Team

**Figure 7-13 Traffic Safety Issue at and around Intersection #3**

### b) Proposed Measures

To improve the traffic flow and traffic safety, it is considered effective to separate heavy trucks from those road section and intersections. Two options of the measure are proposed as depicted in Figure 7-14. Each option is to have a grade separation for the direction of major truck movements. Option 1 is to have Mecca Street directly connected to both the Dead Sea Highway and Highway #80 (to the Desert Highway) by underpass and overpass. Option 2 is to focus on the trucks between Mecca Street and the Dead Sea Highway and construct another underpass for the movement from Mecca Street to the Dead Sea Highway, which costs less than Option 1.




Source: Created by the JICA Study Team

**Figure 7-14 Proposal for Grade Separation of Intersection #3**

### 2) Mid-Term/Long-Term Measure

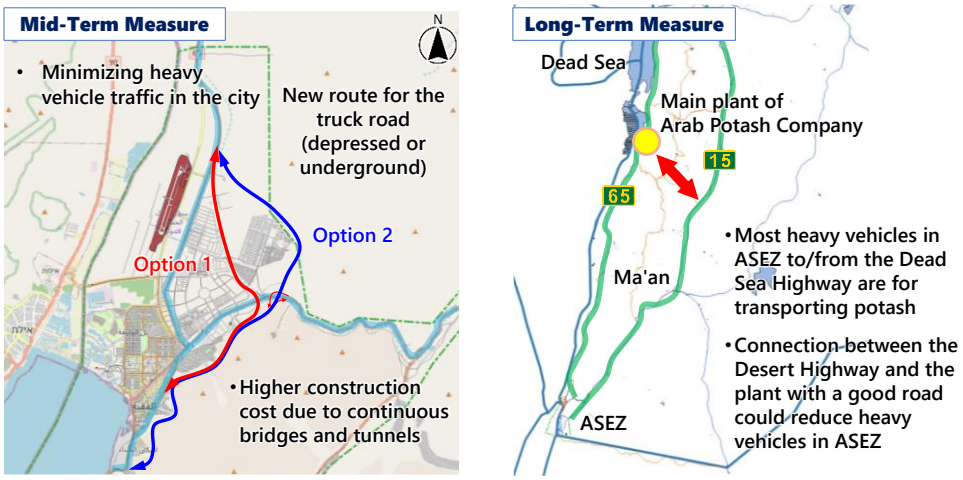
#### a) Issues

Even if the short-term measure is implemented, heavy trucks can still get into the expanded city center area. The major concern is the heavy trucks between the Dead Sea Highway and Mecca Street as they do not have alternative route. Most of them are trucks transporting potash from the main plant of Arab Potash Company located at the Dead Sea to the Aqaba port.

#### b) Proposed Measures

Measures are depicted in Figure 7-15. A mid-term measure is to change the truck route in the city center. Mid-term measure Option 1 is to utilize an existing road constructed along the boundary between Kharma Area and Al Shamiyah Area. The road was proposed as a truck route in the previous ASEZA M/P but not utilized as a truck route. Mid-term measure Option 2 is to construct another road that does not traverse the city area including Al Shamiyah Area. To do so, it requires a road in the mountainous area and might cost more than Option 1 due to continuous tunnels and bridges.

A long-term measure is to construct a road with preferrable road geometry condition connecting the Dead Sea and the Desert Highway. If the connection road is implemented and heavy trucks are not allowed to cross the boundary of ASEZ by the Dead Sea Highway, trucks from the main plant of Arab Potash Company to the Aqaba Port will use the Desert Highway, and it would be the fundamental measure to remove heavy trucks of potash from the city center. This connection road should be implemented by the Jordanian government as the road is out of the ASEZ area, which means this long-term measure might be out of scope of the new ASEZ masterplan. However, it should be noted that it is a promising measure that can remove heavy trucks in the city center of Aqaba, and ASEZ should continuously propose it to the Jordanian government. Even if the long-term measure is implemented, the mid-term measure proposed here is considered necessary to Aqaba to provide not only other trucks but also passenger cars with a bypass.




Source: Created by the JICA Study Team (Map data: OpenStreetMap, https://www.openstreetmap.org)

**Figure 7-15 Proposal for Enhancing Separation of Trucks from the City Center**

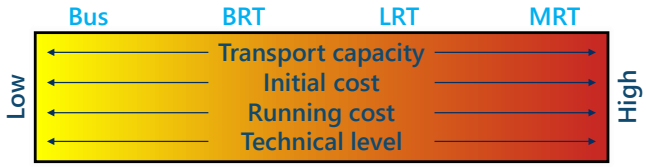
### (2) Public Transport

Public bus operated by Aqaba Transport Company and several individuals is the only public transport system except taxi in Aqaba. However, the current public bus network is not sufficient to serve the demand, and several issues and challenges are raised in Aqaba. Due to the insufficient public transport system, residents and visitors mostly depend on private cars, and even students use private cars driven by parents or other family members to go to school if the distance is not of the level of walking. These situations and increase income of individuals have resulted in the increase of private car use. Traffic congestion is currently not a big issue in Aqaba, but it is obvious that the car ownership will continue to increase. To keep the road traffic and residential environment in a preferrable condition and contribute to the reduction of greenhouse gas, facilitation and promotion of public transport use are important and should be proposed in the new masterplan.

#### 1) New Public Transportation Modes

#### a) Determination of the Mode

Bus rapid transit (hereinafter "BRT") and light rail transit (hereinafter "LRT") are representative urban public transport modes in not only economically developing countries but also developed countries. In general, they are proposed in areas or regions where Mass rapid transit (hereinafter "MRT") is not feasible but there is public transport demand more than public bus and needs for modern, sustainable, eco-friendly, convenient, comfortable, safe, and easy-to-use public transport modes. Tram and monorail are good examples of LRT.



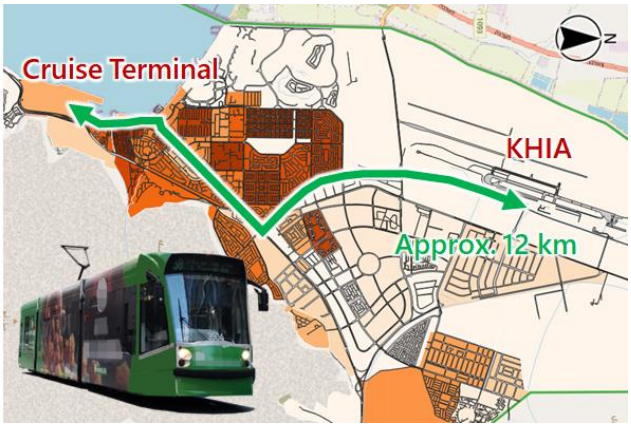

Source: Created by the JICA Study Team

**Figure 7-16 Comparison of Bus, BRT, LRT, and MRT**

ASEZA/ADC is currently considering introducing LRT to the ASEZ urban area. LRT tends to be perceived as attractive due to its modern and innovative design, which is different from conventional public buses and rail transit, and especially when compared to BRT, it is highly rated for its ride comfort and symbolism of the town. On the other hand, LRT is more expensive to introduce than BRT and requires a higher level of technology in terms of infrastructure construction, operation, and maintenance (see Figure 7-16), so BRT is superior to LRT from a financial perspective and generally has an advantage even from a perspective of benefits. However, there is literature[4] that shows that LRT has higher benefits than BRT

[4] Takasugi et al.: "Development of the Method of Measuring the Benefits of Developing Light Rail Transit and Bus Rapid Transit Considering Differences of These Systems and Influence on Urban Population Distribution and a Case Study for Maebashi City, Japan", Journal of the City Planning

depending on the region and what kind of benefits are considered, so, considering the characteristics of the town and the direction it is aiming for in the future, LRT can also be recommended as a new public transportation mode. Therefore, a feasibility study should be carried out first, and the decision should be made after thorough consideration to determine which mode to introduce in the ASEZ. It is also considered to be necessary to compare tram and monorail as LRT in the study. Regardless the mode, one recommended route is to connect highly dense residential area, commercial area, tourist points, KHIA, and Cruise Terminal (or Ferry Terminal) as shown in Figure 7-17. This route can be extended to Wadi Araba and South Beach area depending on the development of those areas. In addition, more lines of the LRT or others should be studied if necessary.




Source: Created by the JICA Study Team

**Figure 7-17 Proposed Main Public Transport Corridor in Aqaba**

**b) Implementation Strategy**

In principle, the mode should be determined based on the result of feasibility study, including traffic demand analysis and the forecast. As a rule of thumb, it is considered that tramway system needs approximately 10,000 passengers per hour during peak hours or 100,000 passengers per day for the viability. However, many public transport systems, even public bus systems, including those in Japan and other economically developed countries, are operated with subsidies from the central/provincial government or municipality. Therefore, it is almost essential to secure subsidies for the capital, operational, and maintenance costs to implement a new public transport mode in Aqaba.

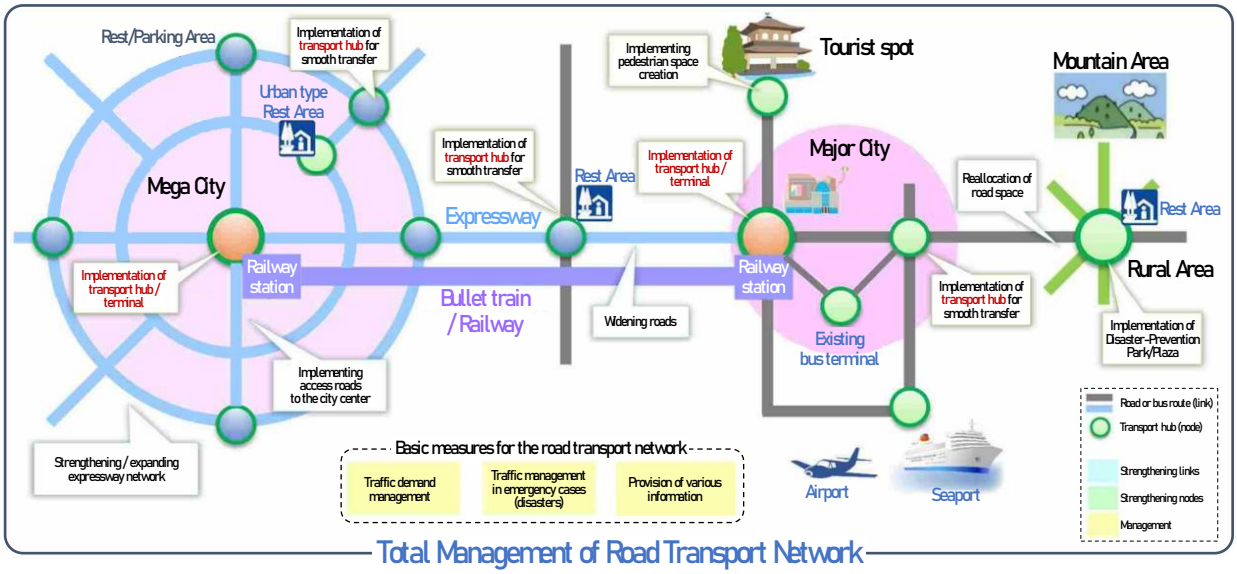
The implementation in three phases is recommended. In the first phase, the ordinary bus service is provided for the main public transport corridor shown in Figure 7-17. In the second phase, BRT service is provided for the corridor. Implementation cost of BRT is usually one-third or one-fourth of that of tramway. It would not need to introduce the full-scale BRT equipped with stations with automated fare collection (AFC) system but might be sufficient with dedicated bus lanes and smart systems like BRT system in Amman. When the passengers are sufficiently increased, LRT can be implemented as the third phase. Utsunomiya Light Rail, which started its tramway service in August 2023 in Utsunomiya City, Japan, is evaluated

Institute of Japan, Vol. 53, No. 3, October 2018.

successful. The population of Utsunomiya City is approximately 511 thousand, which is the same level of the population that Aqaba is aiming at in 2040. However, it should be noted that the project costs and major maintenance costs are from subsidies of central/local governments.

### 2) New Bus Terminal Location

Connectivity between transport modes is one of essential issues to be taken into consideration in the transport planning as well as public transport planning. Well-organized modal connection can support daily life and economic activities by providing smooth transfer between transport modes and more options of trip routes. It can also create business chances. For these reasons, Japanese government has been focusing on the bus terminal and implementing modal connection projects for several decades, although Japan has intensive nation-wide railway and commercial aviation networks. One feature of the concept is to build a bus terminal at major train stations such as bullet train (Shinkansen) stations, which are generally located in the city center. For the reference, the basic concept of the modal connection initiatives of Japan is depicted in Figure 7-18.




Source: "Planning Guidelines for Strengthening Transport Hub Functions" (original title: 「交通拠点の機能強化に関する計画ガイドライン」), Road Burau, the Ministry of Land, Infrastructure, Transport and Tourism of Japan, April 2021 (translated by the JICA Study Team).

**Figure 7-18 Basic Concept of Modal Connection Initiatives in Japan**

Aqaba does not have a passenger railway service, and the domestic aviation service is limited to a route between Amman and Aqaba. It makes Aqaba mostly depend on the long-distance bus services for the inter-city public transport, and, therefore, it is important to locate a bus terminal at an appropriate area and connect it with other public transport modes appropriately.

#### a) Issues of Existing Bus Terminal

As mentioned in Sub-Section 3.6.2 (2) 1), most of the current public bus routes start or end at the bus terminal located in the downtown. Long-distance buses except those of JETT providing luxury bus service also leave from and arrive at this bus terminal in Aqaba. In addition, there are taxis waiting for passengers going to Amman.


Source: Created by the JICA Study Team (Map data: OpenStreetMap, https://www.openstreetmap.org)

**Figure 7-19 Existing Bus Terminal in Downtown of Aqaba**

The current bus terminal has several issues, and ASEZA and ADC have been trying to relocate the bus terminal to another area accommodating all inter-city buses as well as intra-city buses. Those issues are summarized as follows.

- It is located in the center of the Aqaba downtown and causes traffic congestion and environmental problems.
- Without any facilities for passengers and travelers, it is no more than a bus parking.
- It is considered beneficial to utilize the land for more valuable facilities for residents and visitors.

Thus, it is proposed to relocate the bus terminal to another area in Aqaba consolidating all inter-city buses including JETT buses. It is essential to accommodate major routes of intra-city buses and taxis for the easy access, but it does not require all intra-city bus lines connected to the bus terminal.

### b) Basic policy of the Determination of Bus Terminal Location

Basic policies applied to proposing the new bus terminal location are described below.

- Accessibility

The bus terminal should be easily accessed by as many travelers as possible. It requires that the bus terminal should be connected to a good arterial road network and close to downtown, commercial areas, transport hubs, etc. where larger traffic demand is generated. It is also important for inter-city buses to access.

- Connectivity with Other Transport Modes

The bus terminal should be well connected with and accommodate other public transport modes so that it ensures accessibility from areas apart from the location. It is also recommended to provide pick-up/drop facility in the terminal for passengers arriving at or

departing from the terminal by private car.

- Environment

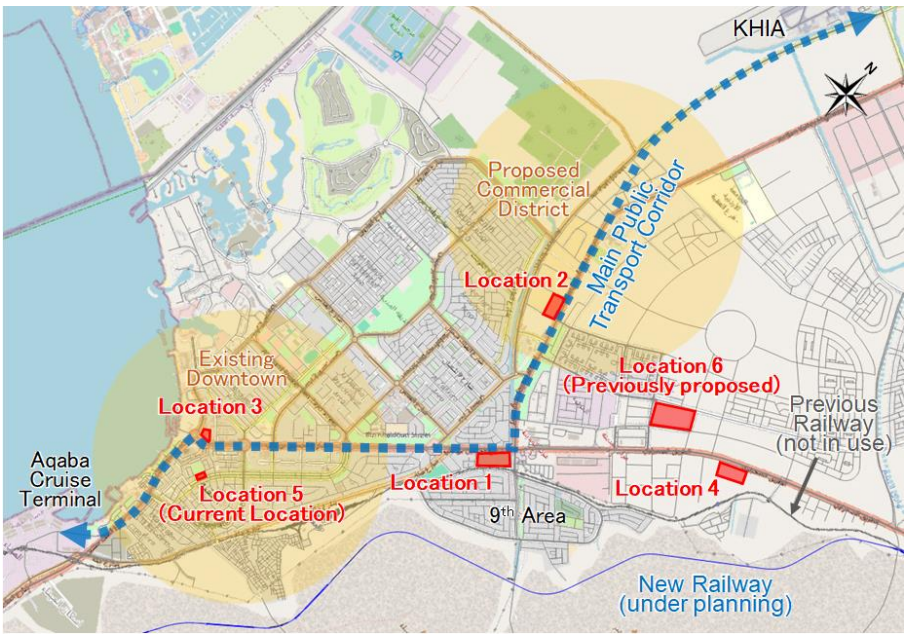
Accessibility is important, but the bus terminal is not recommended to be located in residential areas for better residential environment. It inevitably tends to cause traffic congestion around the site since the bus terminal is one of major facilities generating traffic demand. Therefore, appropriate traffic measures should also be implemented simultaneously.

- Sufficient Space and Easiness of Land Acquisition

The location should be as large as it can accommodate buses, other transport modes, and related facilities. It is strongly recommended to use a land owned by ASEZA or ADC, which requires no land acquisition and resettlement.

### c) Candidates and Proposed Location

Six candidates are considered in this study for the new bus terminal location. The locations are indicated in Figure 7-20, and compared in Table 7-3.



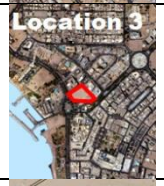
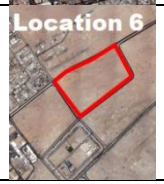

Source: Created by the JICA Study Team (Map data: OpenStreetMap, https://www.openstreetmap.org)

**Figure 7-20 Candidates for the New Bus Terminal Location**

As described in Table 7-3, Location 1 is considered most appropriate and proposed as a new bus terminal location. It has good accessibility from both existing downtown and the proposed new commercial district connected by the major public transport corridor proposed as a new public transport mode (BRT or LRT). Location 2 also has a good accessibility and connectivity, but it could reduce the degree of freedom of studying the area development strategy. If an intercity passenger rail service is under consideration, Location 4, which is close to the previous railway track, might be a good candidate, as it can include a passenger railway station. Transit-oriented development (TOD) can also be expected. However, ASEZA and ADC

confirms that the passenger railway service is currently not feasible and necessary. Location 3 and Location 5 have good accessibility, located in the existing downtown attracting not only residents in Aqaba but visitors and tourists. Especially, Location 3 is good connectivity with the major public transport corridor. However, they need land acquisition since they are owned by private sectors and considered to have insufficient space to accommodate a new bus terminal.

**Table 7-3 Comparison of Candidates for the New Bus Terminal Location**

| Location | Overview | Accessibility and Connectivity | Environment, Land Acquisition, and Others | Recommended |
|---|---|---|---|---|
|  | ・Currently empty<br>・Owned by ADC<br>・Currently no land-use plan | ・Good accessibility from both existing downtown and proposed commercial district<br>・Adjacent to the proposed main public transport corridor | ・Close to the 9th Area Intersection, and a traffic measure required<br>・Sufficient area available and the land acquisition not required | ✓✓ |
|  | ・Currently empty<br>・Owned by ADC<br>・Development of commercial district proposed in this study | ・Good accessibility from the proposed commercial district<br>・Adjacent to the proposed main public transport corridor | ・Sufficient area available and the land acquisition not required<br>・Influence on the commercial district development strategy planning | ✓ |
|  | ・Currently empty in the downtown<br>・Owned by private sector<br>・Future plan not confirmed | ・Excellent accessibility from the existing downtown<br>・Adjacent to the proposed main public transport corridor | ・Insufficient area and the land acquisition required<br>・Significant influence on the traffic condition | |
|  | ・Currently empty<br>・Owned by ADC<br>・Movie-shooting site planned by ADC | ・Poor accessibility from both existing downtown and proposed commercial district<br>・Apart from the proposed main public transport corridor<br>・Best location to be developed together with a passenger railway station | ・Sufficient area available and the land acquisition not required<br>・Revision of land-use plan required<br>・No advantage unless a passenger railway service and TOD (transit-oriented development) are planned | |
|  | ・Current bus terminal in the downtown<br>・Owned by private sector<br>・Redevelopment proposed in this study | ・Excellent accessibility from the existing downtown<br>・Apart from the proposed main public transport corridor | ・Insufficient area and the land owned by private sector<br>・Significant influence on the traffic condition | |
|  | ・Currently empty<br>・Owned by ADC<br>・Previously proposed as a new bus terminal | ・Poor accessibility from both existing downtown and proposed commercial district<br>・Apart from the proposed main public transport corridor<br>・Not facing an arterial road | ・Sufficient area available and the land acquisition not required | |

Note. Aerial photos prepared in the same scale
Source: Created by the JICA Study Team using aerial photos provided by ASEZA

Location 6 is an option that has been previously proposed to ASEZA. It is located in Kharma Area. It is close to Highway 80 and could be a gateway to Aqaba from Dessert Highway. However, it does not face Highway 80 or any other arterial roads, and it is apart from the existing downtown, the area proposed as a commercial district, and the proposed main public transport corridor, so that the accessibility and connectivity are inferior to other candidates. It might be advantageous in terms of traffic condition around the location, but the poor accessibility and connectivity would increase inconvenience of the use of public transport and, consequently, increase the usage and ownership of private cars, which is not aligned with the basic policy of this master plan.

On the other hand, there is a concern of traffic congestion at the 9th Area Intersection if Location 1 is adopted. However, the traffic congestion around the bus terminal is inevitably expected, and the countermeasure is always important wherever it is located. For the 9th Area Intersection, there are several measures already proposed in Sub-Section 7.2.1(1). Also, optimization of the traffic signal operation can improve the traffic capacity of the signalized intersection that is currently operated with default setting of signal parameters, which will be explained in Sub-Section 7.2.1(4)2). Furthermore, locating entrance/exit of the bus terminal as far as possible from the intersection can minimize the influence of traffic to/from the bus terminal on the intersection, of which an example is shown in Figure 7-21.


Source: Created by the JICA Study Team using aerial photos provided by ASEZA

**Figure 7-21 Example of Traffic Movement to/from the New Bus Terminal (Location 1)**

### 3) Public Bus

Most-frequently raised technical problems of current public bus system in Aqaba are the insufficient bus network, uncertainty of bus operation, inconvenient transfer to another line, and the location of the bus terminal. The new ASEZ masterplan should address these issues and show solutions and guidelines for the future development.

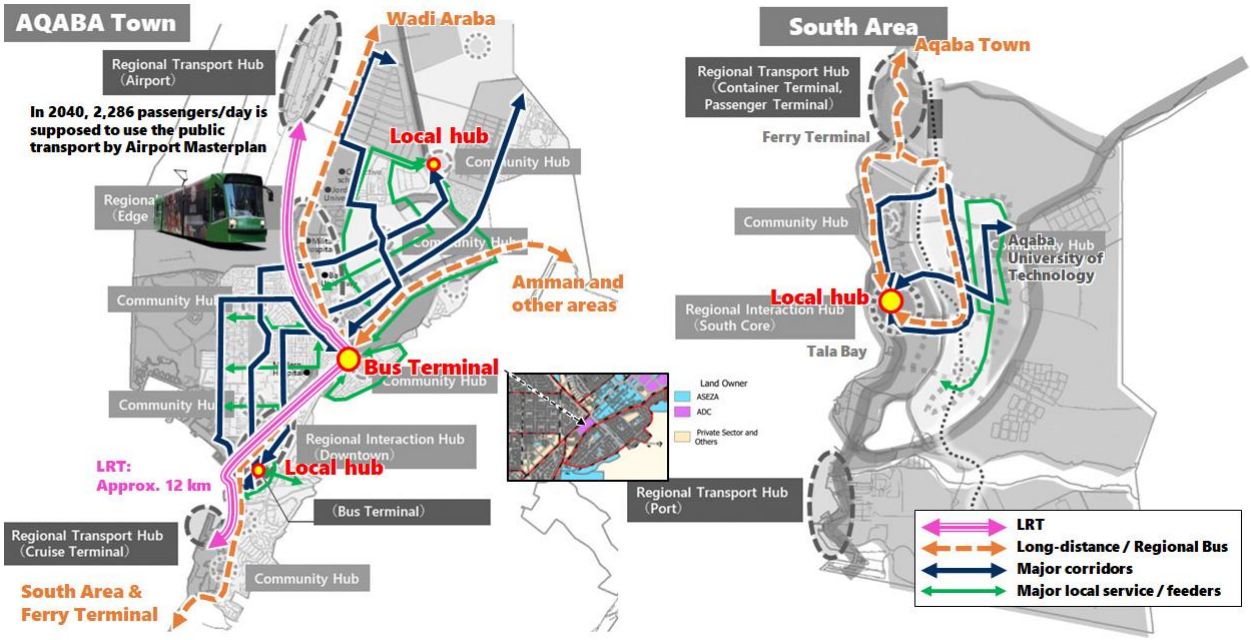
#### a) Reorganization of Bus Network

The public bus lines registered in ASEZA are shown in Table 3-61 to Table 3-64. However, actual bus lines in operation are not the same. For example, the University Route is supposed to serve the demand to/from the KHIA, but the route between the airport and the University of Jordan is currently suspended due to protests of taxi drivers against the bus service at the

airport. In addition, the operation of South Beach Route is also suspended. One reason is, as same as the University Route, that taxi drivers are in protest against the public bus service to the Ferry Terminal, where international passengers between Jordan and Egypt use for ferry travels. The other is the private bus service for workers commuting to the south industrial area, logistics facilities in and around the area, and Aqaba Ports, which is contracted by those facilities and companies. These two routes are considered important routes to be served by public transport in Aqaba, so that a new public bus network to be proposed in the updated ASEZ masterplan should include them, considering other public transport modes that are to be proposed at the same time. In addition, the bus demand from the expanded city area should be covered.

Proposed key public bus lines in 2040 are shown in Figure 7-22. One of them connects KHIA, downtown, and Cruise Terminal, which is proposed as a main public transport corridor in the previous section, and is proposed to be extended to Wadi Araba, Aqaba Ports, and South Industrial Zone in the future. For this line, it is proposed to introduce a new public transport mode such as LRT. However, if there is a delay in the implementation, it would be effective to develop the public transport system in phases, e.g., operating ordinary public buses for that line first and introducing a new public transport mode on the next stage.

A public bus network should be implemented in each of the Aqaba city center and the southern area. Considering transport hubs in each area, it is proposed to develop the public bus network with major lines and feeder lines to smoothly connect each community based on the analysis of public transport demand in 2040. In the detailed study of the public bus network, it should be carefully studied to include general hospitals, universities, schools, government offices, tourist spots, commercial facilities, markets, central business districts (CBD), important transportation facilities (airports, ports, railway stations, bus terminals, etc.), etc.




Source: Created by the JICA Study Team

**Figure 7-22 Proposed Key Public Bus Lines in Aqaba**

### b) Regional Express Service

As described above, it is proposed to develop a bus terminal near 9th District, accommodating not only inter-city buses connecting Aqaba, Amman, and other cities but Aqaba intra-city buses connecting the city center with the Ferry Terminal, Wadi Araba, the southern area, Rashidiya area, etc. For these intra-city buses connecting areas in Aqaba, it is recommended to operate regional express service that buses stop less, so that they increase rapidity and accessibility between the city center and those areas. One example is that those buses do not stop in the city center and stop at only major bus stops in those areas. Another example is that those buses do not stop in the city center and on the route between the city center and each area as a rapid service but stop at all bus stops in those areas as a local service.

### c) Improvement of Bus Service and Operation

Except several bus lines, the bus operation schedule does not exist, and buses depart from the bus terminal any time if the bus becomes full of passengers. If there are not so many passengers, the operation interval becomes long, and the uncertainty of the bus arrival frustrates passengers to use the public bus.

Another issue is bus stop. Few bus stops have a bench and a shelter where passengers can wait for a bus avoiding the strong sun. Even though some bus stops with those amenities are found in Aqaba, bus stops are basically not clearly designated, and passengers can get on and off the bus wherever they want. It might be convenient for passengers. However, sudden stopping of bus regardless of the location involves a high risk of traffic accident. In addition, frequent stopping decreases the bus operation speed and, as a result, the quality of bus service.


Source: Created by the JICA Study Team

**Figure 7-23 Bus Stop with Seating and Shelter in Aqaba**

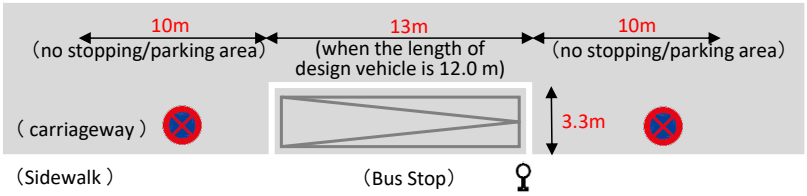
Therefore, it is proposed to determine the bus operation schedule of each line and make every effort to manage the operation as scheduled. At the same time, it is recommended for Aqaba Transport Company to monitor the number of passengers of each line, periodically update the operation schedule, and provide the bus users with the timetable of each bus stop.

It is also proposed to rearrange and clearly designate bus stop locations. Bus stops should be determined at safe locations close to buildings, facilities, and other places that generate high demand. However, the spacing of bus stops in the urban area is recommended 250~500 m.

**Table 7-4 Recommended Spacing of Bus Stops**

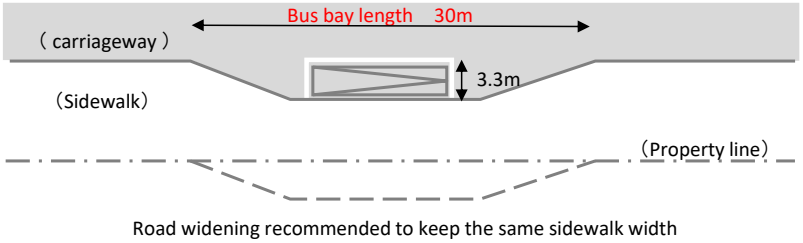
| Area | Recommended Spacing |
|---|---|
| High density (over 40 pax/ha) | Approximately 250 m |
| Moderate density (10~40 pax/ha) | 250 ~ 500 m |
| Low density (under 10 pax/ha) | As needed |

Source: Created by the JICA Study Team



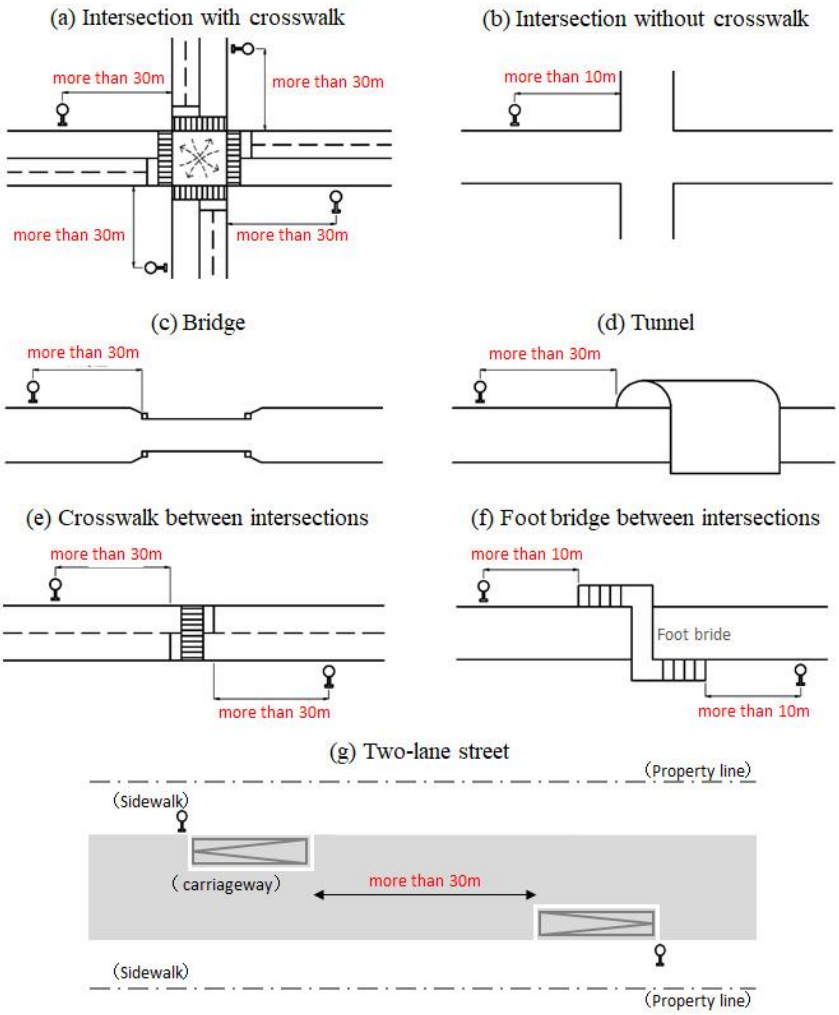

Source: Created by the JICA Study Team

**Figure 7-24 Proposed Dimension of Bus Stop**




Source: Created by the JICA Study Team

**Figure 7-25 Bus Bay Proposed for Bus Stops on Arterial Roads**




Source: Created by the JICA Study Team

**Figure 7-26 Proposed Guidelines for Bus Stop Location**

### d) Eco-Friendly Bus

To reduce the greenhouse gas and improve the urban environment, automakers and many countries are trying to develop and globally promote electric vehicles, substituting conventional vehicles that use fossil fuel. Some countries have declared to regulate the use of even hybrid vehicles. Aligned with this global trend, and for the environment of Aqaba, eco-friendly buses are proposed for the public buses.

Electric Vehicle (hereinafter "EV") is a representative type that is motorized by only electricity that needs recharging the battery for driving. On the other hand, Fuel Cell (hereinafter "FC") vehicle is another type that is motorized by electricity but needs recharging hydrogen to generate electricity instead of recharging the electricity. It is said that the FC vehicle type is more environmentally friendly, because hydrogen naturally exists on the earth and produces electricity combined with oxygen, which also naturally exists on the earth, with no emission of harmful or global warming gas or substances but only water. Instead, FC vehicles require hydrogen station for recharging, and the implementation cost of hydrogen stations is the biggest challenge.

As of August 2023, ADC is preparing procurement of 20 EV buses using loans from EBRD

and has a plan to increase the number of EV buses for the public bus in Aqaba. It is proposed in the future to substitute all existing buses with EV or FC buses and install EV battery rechargers at the bus depots and the bus terminal.

### e) Smart Solutions and Other Options for the Promotion of Bus Use

Other measures for the promotion of bus use and smart solutions for the public bus are proposed below to improve the public bus service quality and realize the smart city in Aqaba.

- Support for bus transfer

At the intersection of two bus lines, bus stops of each line should be installed, and the walking distance for the transfer should be minimized. It is recommended to provide reduced fare or free-of-charge for the transfer.

- Bus facilities

It is proposed to clearly indicate the bus stops using bus stop signs and road marking and install benches and shelters.

The current maintenance workshop is located approximately 500 m of southeast from the office building of Aqaba Transport Company in Kharma Area. The area is approximately 3,200 $m^2$ (40 m × 80 m), and it has several containers used as office or parts-warehouse, maintenance facility, and parking space. The depot for overnight parking is located near 9$^{th}$ Area, which is approximately 20,000 $m^2$ used as a temporary space with one container as an office. It is proposed to have one place for the office building of Aqaba Transport Company with the operation monitoring and control center, the maintenance workshop, and the overnight parking, as well as bus-washing machines, fuel refilling facility, employees' parking space, drivers' rooms for standby, rest, and overnight stay, etc., with improved security. It is also proposed to install the similar facilities at terminal bus stops, if necessary for the efficient bus operation.

(a) Depot for overnight parking

(b) Maintenance Workshop

Source: Created by the JICA Study Team

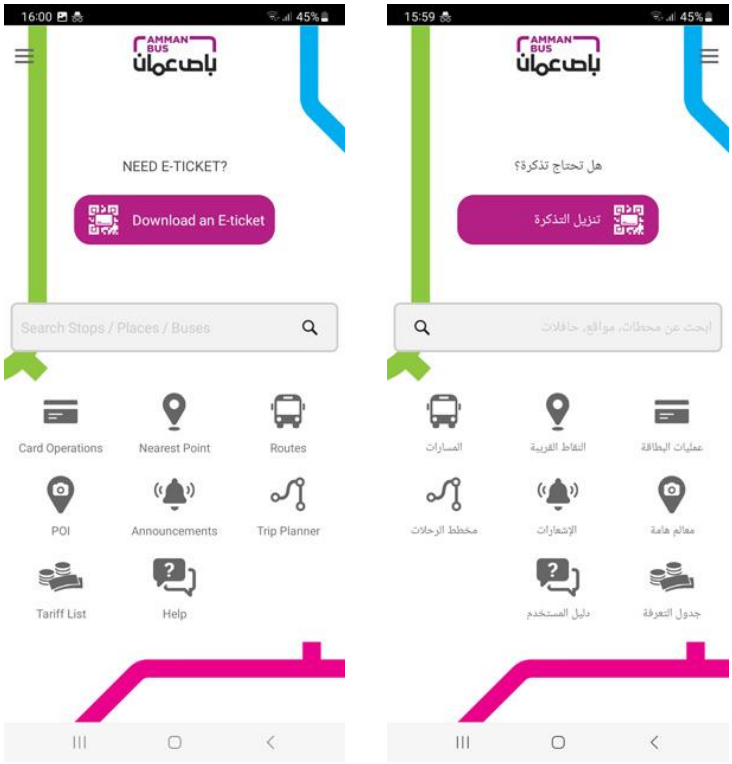
**Figure 7-27 Existing Bus Depot and Maintenance Workshop**

- Provision of bus operation information

It is proposed to provide the bus users with bus information such as bus operation, timetable, transfer info, etc. by online. One conventional way is the information service by using internet homepage or social network service (hereinafter "SNS"). However, the method that is more

popular recently is to use a mobile phone app. Mobile phone app is easier and faster for users to get necessary information, and personalized service, such as route search and fare-payment is also available. In Amman, Jordan, a mobile phone app for the public bus has already been in service (Figure 7-28), which might be an example.

(a) English version (b) Arabic version




Source: Created by the JICA Study Team

**Figure 7-28 Mobile Phone Application "Amman Bus"**

Digital signage at the bus stop is another recommendation. It can display bus operation information, advertisement, notice/warning from administration, tourist information, etc. If a touch-screen function is equipped, interactive use of the digital signage is also available, and users can display contents that the users want to watch.

(a) Utsunomiya, Japan (b) Anyang, Korea


Source: Created by the JICA Study Team

**Figure 7-29 Examples of Digital Signage at Bus stops**

- Fare Collection System

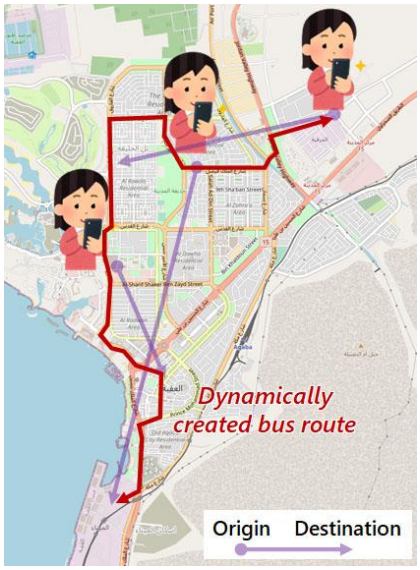
Recently, cashless service for payment using mobile phone application, IC card, etc. is increasing globally. Even in Jordan, buses operated by Amman Bus does not accept cash on the bus but only prepaid IC card or a QR code which is displayed by the mobile phone app. The QR code can be topped up using the app and his/her credit card as well.

- Data utilization

Data obtained by bus operation should be collected, analyzed, and reproduced as another feature of data, and utilized for improving bus service and other public services and creating business chances that can be beneficial to not only bus users but all residents and visitors.

### 4) On-Demand Bus

On-demand bus might be necessary in Aqaba to expand the public bus coverage as a complementary service to the regular bus service in the future. It does not have a fixed route, fixed schedule, or fixed boarding/alighting points (bus stop), or all of them. Users request for a bus by mobile app or internet with information of origin, destination, and departure time. Then the system analyzes all requests in real-time, determine the number of buses, routes of each bus, and locations to stop. This service can be feasible to areas with less public bus demand, so useful for the expansion of public bus expansion.




Source: Created by the JICA Study Team (Map data: OpenStreetMap, https://www.openstreetmap.org)

**Figure 7-30 Concept of On-Demand Bus**

### 5) Passenger Railway Service

Passenger railway service might be necessary between Aqaba and Amman in the future. Current public transport modes between two cities are only long-distance bus (10 JD by JETT) and air (25-50 JD for economy class by Royal Jordanian), and provision of multi-modal public transport is important for those cities.

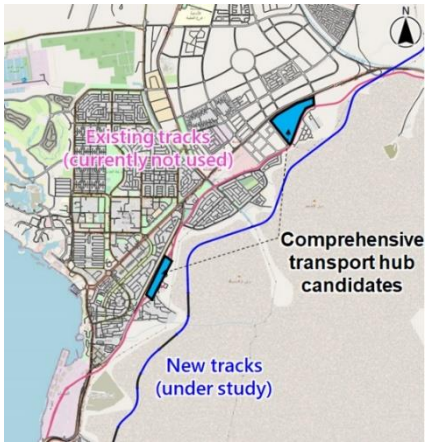
On the other hand, the feasibility is concerned. Due to the topographical condition between Amman and Aqaba, the construction of railway costs more than other lines in Jordan, and even the railway restoration project for cargo does not go smoothly due to the financial issue. Therefore, the passenger rail service should be discussed further with ASEZA and stakeholders, studied carefully, and determined.


Source: Created by the JICA Study Team (Map data: OpenStreetMap, https://www.openstreetmap.org)

**Figure 7-31 Concept of International Passenger Railway Route**

If the passenger rail service is determined to be implemented, a railway station in Aqaba will be necessary. Proposed candidates of location for the railway station are shown in Figure 7-32. It is also proposed to develop the railway station as a comprehensive transport hub for not

only the railway but also long-distance bus, local public bus, LRT/BRT, etc., and to develop the surrounding area based on the transit-oriented development (hereinafter "TOD") strategy. TOD is a type of urban development that maximizes the amount of residential, business, and leisure space within walking distance of public transport. The aims are to increase public transport ridership by reducing the use of private cars and promoting sustainable urban growth. It typically includes a central transit stop, such as a train station, LRT station, or a bus terminal. The densest area of TOD is normally located within a radius of 400-800 m around the central transit stop.




Source: Created by the JICA Study Team (Map data: OpenStreetMap, https://www.openstreetmap.org)

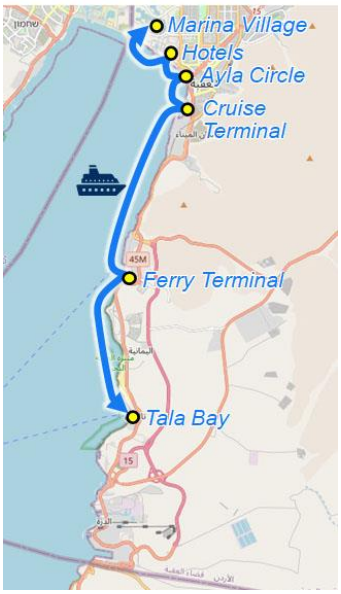
**Figure 7-32 Candidates for TOD Hub Locations**

### 6) Sea Taxi and Flying Taxi

In the 1st Strategic Environment Assessment (SEA) Stakeholder Meeting held on 12th and 13th of July 2023 and technical workgroup meetings for transport and logistics in this study, there were opinions of implementing various transport modes, especially those utilizing the sea. It is proposed to implement a sea taxi system and a flying taxi system in the updated ASEZ masterplan.

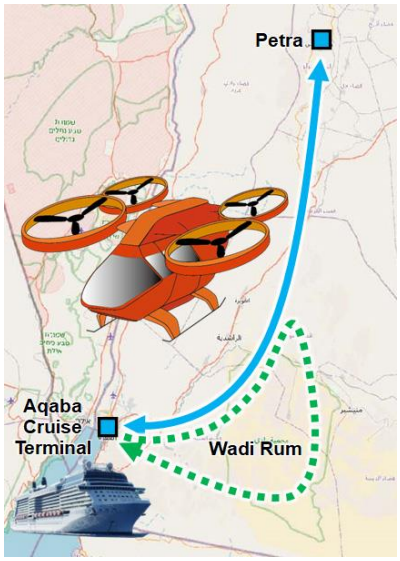
Transport via sea routes is considered as one solution for enhancing connection between the downtown and the southern part of Aqaba. It could be a regular service, chartered service, or both, and the sea taxi is the type of chartered service. It might be more attractive to tourists, but by reducing the fare and operating the boats as a regular service, it could be a public transport mode, popular to tourists.

Flying taxi is currently closer to a tourist attraction. However, there are many cities where drones for passenger transport are under test, even those where the pilot service is to start soon, and flying taxi would be one of typical public transport modes in the near future. One idea for Aqaba is to operate the flying taxi for tourists between Aqaba and major tourist areas such as Petra. There has been helicopter services of the route for the tourist visiting Aqaba by cruise ship. Therefore, it is considered that the demand for using flying taxi exists. The flying taxi can be a new attraction for sightseeing from the sky over Petra, Wadi Rum, etc. On the other hand, there are some challenges. One is a legislative and administrative issue, including the aviation restrictions, another is a political issue about the military concerns because Aqaba is a border city and too close to neighboring countries.




Source: Created by the JICA Study Team (Map data: OpenStreetMap, https://www.openstreetmap.org)

**Figure 7-33 Proposal of Sea Taxi Route**



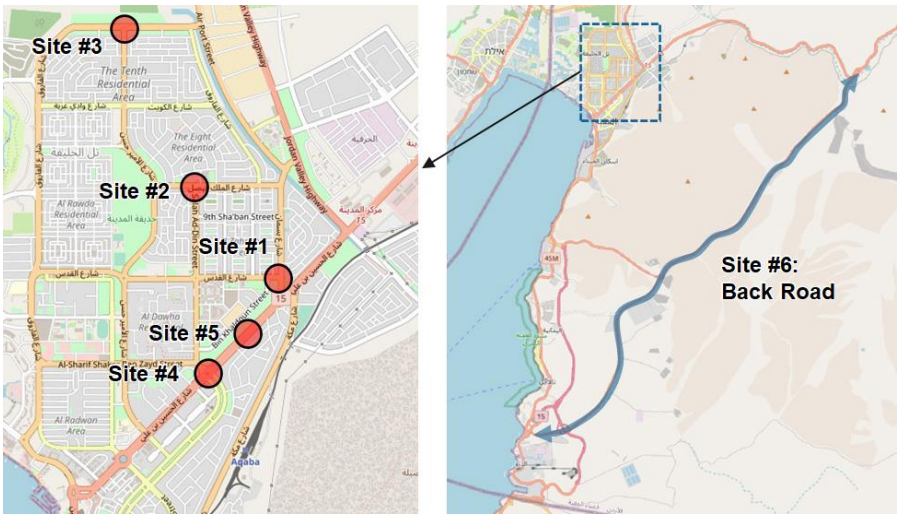

Source: Created by the JICA Study Team (Map data: OpenStreetMap, https://www.openstreetmap.org)

**Figure 7-34 Proposal of Flying Taxi Service**

### (3) Traffic Safety

#### 1) Accident-Prone Locations

Figure 7-35 shows the locations where traffic accidents occur frequently in ASEZ, identified through interviews with ASEZA and the Traffic Police. Sites #1 ~ #4 are listed by ASEZA, and sites #2 ~ #6 are listed by the traffic police as locations where accidents occur frequently. Table 7-5 shows the site condition at each location and the major causes of the accidents.




Source: Created by the JICA Study Team (Map data: OpenStreetMap, https://www.openstreetmap.org)

**Figure 7-35 Accident-Prone Locations in ASEZ**

**Table 7-5 Accident-Prone Locations and Major Causes of Accidents**

| Accident-Prone Locations | Site Condition & Major Causes of Accidents | Options of Measures |
|---|---|---|
| Site #1:<br>7th Area Intersection | •Three-leg intersection (Basman St. & Al-Quds St.)<br>•High traffic volume with many left-turning vehicles from both roads<br>•Approach from Al-Quds St. with ascending slope<br>•Major causes: Aggressive left-turning vehicles, insufficient sight distance, start-up delay caused by insufficient acceleration of vehicles from Al-Quds St., etc. | •No-left-turn<br>•Upgrade to roundabout |
| Site #2:<br>Kalouti and Disi Mosque Intersection | •Three-leg intersection (K. Faysal St. & Salah Ad-Din St.)<br>•High traffic volume with many left-turning vehicles from both roads<br>•Located in front of a mosque with full of on-street parking vehicles in and around the intersection<br>•Major causes: Aggressive left-turning vehicles, etc. | •No-left-turn<br>•Upgrade to roundabout |
| Site #3:<br>10th Area Intersection | •Three-leg intersection (Al-Farouk St. & Pr. Hasan St.)<br>•High traffic volume with many left-turning vehicles from Al-Farouk St. and many right-turning vehicles from Pr. Hasan St.<br>•Insufficient sight distance between the through traffic from the west of Al-Farouk St. and the left-turning vehicles from the east of Al-Farouk St. under the condition of high operating speed on the long tangent section of Al-Farouk St.<br>•Major causes: Aggressive left-turning vehicles, insufficient visibility, etc. | •No-left-turn<br>•Upgrade to roundabout |
| Site #4:<br>Shiekh Zayed Circle | •Roundabout (Sharif Hussein bin Ali Blvd., K. Abdullah St., and Salah Ad-Din St.) with a central island of diameter of about 50 m and 2-lane circulatory roadway<br>•Approach and discharge of each leg separated by wide strip used for planting or park (strip width of approx. 40 m for Sharif Hussein bin | •Geometry improvement of the existing roundabout |

| Accident-Prone Locations | Site Condition & Major Causes of Accidents | Options of Measures |
|---|---|---|
| | Ali Blvd., approx. 50 m for K. Abdullah St., and 35 m for Salah Ad-Din St.)<br>•Operated as four unsignalized intersections until it has been upgraded as the current feature of roundabout<br>•Major causes: aggressive entering vehicles to the circulatory roadway that do not obey the rule of priority on the circulating traffic, inappropriate roundabout shape without curved approach, which allows the through traffic with its movement close to tangent, etc. | |
| Site #5:<br>U-Turn Point on Sharif Hussein bin Ali Blvd. | •U-turn point located between Shiekh Zayed Circle and Army Traffic Signal Intersection on Sharif Hussein bin Ali Blvd. (horizon alignment: tangent)<br>•Major causes: no U-turn Lane (mainly rear-end collisions, etc. | •Installation of U-turn Lane |
| Site #6:<br>Back Road | •Overall section of Back Road<br>•Preferrable horizontal alignment in general but steep vertical grade of 5 ~ 7% due to the topographical condition<br>•Major causes: failure of the braking system of vehicle causing single-vehicle accidents, inappropriate lane-change behavior to avoid low-speed vehicles on the slope, etc. | •Installation of emergency turnout for stopping<br>•Increase of the installation of climbing lanes<br>•Construction of alternative route |

Source: Created by the JICA Study Team based on interview with ASEZA and the Traffic Police and Site Visit

#### 2) Pedestrian Crossing

It is considered in Aqaba that the installation of crosswalks is insufficient, and jaywalking is often observed everywhere. Especially at roundabouts, pedestrian crossing is not protected. Humps are often found in Jordan to reduce the vehicular speed or to provide safe pedestrian crossing. However, those on arterial roads can not only damage vehicles and precision devices transported by trucks but also decrease the comfort of driving, and, sometimes, become a cause of traffic accident.

One solution is to install foot bridges on high- speed arterial roads with high traffic volume. Especially on those roads with six or more traffic lanes, foot bridges are recommended. Another recommendation is installation of traffic lights at the road sections where there are many pedestrians of road crossing. However, it should be carefully examined to minimize the number of locations and applied, because it directly affects the traffic flow. To prevent the jaywalking, installation of fence, barrier, or any kind of physical object between the roadway and the sidewalk is effective.

### (4) Urban Traffic Management

Currently, traffic congestion is not considered to be a critical concern in Aqaba. However, traffic demand is concentrated in the downtown (commercial area) surrounding Ayla Circle, even at night, and, occasionally, it causes traffic congestion. To ensure the traffic safety and the smooth traffic flow, traffic management strategies, especially in the downtown, are proposed.

(a) Commercial area in downtown


(b) Traffic congestion on Al-Nahda Street at night

Source: Created by the JICA Study Team (Map data: OpenStreetMap, https://www.openstreetmap.org)

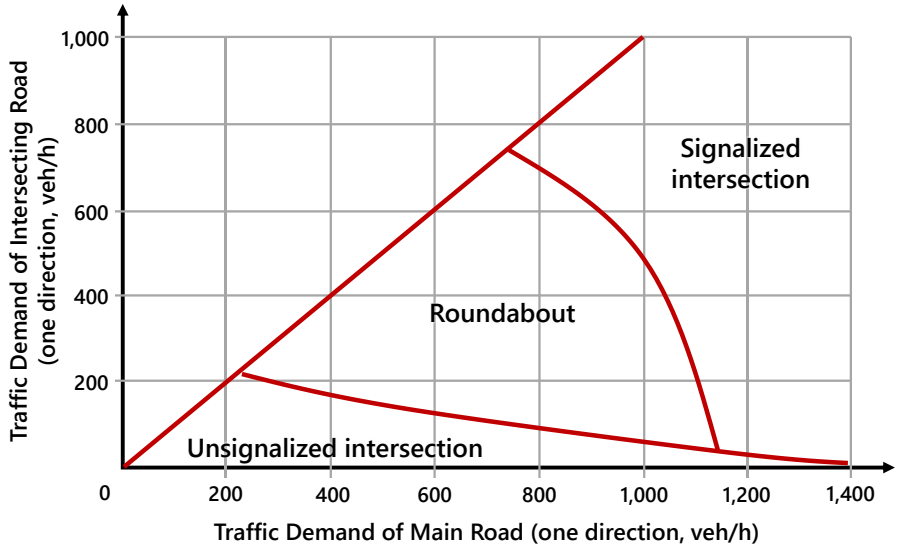
**Figure 7-36 Traffic Congestion in the Commercial Area in Aqaba**

One traffic management strategy is the improvement of traffic capacity of intersection, which is a representative bottleneck in urban road network. Another strategy is to improve the traffic flow by enhancing the traffic capacity of road section between intersections. An affirmative way is to construct more roads or increase traffic lanes by road widening. However, that is not so practical, because it is not easy in the urban area in general. Instead, it is recommended to enhance the traffic capacity by removing elements that decrease the traffic capacity. It is considered that those elements are on-street parking and illegal parking in the downtown. It is also considered to increase traffic capacity of road section by changing the road operation. One representative example is one-way street.

### 1) Intersection Types and Traffic Capacity

Intersection can be divided into at-grade intersection and grade-separated intersection. At-grade intersection can be divided again into unsignalized intersection and signalized intersection based on traffic control methods. Roundabout, which is not normally classified as unsignalized intersection, although it is not controlled by traffic signals, is also one type of at-grade intersection. In general, “stop” control is applied to all or a part of approaches, at unsignalized intersections. At signalized intersections, traffic flow is interrupted by traffic signal control, resulting in delay in travel time due to stopping, waiting at the signal, and starting up. Therefore, unsignalized intersections are advantageous at intersections where the traffic volume is so low that traffic signal control is not necessary, but at intersections where traffic volume increases and it is not possible to deal with it by just stop-control, it is possible to improve the traffic capacity by appropriately implementing traffic signal control. On the other hand, although there is a rule that gives priority to the circulating traffic at roundabouts, stopping is not required in principle, so the traffic capacity is generally larger than that of unsignalized intersections. However, the traffic capacity of roundabouts is generally small compared to signalized intersections where the traffic control is actively carried out. On the other hand, roundabouts are generally evaluated to have fewer serious accidents, so roundabouts are recommended over signalized intersections unless there is enough traffic to

require a signalized intersection. It should be also noted that the cost for the installation and the maintenance of traffic lights and other control system/devices. Figure 7-37 shows the traffic demand conditions for main roads and intersecting roads that will be used as a guideline when selecting the type of at-grade intersection.




Source: Created by the JICA Study Team

**Figure 7-37 Traffic Capacity of At-Grade Intersections by Types**

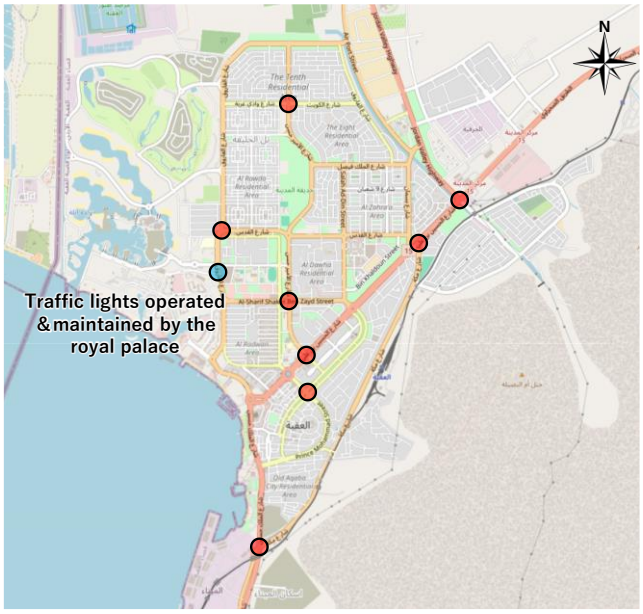
Traffic volume is increasing in the Aqaba city center. Congestion occurs at some intersections during peak hours in the morning and evening, and it is recommended that traffic control be implemented at such intersections as an implementation measure for urban traffic management. In such cases, it is desirable to apply roundabouts as much as possible as described above, and it is necessary to implement traffic signal control at intersections with traffic volumes that cannot be handled by roundabouts. However, the traffic capacity of a signalized intersection is larger than that of an unsignalized intersection or a roundabout only when the traffic signal control is performed appropriately, and at a signalized intersection where the signal control is not performed using appropriate signal parameters, the traffic capacity decreases. It should be noted that this only increases the delay of travel time.

### 2) Signalized Intersection and Traffic Control Center

Systematic traffic control and urban traffic management is essential in urban area to keep the road traffic in a good condition for both traffic efficiency and safety. Traffic signal is to control the traffic movements especially at intersections by stopping and proceeding vehicles in order as scheduled or adaptively depending on the traffic condition. Traffic signal is a type of traffic control at at-grade intersections that can maximize the traffic capacity, but the inappropriate operation causes delay of traffic and, as a result, reduce the traffic capacity.

Traffic control center is a unit in charge of the traffic management and control. In general, traffic control center monitors traffic condition of major roads using CCTV or traffic detector data, adjusts the traffic signal parameters temporarily or periodically, maintains traffic lights, signal controllers, and other related devices, conducts investigation on the traffic condition and safety, and makes proposal for the improvement.

As of October 2023, there are a total of nine signalized intersections in ASEZ (Figure 7-38). One of them is operated and maintained by the royal palace, and the other eight locations are operated and maintained by ASEZA's City Services Directorate. Adaptive traffic signal control system is installed at these eight signalized intersections. However, since the sensors (loop coils) buried in the road surface have broken down during road maintenance or by other reasons, there is currently no place where the adaptive traffic signal control is performed, and all those signalized intersections are operated using the default setting of signal parameters. It means that all those intersections are being operated inappropriately. In addition, there is no traffic control center, and these traffic lights cannot be monitored or remotely controlled by ASEZA, so even if a traffic light stops working due to a malfunction, ASEZA cannot notice it, and City Services Directorate dispatches employees to the site when it receives a notice from residents or the police. Currently, ASEZA has a plan to introduce a state-of-the-art traffic control system.




Source: Created by the JICA Study Team (Map data: OpenStreetMap, https://www.openstreetmap.org)

**Figure 7-38 Signalized Intersections in ASEZ (9 Locations in Total)**

If the traffic volume in ASEZ increases more and the traffic lights increase in the future, they should be operated and maintained systematically, and coordination of traffic signal is also required. Traffic enforcement can also be conducted by traffic control center by using CCTV or other AI systems or entrusted to it by traffic police.

(a) Phnom Penh, Cambodia (b) Tokyo, Japan (c) Stuttgart, Germany

Source: Created by the JICA Study Team

**Figure 7-39 Examples of Traffic Control Centers**

### 3) Parking Management

In Aqaba, off-street parking including parking space of each office buildings and shopping malls is considered insufficient, so that drivers mostly depend on on-street parking, even for overnight parking. As mentioned above, illegal parking and inappropriate on-street parking decrease not only the traffic capacity but also the traffic safety.

Figure 7-40 shows examples of illegal parking. On-street parking is basically permitted on those streets in the figure, but the problem is the stopping or parking in the traffic lane and interfere the traffic. It obviously decreases the speed, thus the traffic capacity, and even the traffic safety. On directionally undivided roads, other vehicles are forced to cross the median and pass the illegally parked vehicles, which is a dangerous behavior to opposing vehicles and pedestrians who cross the road. The case of Figure 7-40 (b) has another problem, parking at the crosswalk, which significantly increases the risk of accidents.

(a) Al-Nahda Street (b) King Hussein Street

Source: Created by the JICA Study Team

**Figure 7-40 Illegal Parking in the Downtown and on Arterial Roads**

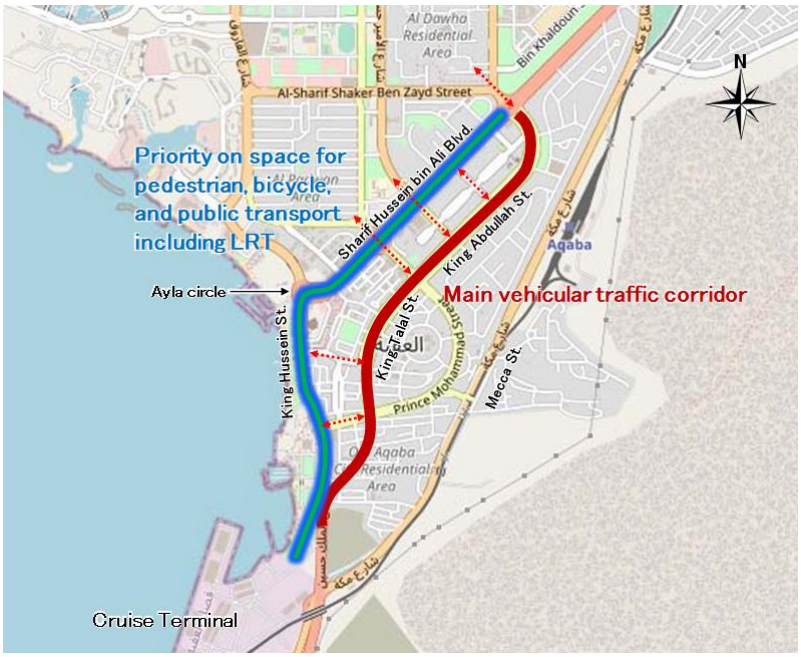
One solution is to prepare more off-street parking space, including parking buildings, and minimize road sections allowing the on-street parking in the downtown. Limited on-street parking and increase of toll parking space can also be a measure of reducing traffic demand to the area. Another is to strictly apply no-parking/stopping zone around intersection, crosswalk, etc. and strengthen the enforcement of traffic rules. Even in other areas including residential areas, no-stopping/parking zone should be clearly designated at the risky locations or road sections.

### (5) Transition of Main Traffic Corridor in Aqaba CBD

Sharif Hussein bin Ali Boulevard and King Hussein Street, located in the CBD and the Aqaba downtown area near Ayla Circle, are the busiest road sections in Aqaba. The main reason for this is the concentration of traffic in the CBD and downtown area, but another reason is that there is no other arterial road connecting the Aqaba city center, especially the CBD and the downtown, to the southern part of Aqaba.

These road sections are important from the perspective of urban landscape and tourism, and a strategy is recommended to prioritize pedestrians, bicycles, and public transportation such as LRT, and minimize access by private vehicles. However, since the area is already urbanized, it is difficult to widen the roads, and if measures are implemented based on the above strategy, the roadway width may become narrower than it is now. Therefore, considering that traffic demand will increase further in the future, these road sections would be a major bottleneck in the Aqaba city center.

As a countermeasure, as shown in Figure 7-41, it is proposed to develop or upgrade King Abdullah Street and King Talal Street as a main vehicular traffic corridor and develop Sharif Hussein Bin Ali Boulevard and King Hussein Street in this area mainly for pedestrians, bicycles, and public transportation with limited access by vehicles.




Source: Created by the JICA Study Team (Map data: OpenStreetMap, https://www.openstreetmap.org)

**Figure 7-41 Transition of Main Traffic Corridor in Aqaba CBD**

### 7.2.2 Transport and Logistics Contributing to "Opportunity of Business"

#### (1) Inter-Regional Arterial Road Network

The only inter-regional arterial roads connecting ASEZ with Amman and other cities are the Dead Sea Highway and the Desert Highway. As shown in Figure 7-11, heavy trucks for Aqaba Port using the Dead Sea Highway should pass through the Aqaba city center, while those using the Desert Highway should use the Back Road. Regarding the situation of this current inter-regional arterial road network, following issues are raised.

- Expansion of the city center

  Karma Area has already been being developed, and it is considered that, in the future, it will be developed up to the level of the current Aqaba city center, along with the area around KHIA. In that case, heavy trucks and through traffic departing from and arriving at Aqaba Port using the Dead Sea Highway would have to pass through the expanded urban area, leading to concerns about deterioration of the urban residential environment and increase in traffic congestion and accidents.

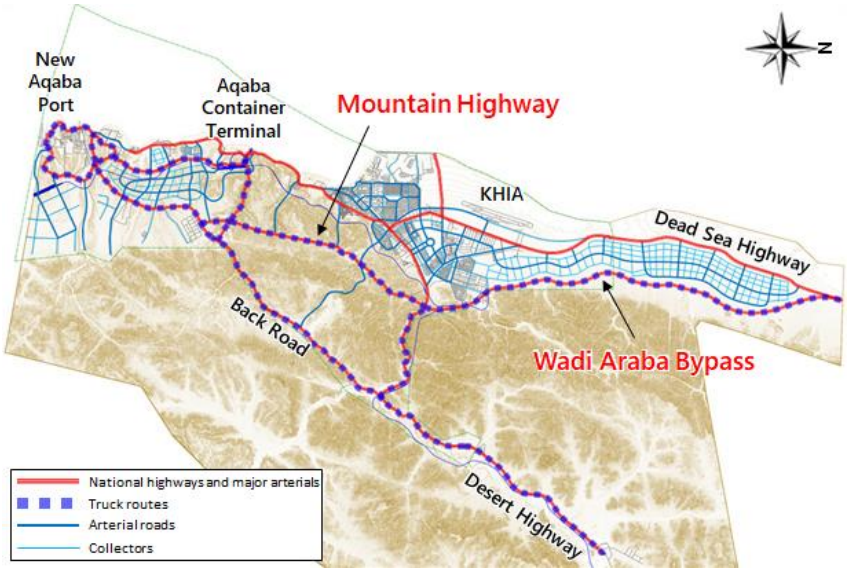
- Development of residential areas in Wadi Araba and South Beach

  Currently, Wadi Araba has not been developed yet, and only some part of the South Beach area has been developed. However, if these areas are developed as proposed in this M/P, there are concerns that heavy trucks and through traffic will worsen the urban residential environment and increase traffic congestion and accidents.

- Long and steep vertical grade of the Back Road

  Due to the topography, the Back Road is a long slope with a vertical gradient of 5 to 7%, and a fully loaded heavy trucks travel uphill at a speed of approximately 20 km/h. This not only reduces traffic performance of the road, but also induces traffic accidents caused by low-speed vehicles, as well as those accidents caused by brake failure.

Based on the above situation, this M/P proposes the development of Mountain Highway and Wadi Araba Bypass as shown in Figure 7-42.

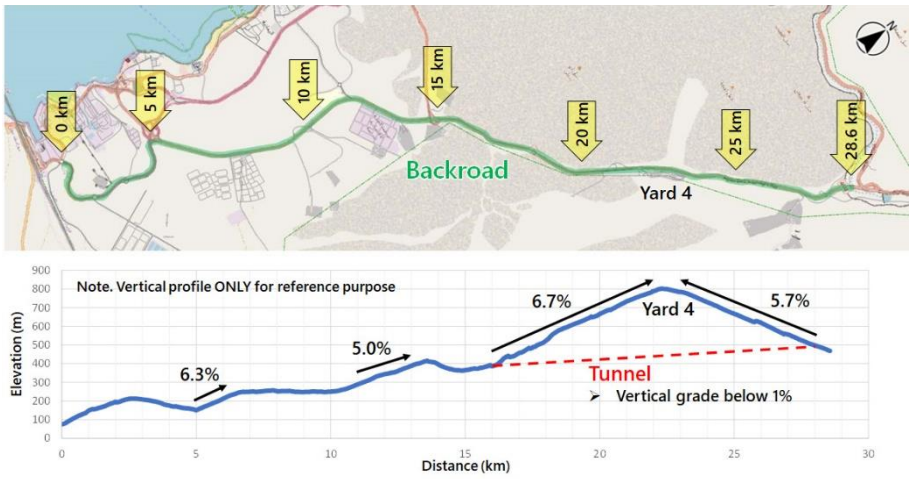



Source: Created by the JICA Study Team (Map data: OpenStreetMap, https://www.openstreetmap.org)

**Figure 7-42 Proposal of New Inter-Regional Arterial Road Construction**

### 1) Mountain Highway

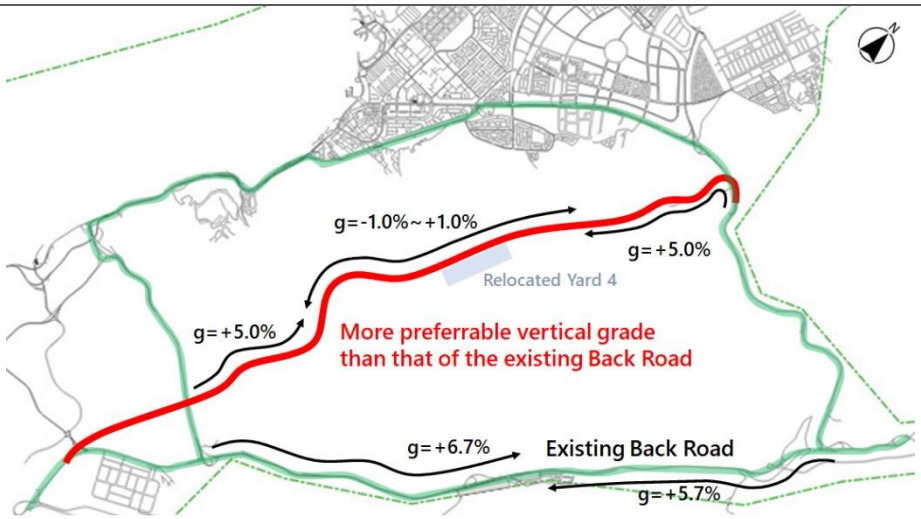
The Back Road is an essential arterial road for the logistics, and most heavy trucks from the Desert Highway use it and go to the Aqaba ports. One issue is the steep vertical grade of the road that decreases the traffic performance. To realize the truck-free city center, the current Back Road was constructed in the mountain area as proposed in the ASEZA M/P and used by many heavy trucks for logistics as a main access road to Aqaba Ports from Amman and other areas of Jordan. It makes the vertical grade steep, and the average gradient is 6.7% at the southern section from Yard 4, and 5.7% at the northern section (see Figure 7-43). To consider the importance of Aqaba Ports from the perspective of national economy, a long tunnel might be necessary for Aqaba. However, the construction cost would be very high, and the road tunnel longer than 10 km might not be feasible. In addition, it is not easy to relocate Yard 4, either.




Source: Created by the JICA Study Team (Map data: OpenStreetMap, https://www.openstreetmap.org)

**Figure 7-43 Rough Measures of Elevation of the Back Road**

One recommendation is to construct the 2nd Back Road, Mountain Highway, with lower gradient (see Figure 7-44). ADC has studied on the same issue in the past, and this recommendation is close to one of new routes studied by ADC. Yard 4 still needs to be relocated. However, it can be installed on the new route by filling the valley.

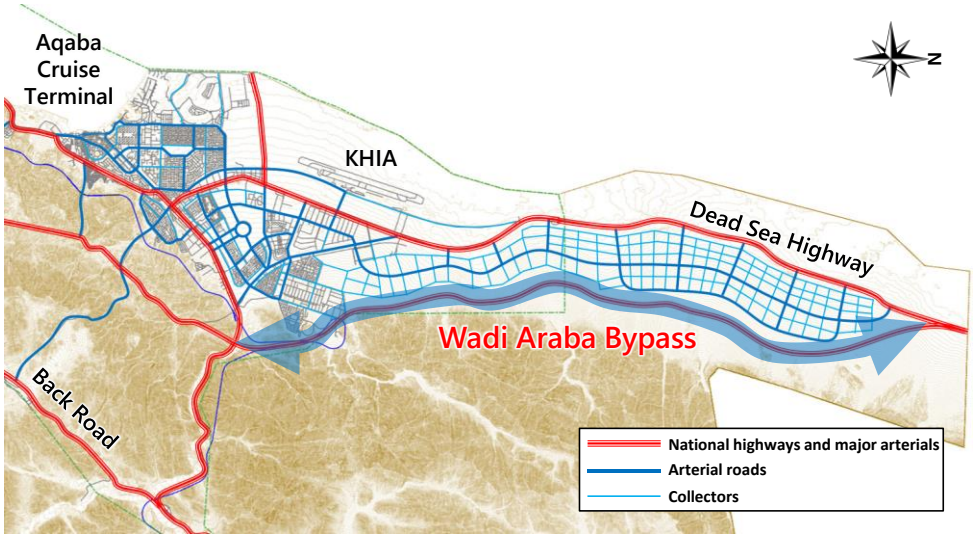



Source: Created by the JICA Study Team

**Figure 7-44 Proposal of Mountain Highway**

### 2) Wadi Araba Bypass

In the future, when the Wadi Araba area is developed as a residential area, there will be a need for an arterial road that will allow safe and smooth movement between the Wadi Araba area and the Aqaba city center. It is considered that the existing Dead Sea Highway can play this role, but the highway is currently used as a transport route for potash by Arab Potash Company (APC), and the amount of transport is likely to increase in the future. Therefore, there are concerns not only about the deterioration of the housing environment but also about an increase in traffic congestion and traffic accidents. In addition, at the north of the area, Wadi Araba Integrated Development Master Plan (August 2016) has been formulated separately from this M/P, and the development of that area will increase the traffic that does not depart from or arrive in but just go through the ASEZ Wadi Araba area.




Source: Created by the JICA Study Team

**Figure 7-45 Proposal of Wadi Araba Bypass**

As a countermeasure, it is proposed to construct a new inter-regional arterial road in the Wadi Araba area (see Figure 7-45). It is also proposed that the Dead Sea Highway is used as an

arterial road mainly used by traffic arriving in and departing from the Wadi Araba area, and that the area is included in the truck-free zone in Aqaba to protect the residential environment in the Wadi Araba aria. At the same time, the Wadi Araba Bypass is proposed to be constructed as a high-standard road that can be used by through traffic that does not depart from or arrive in the Wadi Araba area including the heavy trucks, which allows those heavy trucks and through traffic to quickly reach Aqaba Port area without being involved in traffic congestion. To this end, it is considered effective to construct the Wadi Araba bypass to connect to the Mountain Highway explained above.

#### 3) Countermeasures for Overweighted Vehicles

There have been challenges in Aqaba with oversized or overweighted trucks exceeding the maximum limit. In the case of oversized vehicles, it is difficult to transport specific cargo because they cannot pass through road sections with insufficient roadway width, and in the case of overloaded vehicles, they have a significant adverse impact on road pavement and road structure. As countermeasures, reconstruction of existing road structures or construction of new roads are being considered.

However, except for roads constructed for special purposes, such as military roads and port roads in Japan, it is difficult to find examples of roads planned, designed, or constructed for the passage of vehicles that exceed the maximum dimension or weight of the design vehicle as specified by the government. The main premise of any country is to allow traffic to pass as required by law, and usually the number of hauls is increased so that the maximum weight is not exceeded. When transporting oversized cargo that exceeds the maximum dimensional limit, the cargo should be disassembled and transported whenever possible, or other traffic may need to be restricted at night while the oversized cargo is passing. In some situations, temporary roads may need to be built, or road structures need to be removed and restored. However, those are usually not permitted from the economic perspective. Furthermore, it is necessary to consider whether the problem can be solved by addressing only the roads in the ASEZ. Therefore, it is desirable to consider strengthening enforcement of oversized or overweighted vehicles as a priority, and to consider other measures again, when necessary, from the economic and other perspectives.

### (2) Airport

#### 1) Basic Strategies

King Hussein International Airport (hereinafter “KHIA”) is the only airport in ASEZ that can serve air passengers and air cargo for Aqaba and the nearby cities. Scheduled flights for passengers are limited, and there is currently no scheduled cargo flight. However, the number of annual passengers is increasing, and there is potential air cargo demand to consider the importance of ASEZ in Jordan. Therefore, a long-term measure for revitalization of the airport as a major transport facility is essential for ASEZ, and, for the feasible and sustainable operation and management, upgrade of the airport facilities, and development of surrounding areas are proposed in the new ASEZ urban masterplan.

ADC completed a comprehensive masterplan for the KHIA in December 2022, and it was approved by the Jordanian government in 2023. To align with the airport masterplan, it is

proposed to reflect the airport masterplan in the new ASEZ urban masterplan. The overview of the airport masterplan from the perspective of transport is summarized below.

### 2) KHIA Comprehensive Master Plan

The Development of Masterplan and New Passenger Building Project for King Hussein International Airport (hereinafter "KHIA Development Project") started in September 2021, of which phases are divided into four, and the comprehensive master plan (hereinafter "Airport Master Plan") is a part of Phase 2. After the approval, it is planned to conduct the development of final comprehensive master plan, various design stages including preliminary design and detailed design, and preparation of tender documents. The KHIA Development Project is aiming to make the airport a new center for international regular and low-cost flights and transit passengers. The phases of the project are indicated in Table 7-6.

**Table 7-6 Phases of the KHIA Development Project**

| Phases | Work Items |
|---|---|
| Phase 1 | ・ 1A: Ambition and requirements, data collection, and air traffic forecast<br>・ 1B: Business development plan<br>・ 1C: Changi's master plan review |
| Phase 2 | ・ 2A: Case study, review of existing situation, airspace analysis, obstacle limitations surface study and flood resilience study<br>・ 2B: Initial comprehensive plan (land use plan alternatives)<br>・ 2C: Comprehensive master plan<br>・ 2D: Final comprehensive master plan |
| Phase 3 | ・ 3A: Site Plan<br>・ 3B: Preliminary Design<br>・ 3C: Schematic Design |
| Phase 4 | ・ 4A: Detailed Design and Tender Documents<br>・ 4B: Final Design |

Source: Comprehensive Master Plan (Phase 2C) for the Development of Masterplan and New Passenger Building of King Hussein International Airport, Aqaba Development Corporation, Dec. 2022

#### a) Key Characteristics of the KHIA Development Project

Key characteristics described in the Airport Master Plan are as follows.

- New passenger terminal building, associated apron, landside infrastructure, and parking
- New support and utility facilities and expansion of existing utilities, including a new airport rescue firefighting facility
- Runway to be retained
- Two main commercial development areas
- Airport Street as the main access to the passenger terminal area from the city center


Source: Comprehensive Master Plan (Phase 2C) for the Development of Masterplan and New Passenger Building of King Hussein International Airport, Aqaba Development Corporation, Dec. 2022

**Figure 7-46 Layout Plan in the KHIA Development Project**

### b) Air Traffic Forecast

It is forecasted in the Airport Master Plan that approximately 2.4 million passengers will use the KHIA in 2050 of which international passengers are 89.7%. Annual cargo volume in 2050 is forecasted to be 11,753 tonnes. The details are given in Table 7-7.

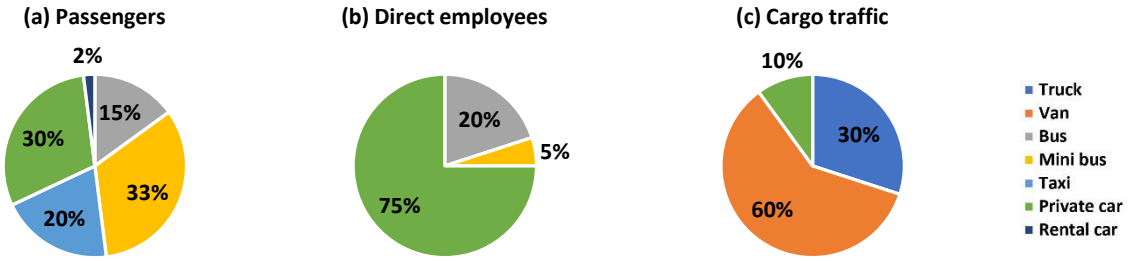
**Table 7-7 Annual Air Traffic Forecast of KHIA**

| Item | 2025 | 2030 | 2040 | 2050 |
|---|---|---|---|---|
| Annual passenger number (PAX) | 676,500 | 1,033,200 | 1,738,400 | 2,410,600 |
| *Domestic* | *109,300* | *172,100* | *201,200* | *247,500* |
| *International* | *567,200* | *861,100* | *1,537,200* | *2,163,100* |
| Annual aircraft movements | 7,351 | 10,204 | 14,184 | 17,333 |
| Annual cargo volume (tonnes) | 3,813 | 5,826 | 9,014 | 11,753 |

Source: Comprehensive Master Plan (Phase 2C) for the Development of Masterplan and New Passenger Building of King Hussein International Airport, Aqaba Development Corporation, Dec. 2022

### c) Landside Traffic Forecast

Landside traffic in the Airport Master Plan is divided by segment of users into four main flows: passengers; employees; visitors, delivery, and maintenance (VDM); and cargo., of which forecast is the basis of landside planning. To forecast the land traffic, the number of people or cargo volume of each main flow at the peak hour was estimated first, and, using the modal splits determined based on a report of Changi International Airport, ADC's input, and observations by the consultants for the Airport Master Plan, the vehicular traffic was forecasted in passenger car units (pcu).




Source: Comprehensive Master Plan (Phase 2C) for the Development of Masterplan and New Passenger Building of King Hussein International Airport, Aqaba Development Corporation, Dec. 2022

**Figure 7-47 Modal Splits for the Landside Traffic Forecast**

**Table 7-8 Forecast of Peak Hour Landside Traffic**

| Main flows | 2025 | 2030 | 2040 | 2050 |
|---|---|---|---|---|
| Passengers – Total 2-way peak (pcu/h) | 395 | 452 | 643 | 736 |
| Employees (pcu/h) | 160 | 224 | 383 | 543 |
| VDM (visitors, delivery, and maintenance) (pcu/h) | 24 | 22 | 38 | 54 |
| Cargo (pcu/h) | 4 | 8 | 13 | 17 |
| Total (pcu/h) | 2,608 | 2,736 | 3,117 | 3,400 |

Source: Comprehensive Master Plan (Phase 2C) for the Development of Masterplan and New Passenger Building of King Hussein International Airport, Aqaba Development Corporation, Dec. 2022

#### d) Commercial Development

As mentioned in Sub-Section a) "Key Characteristics of the KHIA Development Project" above, commercial development is one of key characteristics of the project. The Airport Master Plan proposes to have a combination of retail, hospitality, and business land use developed along the main access road, which is the Airport Street. The Airport Master Plan also mentions use of the existing terminal as commercial area, as well as development of solar farm and areas for industrial and logistics functions (refer to Figure 7-46).

### 3) Proposal for the KHIA Comprehensive Master Plan

Although the KHIA Comprehensive Master Plan has been formulated and approved earlier than this M/P, the following items are proposed for the masterplan of the airport as an important transport and logistics hub in ASEZ.

#### a) Airport Disaster Prevention Measures

As described in Chapter 3, there is a risk of inundation in the area surrounding KHIA, and there is actually a past history of airport facilities being flooded and airport functions being affected. Since the airport is an important transport & logistics hub of ASEZ, it is proposed to examine appropriate flood countermeasures and reflecting them in the KHIA Comprehensive Master Plan.

#### b) Airport Access and Landside Transport Facility Planning

This M/P update proposes a route connecting Aqaba Cruise Terminal, Aqaba city center, and the airport as a main public transport corridor, and also proposes implementation of new public transport modes such as LRT in the future. In line with this, it is proposed to reconsider the airport access in the KHIA Comprehensive Master Plan as well as the landside transport facility planning.

## (3) Ports

### 1) Overall port logistics strategy

As the only port in Jordan, the Port of Aqaba plays a vital role in the country's economy. In addition, the port and logistics sector's sustainable development and operation are required to respond to global climate change. Furthermore, there is a need to develop logistics-related industries, which account for roughly less than 10% of Jordan's GDP.

Under these circumstances, it is necessary to develop logistics-related industries that effectively utilize the port and airport in a manner consistent with the future urban development of the ASEZ area.

### 2) North Port Area

#### a) Cruise terminal

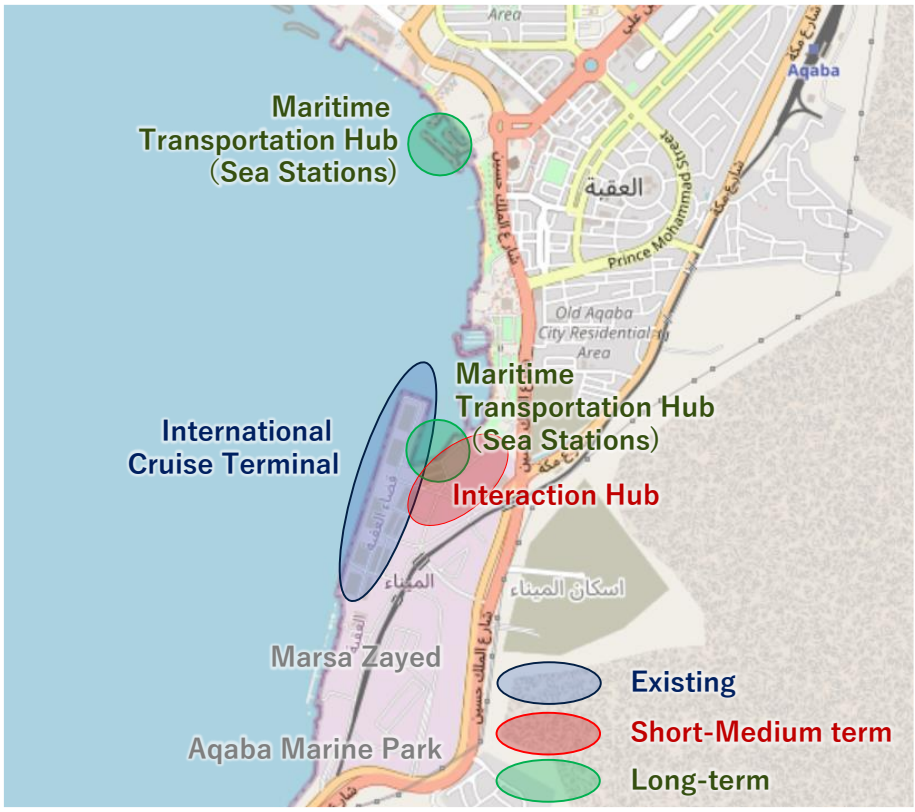
In September 2021, ADC and Abu Dhabi AD Ports Group signed a basic agreement to establish a dedicated international cruise terminal in the North Port Area, and the inauguration ceremony of the cruise terminal building was held in January 2023. The port facility has a quay length of 720m (with a water depth of 10 to 13 meters), with facilities for 2 to 4 cruise ships to dock simultaneously. Currently, passengers are transported by sightseeing buses for optional tours arranged by cruise ship operators and tourist companies and by taxis for private tours upon arrival of cruise ships. The terminal is exclusively for cruise passengers, and no waterfront space has been developed for the enjoyment of residents and other tourists. Therefore, no public transportation system connects the terminal to the city of Aqaba.

The "AQABA PORTS MASTER PLAN UPDATE -Draft Final Report-, January 2020" (hereinafter referred to as the "Port Master Plan") proposes the development of four new cruise terminals. However, for now, the current facilities (three berths) should be used to meet current needs, and new developments should be reviewed based on demand.

#### b) Proposals (for the North Port Area)

We suggest the following based on the situation and other factors mentioned above.

- To position the current cruise terminal as a center for international marine tourism and to develop the surrounding area as a waterfront park for residents and other tourists.
- Redevelop the existing tower behind the facilities as a symbolic tower, along with commercial facilities such as restaurants and souvenir shops.
- Develop, as a long-term plan, the waterfront line on the land side of the cruise berth as a hub/nodal point between marine transportation such as ship cabs and land-based public transportation such as buses and taxis.




Source: Created by the JICA Study Team (Map data: OpenStreetMap, https://www.openstreetmap.org)

**Figure 7-48 Proposal for North Port Area Zoning**

### 3) Middle Port Area

#### a) Container terminal

The container terminal has been operated by ACT since 2006. It has been expanding its cargo handling capacity in line with the growth of the domestic economy. The current capacity of the facility is 1.3 million TEUs per year. According to ADC's "AQABA PORTS MASTER PLAN UPDATE -Draft Final Report-, January 2020", no capacity shortage is expected until 2030. (Capacity shortage is expected after 2030). Currently, ACT estimates the future demand at approximately 1.5 million TEUs in 2030 and plans to expand the facility's capacity by upgrading cargo handling equipment and gate processing capacity as needed. According to ACT, if the Iraqi border is opened, the projected demand would be 2.4 million TEUs (+900,000 TEUs). ACT has signed a Memorandum of Understanding with the government to extend the concession from 2031 to 2046.

The Jordanian Government is considering developing a new rail terminal behind the facilities and connecting the container terminal by rail to the Madounah Dry Port/Logistics Center near Amman. The plan is based on the 2040 target year for decarbonization.

As mentioned above, ACT envisions a customs facility near the ferry terminal as part of its future development vision. In addition to advanced logistics functions, R&D facilities, employee housing, entertainment functions such as an aquarium, and eco-tourism facilities are also planned behind the site. Thus, it is necessary to consider zoning consistent with this concept of future development and the needs of the ferry terminal and urban development.

**b) Ferry terminal**

An average of two ferries between the Port of Aqaba and the Port of Nuweiba (Egypt) arrive at both berths daily. There is also a plan to connect the Port of El-Arish (Egypt) and the Port of Nuweiba (Egypt) on the Mediterranean Sea, via land transportation and then transport cargo to the Port of Aqaba using a new ferry (with a capacity of 100 trucks) that is currently under construction. The plan is to compete with the sea transport of containerized cargo to neighboring countries, including itself, through the Port of Haifa (Israel) on the Mediterranean Sea.

The above will add demand to the current ferry yard (85 for departures and 85 for arrivals), which is expected to strain the facility's capacity further.

Trucks and other vehicles boarding the ferry wait at the multi-purpose vehicle waiting area behind the port until the ferry arrives. Then, the vehicles go through customs procedures and other formalities at the departure yard of the ferry terminal. As for trucks disembarking from the ferry, they go through customs procedures at the arrival yard and then leave the ferry terminal. Since the arrival yard is located between the ferry and the departure yard, it is preferable to separate the flow lines.

On the other hand, according to the "AQABA PORTS MASTER PLAN UPDATE -Draft Final Report-, January 2020", the capacity of the facilities will exceed the estimated future demand until 2045, and there will be no capacity constraints of the existing ferry terminal facilities.

**c) Cement berth and rice berth（Mu'tah Berth）**

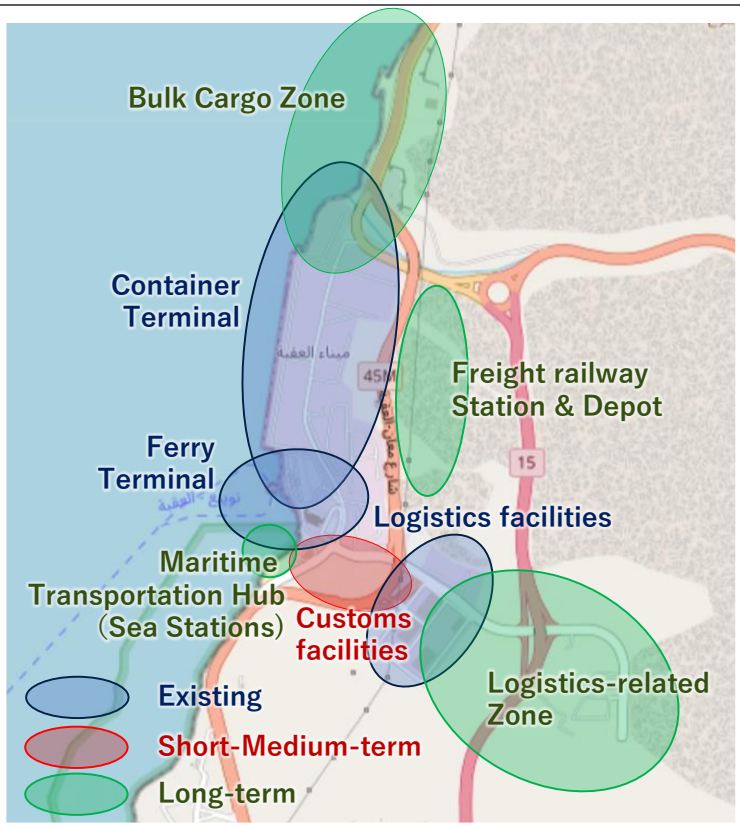
The cement and rice berths are currently out of service due to a lack of firefighting equipment and other safety concerns. The silos behind them are also temporarily out of service.

According to the "AQABA PORTS MASTER PLAN UPDATE -Draft Final Report-, January 2020", the total capacity of the dry bulk facilities will exceed the estimated future demand until 2045, and there will be no capacity constraints. Silica handling is being considered for the future.

**d) Proposals (for the Middle Port Area)**

We suggest the following based on the situation and other factors mentioned above.

- In anticipation of future growth in ferry demand, reorganize the existing yard as a departure yard and develop a new ferry arrival yard on an adjacent parcel.
- In anticipation of future growth in container and ferry demand, Yard 4's functions, which are responsible for the centralized customs clearance of import cargo, will be expanded.
- The area where the cement berth and rice berth are located is expected to be used primarily for handling silica, which is currently under consideration. However, this area may also be considered as an area for future development to support the introduction of functions that complement the New South Port Area.
- The area where the cement berths and rice berths are located will be developed with silica handling facilities, which are currently under consideration.




Source: Created by the JICA Study Team (Map data: OpenStreetMap, https://www.openstreetmap.org)

**Figure 7-49 Proposal for Middle Port Area Zoning**

#### 4) New South Port Area

##### a) RoRo and general cargo terminal (Aqaba New Port)

The volume of RoRo and general cargoes handled at the RoRo and general cargo terminal, known as Aqaba New Port, has generally remained flat, and according to the "AQABA PORTS MASTER PLAN UPDATE -Draft Final Report-, January 2020", no capacity constraint is expected until 2040.

On the other hand, imports of finished vehicles are increasing, and the yards behind the port are insufficient. In addition, the handling of project cargoes of wind power-related parts (turbines, blades, etc.) for the NEOM project under development in Saudi Arabia has started, and inquiries are coming in for larger blades (85m) than those for wind turbines currently handled (63m). Although there is no problem with the load-bearing capacity of the quay soil, the transportation route (road) to the border and the border facilities needs to be improved.

##### b) Dry bulk terminal (Industrial Terminal) and phosphate terminal

The volume of dry bulk cargoes (ammonia, fuel oil, sulfur, phosphoric acid, potash, fertilizer, phosphate ore, diammonium phosphate, grain, etc.) handled at the dry bulk terminal (called Industrial Terminal) and the phosphate terminal (called Phosphate Terminal) has generally remained flat. The "AQABA PORTS MASTER PLAN UPDATE -Draft Final Report-, January 2020" also indicates that there will be no capacity constraints until 2040.

**c) LNG terminal, oil terminal, and LPG terminal**

The volume of liquid bulk cargoes handled at the LNG, oil, and LPG terminals has generally remained flat. According to the "AQABA PORTS MASTER PLAN UPDATE -Draft Final Report-, January 2020", no capacity constraints are expected until 2040.

On the other hand, a new berth is planned to be constructed south of the current oil terminal.

**d) Marine service facilities**

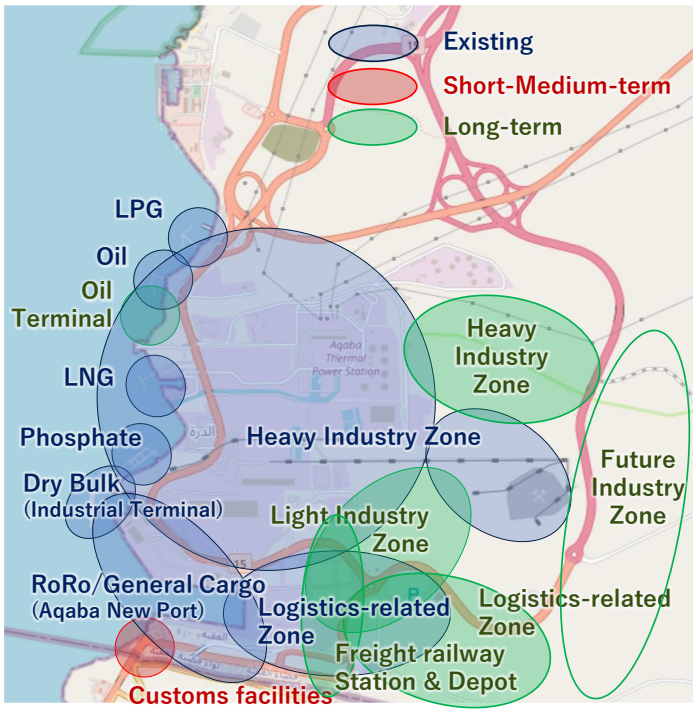
Marine service facilities (Specialized Marine Services and Marine Services) have been developed at two locations as mooring facilities for tugboats and other vessels.

The development of port reception facilities (PRF) for waste and oil mixtures generated from ships that cannot be discharged directly into the sea, according to the International Convention for the Prevention of Pollution from Ships (MARPOL 73/78 Convention), should also be considered.

**e) Proposals (for the New South Port Area)**

We suggest the following based on the situation and other factors mentioned above.

- Develop motor pools to accommodate increased imports of finished vehicles (through the construction of new facilities and improvement of existing facilities (phased approach)).
- Develop project cargo storage (e.g., for NEOM).
- Improve access to the Saudi border (road alignment, border facility improvements).
- Construct a new oil terminal.




Source: Created by the JICA Study Team (Map data: OpenStreetMap, https://www.openstreetmap.org)

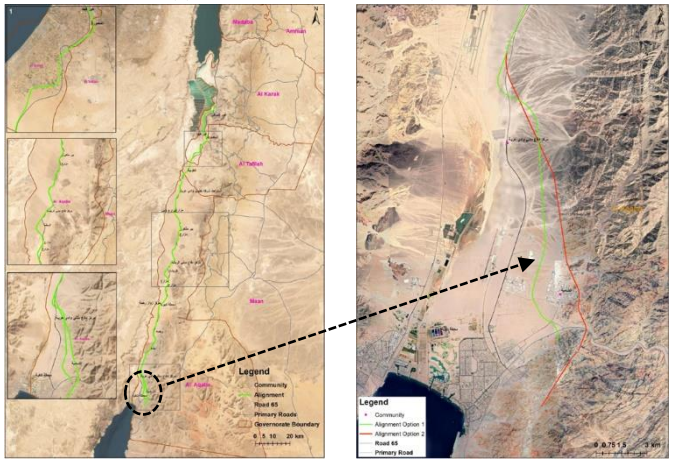
**Figure 7-50 Proposal for New South Port Area Zoning**

### (4) Railway network

#### 1) Current Situation and Existing Plans

So far, various plans have been made for the development of railways. Currently, the previous plans are being optimized in terms of economic viability. As a result, studies are underway to develop a freight railway connecting the Aqaba Container Terminal (ACT) and the Madounah Dry Port Logistics Center. The current focus is on transporting containerized cargo and phosphate ore, with the possibility of transporting potash from the Dead Sea in the future. Those railway routes under study as of June 2024 are shown in Figure 7-51.

(a) The Dead Sea ~ ASEZ (Potash)




(b) Shidiya Mine ~ ASEZ (Phosphate Ore)

Source: Document provided by ASEZA

**Figure 7-51 Freight Railway Routes under Study (as of June 2024)**

A dry port is a facility with logistical functions similar to a seaport but connected to rail and other frequent and punctual transportation services. Therefore, it is necessary to ensure a specific cargo volume for viability. Dry ports allow the round use of containers, shortening the transport distance to the port, reducing transportation costs and environmental impact, and relieving the burden on drivers. On the other hand, cost increase due to drayage and the use of dry ports. Advantages for the port side (container terminals and shipping companies) include reduced container terminal capacity, elimination of traffic congestion in the surrounding area, and improved services for shippers. Disadvantages/challenges for shipping companies include increased operational complexity due to the retention of their containers in inland areas and ensuring the quality of empty containers for round-trip use (cleaning, damage, maintenance, etc.). This is particularly true in the case of an excess-importing country such as Jordan.

#### 2) Proposal (railway-related)

We suggest the following based on the situation and other factors mentioned above.

- Develop a freight rail connection between ACT and Madounah Dry Port Logistics Center.
  - ➢ The setting of the operation schedule focusing on containerized cargo transport.
- Extend freight rail from ACT to New South Port Area.
  - ➢ Development of a rail freight station specializing in bulk phosphate ore, potash, etc.,

with a schedule to include containerized cargo.

- Extend rail access from Ma'an to the Saudi border (Modawara/Harat Ammar border).


Source: Created by the JICA Study Team (Map data: OpenStreetMap, https://www.openstreetmap.org)

**Figure 7-52 Conceptual Railway Network**

### 7.2.3 Transport and Logistics Contributing to "Value of Environment"

#### (1) Facilitation of Bicycle Use

Bicycle has been beloved for a long time by many people for not only hobby and leisure but also commuting and business as a transport mode. Bicycle is basically a personal mobility mode, not like a public transport, ensuring high degree of freedom of personal trips. Therefore, it can be faster, more comfortable, and more convenient than walking and even public transport for short-distance trips. Most of all, bicycle is a non-motorized transport mode and emission-free, so that it can contribute to the reduction of greenhouse gas, as well as the public health. From the perspective of urban mobility planning, bicycle requires less driving and parking space, which means less investment for related facilities in general, and can be used and enjoyed by not only residents but also visitors and tourist. Therefore, facilitation and promotion of bicycle use in Aqaba is proposed in the masterplan.

##### 1) Implementation of Bicycle Lane

There are many advantages of using bicycles as mentioned above. On the other hand, there exist disadvantages as well, and the biggest concern should be the safety issue, especially the conflicts between bicycles, pedestrians, and vehicles. Bicycle lane is a measure to minimize those conflicts by clearly dividing and designating road space for bicycles.

Examples of bicycle lanes are shown in Figure 7-53. The basic type of bicycle lane is to install the lane for each direction on each side of the roadway. It should be noted that the lane is physically divided by using barriers, fence, or small structures, or visually divided so that it is easily recognized that the road space is for bicycles by using colored pavement, lane marking with a different color, road surface marking of pictogram, etc., sometimes together with traffic signs. There are variations of type: bicycle lanes of both directions on one side of roadway, those in the middle of roadway, those as a bicycle road that is separated from the roadway.


Source: Provided by the JICA Study Team

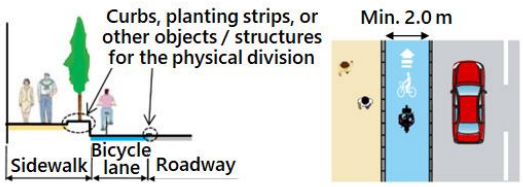
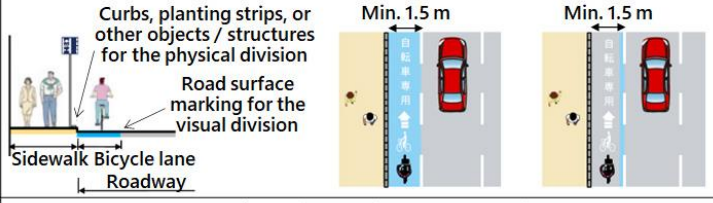
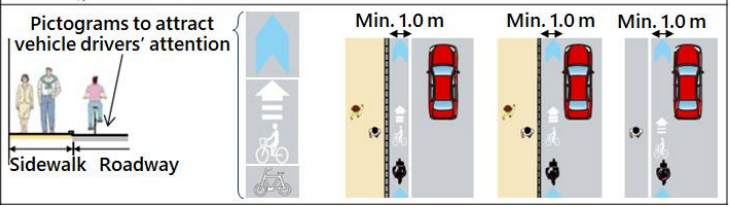
**Figure 7-53 Examples of Bicycle Lane**

### 2) Bicycle Lane Types and Reallocation of Existing Road Space

Bicycle lanes, excluding those installed as a bicycle road, should be installed as a part of roadway. For that, reallocation of existing road space becomes an important issue, and this sub-section proposes bicycle lane types for Aqaba and several installation options.

Japanese guideline shows three types of bicycle lane (see Table 7-9). Type A is for arterial roads with relatively high traffic volume and vehicular speed. Therefore, the feature of Type A is to have physically separated roadway space dedicated to bicycles separated from ordinary vehicles and pedestrians. Type B is for roads with less traffic and lower vehicular speed than arterial roads, and the bicycle lane is visually divided from ordinary traffic lanes within the roadway. Type C allows the mix of bicycles, vehicles, and, depending on the site condition, pedestrians. Therefore, Type C is applied to small roads such as local roads with low traffic volume and vehicular speed.

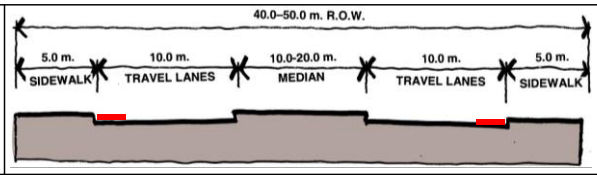
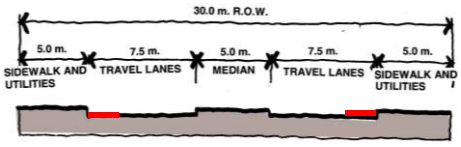
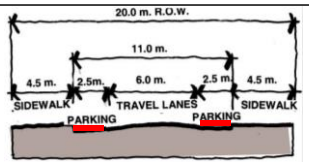
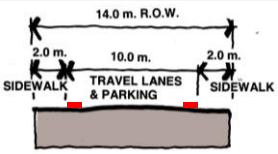
**Table 7-9 Guideline for Bicycle Lane Types in Japan**

| | |
|---|---|
| **Type A**<br>● Dedicated bicycle lane, physically divided from the roadway and the sidewalk<br>● Applied to roads of which maximum speed > 50 km/h |  |
| **Type B**<br>● Dedicated bicycle lane, physically divided from the sidewalk but visually divided from the traffic lanes within the roadway<br>● Applied to other roads of the condition of Types A and C |  |
| **Type C**<br>● Mixed with other road traffic, but visually indicated<br>● Applied to roads of which maximum speed ≤ 40 km/h and traffic volume ≤ 4,000 veh/day |  |

Source: "Guidelines for the Creation of Safe and Comfortable Bicycle Use Environment" (translated by the JICA Study Team). Ministry of Land, Infrastructure, Transport and Tourism (Road Bureau) and National Police Agency (Traffic Bureau) of Japan, July 2016

A proposal of bicycle lane types for Aqaba is summarized in Table 7-10. It is to apply Type A defined in the Japanese guideline to primary roads, Type B to secondary roads and neighborhood roads, and Type C to local roads. On roads where there is sufficient width of median, it is another option to install bicycle lanes or a bicycle road on the median.

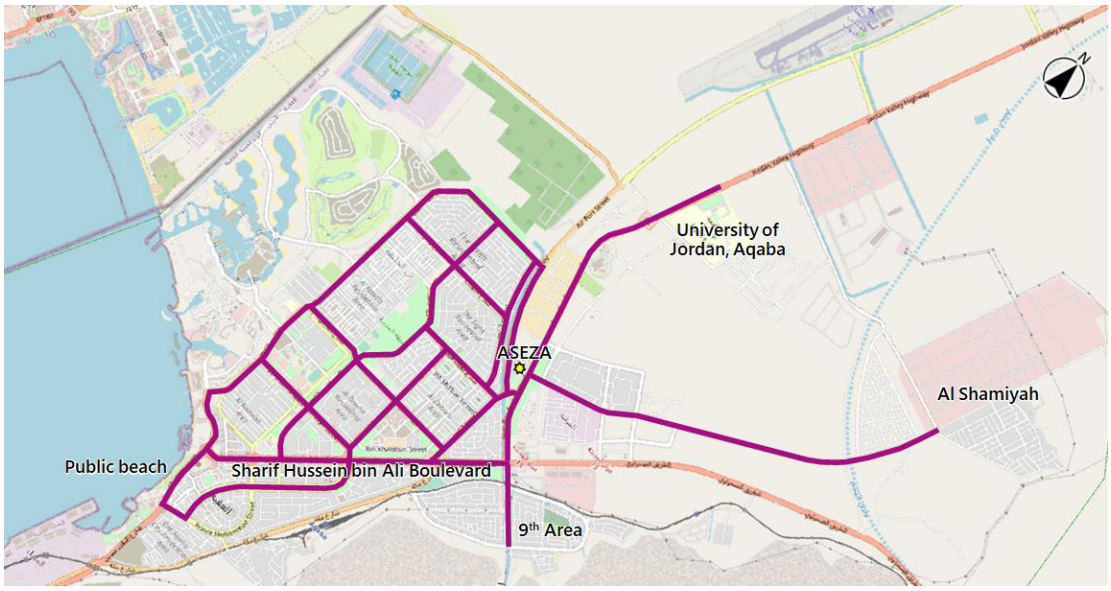
**Table 7-10 Proposal of Bicycle Lane Types for Aqaba and the Installation**

| | | |
|---|---|---|
| Primary road<br>Type A |  | Other options:<br>• Bicycle lanes on the median<br>• Bicycle lanes on the sidewalk but physically divided from the pedestrian space |
| Secondary road<br>Type B |  | Other options:<br>• Bicycle lanes on the median<br>• Bicycle lanes on the sidewalk but physically divided from the pedestrian space |
| Neighborhood road<br>Type B |  | Remark:<br>• Should be aware of car parking |
| Local Road<br>Type C |  | Remark:<br>• Should be aware of car parking |

Source: Created by the JICA Study Team (using figures from ASEZA Design Guideline 2001)

### 3) Formulation of Bicycle Lane Network

A proposal for the bicycle lane network is shown in Figure 7-54. The target area is mainly the city center, and extension of the network to University of Jordan, 9th Area, and Al Shmaiyah Area. The details such as types for each road section, implementation scheme, phasing plan, etc. should be discussed with ASEZA and related agencies and determined.




Source: Created by the JICA Study Team (Map data: OpenStreetMap (https://www.openstreetmap.org))

**Figure 7-54 Proposal for Bicycle Lane Network in Aqaba**

When implementing the bicycle lane network, one of issues that should be taken into account at the same time is the on-street parking. Off-street parking space is limited in Aqaba, and on-street parking is the basic form of car parking, even including the overnight parking of private cars. However, on-street parking on the roads with bicycle lanes is not preferrable and has the risk of traffic accidents between bicycles and vehicles. Therefore, on-street parking should be basically prohibited on those roads, and car-parking measures should be implemented at the same time.

Source: Created by the JICA Study Team

**Figure 7-55 On-Street Parking on Sharif Hussein bin Ali Boulevard in Aqaba**

### 4) Bicycle Parking

For promoting the bicycle use, provision of safe and convenient bicycle parking space is also important. In addition, preventing illegally parked or discarded bicycles especially in the downtown or commercial areas is important to keep the preferrable urban landscape and environment. It is also a good idea to promote bicycle use of students and install bicycle parking space at schools.

Source: Created by the JICA Study Team

**Figure 7-56 Example of Indoor Bicycle Parking in Tokyo, Japan**

### 5) Bicycle Rental or Shared-Bicycle Service

Bicycle rental or shared-bicycle service is another good option for promoting the bicycle & public transport use. Bicycle rental or shared-bicycles in downtown or commercial areas can be used as last-one-mile transport mode by residents who arrive there by public transport, which also promotes the use of public transport. They can be also used as an urban mobility mode for economic activities and can also provide visitors with a good mobility mode for sightseeing in the downtown. Shared-bicycle service is recently popular in many cities in the world. Figure 7-57 shows examples in various cities.

Tokyo, Japan

London, UK

London, UK

Taipei, Taiwan

Hamburg, Germany

Brussels, Belgium

Vienna, Austria


Washington, D.C., USA

New York, USA

Source: Provided by the JICA Study Team

**Figure 7-57 Examples of Shared-Bicycle Service**

### (2) Facilitation of EV Use

In 2021, zero-emission vehicle pledges were made at COP26 held in UK. To achieve the goal, 30 countries have agreed to work together to make zero-emission vehicle the new normal by making them accessible, affordable, and sustainable in all regions by 2030 or sooner[5]. Many countries have declared to ban sales of fossil fuel vehicles and even plug-in hybrid electric vehicles (PHEVs) by 2025~2040. Japanese government has also declared to do so by 2035. According to a news article, EV market share has been increased to 34.6% in Jordan over 5 year (2018 to 2022)[6].

[5] United Nations Climate Change, 10 November 2021 (https://unfccc.int/news/zero-emission-vehicle-pledges-made-at-cop26)
[6] Jordan News, last updated on 2 March 2023 (https://www.jordannews.jo/Section-109/News/Electric-cars-market-share-increases-to-34-6-in-Jordan-over-5-years-27319)

As already explained in Sub-Section 3.6.1 (2) 4), Jordanian government declared in 2016 14% reduction of greenhouse gas by 2030 and revised the goal in 2022 to 31% reduction by 2030. Global automakers make every effort to expand their EV sales, and the EV market share in other countries are increasing. Because there is no automaker in Jordan, all vehicles including used cars should be imported. Under these circumstances, it is very clear that the EV market share in Jordan will be expanded more and more in the near future or that the Jordanian government will positively promote the EV use. Therefore, it is recommended to address the issue of the promotion of EV use in the updated M/P.

There have been three major concerns of EVs in the past: battery charging, range (cruising distance) of EV, and safety of the battery. However, safety of battery has been improved these days and is expected to be more improved. Regarding the range of EV, recent EV models guarantee hundreds of kilometers by one recharging, as same as fossil fuel vehicles, and some models can run longer.

One concern that frustrates consumers is the battery charging issues. One issue is the battery charging station. It is one advantage of EV that the battery can be charged at home. However, it is still not easy to find EV charging stations during the trip. Second issue is the charging time. For an ordinary passenger car, it takes only some minutes to fill it up. However, it takes 10 hours to fully recharge an EV with 60 kWh battery by regular charger (6 kW). Even if a quick charger of 60 kW is used, it takes one hour.

To overcome the situation and promote the EV use, it is essential to increase the EV charging stations. In Japan, approximately 21 thousand regular charges and 9 thousand quick chargers have been installed in total as of March 2023, and, by 2030, 120 thousand and 30 thousand, respectively, will be installed additionally.

There have been researches on the theoretical optimization of the deployment of EV charging stations. However, the point is to install EV chargers at parking areas of restaurants, markets, commercial buildings, resting areas of highways, etc. where drivers can recharge their EVs while they do something at the same time. The same strategy is proposed in Aqaba.


Source: Created by the JICA Study Team

**Figure 7-58 EV Quick Charging Devices in a Commercial Building (Japan)**

## 7.3 Urban Utilities

Based on the disaster risks in ASEZ organized in Chapter 3 and the development vision and basic strategies organized in Chapter 4, the following are the strategies for disaster risk management to promote the resilience of ASEZ for its sustainable development in the future.

**Table 7-11 Utility Strategies to Realize Development Vision**

| Development strategies | Utility Strategies |
|---|---|
| **[VALUE of ENVIRONMENT] Full of Green and Nature - From gray infrastructure to green Infrastructure -** | ・ Upgrading water supply, sewage and wastewater treatment system corresponding to future urban and industrial development<br>・ Developing rainwater drainage system considering future conditions and rainfall<br>・ Ensuring stable electricity supply in the future<br>・ Promoting telecommunication business with collaboration between public sector and private sector<br>・ Upgrading and expanding waste treatment facilities and improving waste management system |

Currently each utility sector has its own maintenance, management, and operating entity, and individual business and operational plans are being formulated. Therefore, the business plans for each sector will be reviewed and updated in a manner consistent with the future urban structure and land use plans associated with the revision of the Urban Development Master Plan. In this section, the development direction of each utility sector is indicated based on the current situation.

### 7.3.1 Drinking Water Supply System

#### (1) Determining Target Amount of Water Distribution

It is necessary to plan the facilities for water supply such as distribution reservoirs, pumping stations, and water supply pipes utilizing the existing facilities based on the distribution of water supply demand consistent with the future urban structure, land use and population distribution conditions on the Urban Development Master Plan. Besides, verification of the unit amount of water distribution in line with land use and urban activities is needed.

The reason why the invalid water is caused needs to be clarified by leakage and theft of the water provided. In addition, the survey of the actual situation and consideration of countermeasures regarding free distribution water for green lands, roads, and firefighting and so on need to be conducted.

- Understanding the distribution of water supply demand consistent with the future urban structure, land use and population distribution conditions
- Consideration of the unit amount of water distribution by land use
- Studying on invalid and non-revenue water amount

### (2) Securing Water Source

Water sources to enable stable water supply need to be secured through different projects including the coordination with the Aqaba – Amman desalination / water transmission project.

- Understanding the future water balance for the entire city and the need of securing new water sources
- Investigation into the causes of the gradual decrease in water withdrawals from existing water sources (wells) and study of measures to deal with the situation
- Coordinate with the Aqaba – Amman desalination / water transmission project

### (3) Improvement of Effective and Revenue Water Ratio

- Identification of leaks and invalid water and consideration of improvement measures
- Confirmation of invalid water (park/street watering) and considering measures for other invalid water (stolen water)

### (4) Development of Water Distribution System

Updating target areas of water distribution and development of water reservoirs and pumping stations are needed on the basis of updating the Urban Development Master Plan. Furthermore, it is necessary to avoid the negative impact on the existing water supply networks by the new large-scale urban development projects, by designing the water distribution area for each large-scale project.

- Review of the proper layout of water distribution reservoirs, relay pumping stations, etc. according to the future urban structure
- Consideration of response policy for large scale development
- Study on the prospect and smartening drinking water supply system facilities in light with the future urban plan

### (5) Countermeasures for Aging Water Supply Facilities

- Develop a desirable maintenance plan for water supply infrastructure taking account of life cycle costs
- Countermeasures against water leakage

## 7.3.2 Sewage System

### (1) Determining Target Sewage Water Volume

As well as water supply system, distribution of sewage water volume based on the land use plan on the urban development mater plan, facility plans, and population distribution in ASEZ should be clarified. Based on that, the development plan of wastewater management facilities including pumping station and sewage drainage pipes need to be formulated.

- Assessing the distribution of sewage generation based on the future urban structure, land use

and population distribution

- Consideration of target sewage water volume by land use

**(2) Proper Siting of Sewage Treatment Plant and Establishing Sewage Treatment Zones**

It is important to consider the expansion of existing sewage and wastewater treatment plant taking account of future demand based on urban development plan. In case that the treatment capacity will be insufficient, new sewage treatment facilities need to be planned based on the survey for appropriate location of the plant. Besides, the development of treatment facilities for the wastewater in the south region of ASEZ need to be considered.

- Consider the expansion of existing sewage treatment plant
- Establishment of a treatment area (subdivision) plan and proper placement of a terminal treatment plant in accordance with the future urban structure
- Study on ways to improve sewage and wastewater treatment services to the southern region

**(3) Improvements of Sewage Treatment System**

- Review of natural flow and pumping sections and appropriate placement of pumping stations
- Study of combining sewer treatment areas with single septic tank treatment areas or individual house septic tank areas, etc.
- Study on the prospect and smartening the sewerage facilities for future urban planning
- Consideration of countermeasures against illegal drainage

**(4) Countermeasures for Aging Sewage and Wastewater Treatment System**

- Develop a desirable maintenance plan for sewage and wastewater facilities taking account of life cycle costs

### 7.3.3 Reclaimed Water

**(1) Consideration of Reclaimed Water (Gray Water) Demand Expansion**

The current situation that approximately 70% of reclaimed water is used for agriculture and industry should be sustained. The demand of reclaimed water needs to be explored which will contribute to decrease the demand of water supply. New development of wastewater treatment plant which covers the treatment of wastewater in the south industrial zone needs to be considered for the future development.

- Study on expansion of grey water use for agricultural water, industrial water, and sprinkling water and so on
- Consideration of demand generation for reclaimed water
- Study of reclaimed water utilization system for expansion/addition of terminal treatment plant, etc.

**(2) Improvements of Reclaimed Water System**

- Expansion of reclaimed water network
- Appropriate placement of reclaimed water distribution reservoirs and enhancement and smartening of reclaimed water distribution pipe network

**(3) Countermeasures for Aging Reclaimed Water System**

- Develop a desirable maintenance plan for reclaimed water facilities taking account of life cycle costs

### 7.3.4 Irrigation

**(1) Consideration of Expansion of Irrigated Areas**

In order to estimate irrigation water demand, selection of agricultural crops and necessary precipitation for them need to be studied. Then, the area for irrigation needs to be planned considering the availability of reclaimed water.

- Considering expansion of reclaimed water use for agriculture, industry and fire extinction
- Studying water balance and necessary amount of water for irrigation areas
- Planning new irrigation reservoirs

**(2) Formulation of Maintenance and Management Operation Plan of Irrigation**

- Developing operational plan of agricultural water use
- Formulating irrigation maintenance and renewal plan

### 7.3.5 Rainwater Drainage

**(1) Rainwater Drainage and Watershed Planning**

- Understanding rainwater drainage conditions and current status of drainage facilities
- Planning rainwater drainage and watershed boundaries
- Clarification of rainwater drainage channels and study of target wadis to be preserved

**(2) Establishment of Planned Rainwater Volume**

- Organize rainfall statistics and rainfall intensity by rainfall probability year
- Establish policy for setting planned rainfall (e.g., rainfall probability year, runoff coefficient)

**(3) Formulation of Rainwater Drainage Plan**

- Calculate rainwater runoff volume and establish required drainage channel cross-sections for

each planned watershed

#### (4) Study of Wadi Conservation and End-of-Stream Treatment Policies

- Study of wadi preservation and end-of-stream treatment policies

### 7.3.6 Electricity

#### (1) Updating Electricity Business Plan

In light of the land use plan of ASEZ Urban Development Master Plan and distribution plan of facilities and population, the electricity business plan needs to be updated to ensue stable electricity supply for the city.

- Updating electricity business plan consistent with the revised Urban Development Master Plan

### 7.3.7 Telecommunication

#### (1) Updating Telecommunication Business Plan

The telecommunication business plan should be updated to ensure stable electricity supply for the city based on the land use plan of ASEZ Urban Development Master Plan and distribution plan of facilities and population. The coordination and collaboration between public sector and private sector will be important to effectively manage and develop the telecommunication facilities in ASEZ.

- Updating telecommunication business plan consistent with the revised Urban Development Master Plan

### 7.3.8 Waste Management

#### (1) Upgrading Waste Management Plan and System

In addition to improve and expand existing waste management facilities, the waste management system for ASEZ development needs to be upgraded in order to realize eco-friendly and clean urban environment.

- Upgrading waste management plan and system consistent with the revised Urban Development Master Plan

### 7.3.9 Gas

#### (1) Updating Gas Business Plan

Based on the land use plan of ASEZ Urban Development Master Plan and distribution plan of facilities and population, the gas business plan needs to be updated to ensure sufficient gas supply for the city.

- Updating gas business plan consistent with the revised Urban Development Master Plan

## 7.4 Environment Preservation and Management

The sectoral strategies related to environment preservation and management to realize urban development vision, basic strategies, and urban structure organized in Chapter 4 is as shown in the following table.

**Table 7-12 Environment Preservation and Management Strategies to Realize Basic Strategy**

| Basic Strategy | Environment Preservation and Management Strategy |
|---|---|
| **【Value of Environment】**<br>**Full of Green and Nature**<br>**～From Gray Infrastructure to Green Infrastructure～** | ●Preservation and management of abundant marine resources, natural resources, clean air, and rich ecological system<br>➢ Implementation of environmental monitoring and improvement measures on air quality, water quality, noise and vibration for better life in ASEZ<br>➢ Preservation of invaluable natural resources and ecological system<br>➢ Develop and expand spots (aquarium, bird sanctuary) where people can come into contact with nature as marine resources and migratory birds, and other natural resources, as well as communicating the significance of environmental conservation to children, citizens, and tourists by developing the facilities as tourism resources.<br>➢ Preservation of outstanding natural features (Wadi Araba and the Gulf of Aqaba) and development of environmental infrastructure to attract future high-end.<br>➢ Promoting green infrastructure in flood control, pedestrian space networks, and landscapes.<br>➢ Promote climate change mitigation measures through the development of public transportation and its use, encouraging walking and bicycling, and the use of renewable energy.<br>➢ Appropriate water resource management and waste treatment |

Source: JICA Study Team

### 7.4.1 Challenges on Environment Preservation and Management

Environmental challenges in ASEZ are shown on the following table.

**Table 7-13 Challenges related to Environment Preservation and Management in ASEZ**

| Item | Current Challenges | Future Challenges |
|---|---|---|
| Air Quality | ・ Dust from natural sources and exhaust gas from factories are seen to have an impact. | ・ Newly developed areas may be affected by dust from surrounding bare land.<br>・ Need to accommodate future increases in the number of vehicles on the road and in the number of factories. |
| Water Pollution | ・ Currently, there is no trend of water quality deterioration in the Gulf of Aqaba. | ・ Cumulative impact of large-scale development projects is expected.<br>・ Increase in load due to future increase in hotels, factories, and so on. |
| Waste | ・ No separate collection system for solid waste<br>・ No waste incineration facilities<br>・ No facilities for reuse or recycling of useful waste<br>・ Open dumping site, so there is a possibility of waste runoff during rainfall. | ・ Need to address future increases in general and industrial waste. |
| Noise and Vibration | ・ No damage from noise and vibration is currently apparent. | ・ Need to accommodate future increases in the number of vehicles on the road and in the number of factories. |
| Land Subsidence | ・ Under the current circumstances, subsidence damage is not apparent. | ・ Concerned about future impacts from overuse of groundwater. |
| Protected Area | ・ No issues are found in the protected area at the present time. | ・ The creation of a new urban center in the southern coastal area could have an impact.<br>・ If overuse occurs as a result of increased tourism, this could have an impact on the protected area. |
| Ecosystem | ・ Water quality thresholds affecting marine life have not been studied. | ・ If deterioration of water quality in the Gulf of Aqaba occurs, it may affect the marine ecosystem.<br>・ If overuse occurs in protected areas, etc. due to an increase in the number of tourists, the ecosystem may be affected. |
| Climate Change | ・ Climate change adaptation measures are not being actively considered.<br>・ Inactive use of renewable energy. | ・ The risks associated with future climate change (e.g., occurrence of guerrilla rainstorms, heat waves, etc.) need to be addressed. |

Source: JICA Study Team

### 7.4.2 Environment Preservation and Management Strategy

Based on the challenges, the strategies for environment preservation and management are as shown in the following table.

**Table 7-14 Environmental Preservation and Management Strategy**

| Item | Challenges | Strategy (Mitigation Measures and Recommendations) |
|---|---|---|
| Air Quality | ・ Impact of dust from surrounding bare ground | ・ Installation of green belts for dust control purposes. |
| | ・ Impact of exhaust gas from increasing vehicles on the road | ・ Establishment of bypasses to avoid urban areas. |
| | ・ Impact of exhaust gas from increased number of factories | ・ Conduct air quality monitoring in industrial areas.<br>・ Establishment of green belts as buffer zones between industrial and residential areas. |
| Water Pollution | ・ Cumulative impact by large development projects | ・ Monitor proper implementation of water pollution mitigation measures.<br>・ If a trend of water quality deterioration in the Gulf of Aqaba is observed, consider requesting additional water pollution control measures. |
| | ・ Increase in load due to increase in hotels, factories, etc. | ・ If a trend of water quality deterioration in the Gulf of Aqaba is observed, consider requesting additional water pollution control measures. |
| Waste | ・ Increase in general and industrial waste | ・ Waste sorting, collection, and recycling.<br>・ Promote the 3Rs (Reduce, Reuse, Recycle) of waste. |
| | ・ Waste runoff during rainfall from open dumping sites | ・ Installation of wire mesh fencing to prevent runoff. |
| Noise and Vibration | ・ Noise and vibration impact from increased number of vehicles | ・ Developing bypass to avoid urban areas. |
| | ・ Noise and vibration impact from increased number of factories | ・ Establishment of green belts as buffer zones between industrial and residential areas. |
| Land Subsidence | ・ Possible land subsidence due to excessive use of groundwater | ・ Monitoring of groundwater use. |
| Protected Area | ・ Impact by developing a new urban center in the southern coastal area | ・ Sewage and waste disposal through proper urban planning.<br>・ Regulating development in coastal area. |
| | ・ Impact of overuse due to increased tourism | ・ Registration of tourism operators and making environmental considerations compulsory.<br>・ Set maximum number of tourists per day.<br>・ Restrictions of access vehicle. |
| Ecosystem | ・ Cumulative impact of large development projects | ・ [Same as water pollution] |
| | ・ Increase in load due to increase in hotels, factories, etc. | ・ [Same as water pollution] |
| | ・ Unanticipated impacts on marine life due to lack of research on water quality thresholds affecting marine life | ・ DNA analysis of marine life in the Gulf of Aqaba, and database maintenance.<br>・ Simplified monitoring by providing environmental DNA analysis tools.<br>・ Facilitate assessment of marine ecosystems by establishing indicator species. |
| Climate Change | ・ Consideration of climate change adaptation measures | ・ Climate change adaptation in Aqaba. |
| | ・ Utilization of renewable energy | ・ Photovoltaic power generation for buildings<br>・ Considering solar power, wind power, etc. |
| | ・ Address risks of future climate change (e.g., occurrence of guerrilla rainstorms, heat waves) | ・ Reducing flood risk by using hazard maps<br>・ Study measures to address climate change risks and publicize them to the people. |

Source: JICA Study Team

## 7.5 Disaster Risk Management

Based on the assessment of the current status of disaster risks in ASEZ outlined in Chapter 3 and the development vision and basic strategies presented in Chapter 4, the following disaster risk management strategies are proposed to enhance ASEZ's resilience for sustainable development. Given that flash floods and earthquakes are significant natural disasters in Aqaba, the suggested mitigation measures and priority projects will focus on addressing these risks.

**Table 7-15 Disaster Risk Management Strategies to Realize the Development Vision**

| Development strategies | Disaster Risk Management Strategies |
|---|---|
| **[VALUE of ENVIRONMENT] Full of Green and Nature - From gray infrastructure to green Infrastructure -** | ・ Developing Disaster-Resilient Urban Structure<br>➢ Identifying Disaster Risks and the Safe Zones<br>➢ Risk Informed Urban and Sustainable Development<br>➢ Considering Land Use in response to Disaster Hazard<br>➢ Strengthening buildings and infrastructure to cope with disaster risks<br>・ Promoting accurate and advance warning, safe and secure evacuation and effective emergency response<br>➢ Upgrading the Early Warning System to be accurate and ahead of the events.<br>➢ Ensuring secure evacuation actions<br>➢ Securing safe space for evacuation<br>➢ Establishing spaces and functions that enable rapid disaster response activities<br>・ Structuring organizations, people, and companies to be resilient to disasters<br>➢ Increasing Disaster Management Capability of ASEZA<br>➢ Improving Disaster Risk Management Capacity of Residents and Companies<br>➢ Promoting pre-disaster recovery |

### (1) Perspectives and approaches toward disaster risk management

#### 1) Perspectives toward building a disaster-resilient city

In promoting the development of a disaster-resistant city, two perspectives are important: "minimizing damage" and "early recovery from damages".

ASEZ is an important city in southern Jordan, with many residents and visitors, and it has many important infrastructures, including Jordan's only seaport. Therefore, it is foreseen that damage caused by disasters and delays in recovery will lead to stagnation in the economy and vitality of the country.

The government must build disaster resilience and mitigate vulnerability to disasters through cooperation and collaboration among residents, companies, and related parties. It is also important to prepare in advance with soft measures for reconstruction to cope with any damage.

#### 2) Approach to Disaster Risk Management

**a) Combining structural (Grey) and non-structural (Green) measures**

In order to realize a disaster-resilient city, physical, structural, and non-structural measures that encourage awareness and change in people's behavior are indispensable. Combining both makes it possible to build stronger social resilience and enhance disaster preparedness.

Role of Structural Measures: this includes physical measures such as increasing the resilience of buildings and infrastructures, establishing evacuation routes and shelters, and improving disaster-prevention facilities and equipment. Such measures are essential to minimize the damage in a disaster.

Role of Non-structural measures: this includes non-physical measures such as raising people's awareness through training and education and promoting organizational and social preparedness through the development of evacuation and disaster response plans. Such measures are important to mitigate the impact of disasters even before they occur.

**b) Stepwise measures through short-term and medium- to long-term measures**

Two types of measures should be implemented to build a disaster-resilient city: those that should be prioritized in the short term from the perspective of protecting human lives and those that should be implemented over time in the medium to long term, such as building infrastructure and systems to prepare for disasters, creating a disaster-resistant urban structure, and educating and training people. Combining those approaches will contribute to reducing damage and risks in the event of a disaster and enhancing society's resilience, including its ability to resist and respond to disasters.

## (2) Strategies for Disaster Risk Management in ASEZ

**1) Developing disaster-resilient urban structure**

In order to protect the lives and property of residents and businesses from disasters and create an environment where everyone can continue to live comfortably with no worry and where businesses can invest with peace of mind, it is important to create a city with reduced disaster risk by minimizing areas, buildings, and other elements that are vulnerable to damage from disasters.

Especially for flooding, while the results of the hazard maps prepared in this study indicated that existing and future development areas in ASEZ may be affected by various levels of flood hazards, development will continue to be unavoidable in hazard-prone areas due to geographical constraints. Therefore, appropriate flood recovery mitigation measures should be implemented.

**2) Promoting safe and secure evacuation and emergency response**

Since prompt evacuation and emergency response are essential to save lives, it is important to ensure an environment where everyone can evacuate safely and securely and enable swift emergency response.

The rapid and accurate distribution of disaster and evacuation information and securing evacuation shelters and routes will help minimize human suffering. In addition, securing road networks and other transportation networks that could function even in times of disaster and

securing space for rescue and support activities will contribute to prompt disaster response and early recovery/reconstruction.

#### 3) Structuring organizations, people, and companies to be resilient to disasters

Since both "building disaster-resistant urban structure" and "promoting safe and secure evacuation and emergency response" can only be realized through cooperation and collaboration among residents, companies, related parties, and the government, it is important to raise awareness of disaster prevention and prepare for disasters in advance from ordinary times.

Comprehensive planning that considers resilience and establishes a structure that enables early recovery and restoration from disaster will minimize secondary effects such as economic stagnation.

Aqaba should promote disaster preparedness and BCP formulation by the government and companies operating critical infrastructure and lifelines to ensure the early recovery of industrial functions.

### 7.5.1 Natural Disaster Risk Management Strategy

Based on the natural disaster risk management policy described above, this section presents the strategies and needed actions for disaster risk management in ASEZs.

#### (1) Developing Disaster-Resilient Urban Structure

#### 1) Identifying Disaster Risks

In order to develop a disaster-resilient urban structure, it is important to understand the disaster risks in each region. Hazard maps showing the types and severity of natural disasters that may occur, as well as risk maps showing the potential damage and impact of disasters, should be prepared at the district level to assist in decision-making for disaster risk management and preventive measures.

In creating risk maps to understand the specific types of damage that can be assumed in each area, issues are extracted by understanding the location, geological features, urban formation records, past disasters, etc. In addition, possible damages are examined at the regional level by overlaying human population characteristics, urban characteristics, infrastructure development disaster prevention/mitigation measures that have already been taken, and other factors. The current situation and areas where disaster risk may increase in the future should be considered.

For flooding, risk maps should be prepared based on the flood hazard maps prepared in Chapter 3, which will be used to identify specific measures to be taken.

[Needed actions]

- Creation of flood risk maps (e.g., analysis of probability and scale of disaster, extent of impact, expected areas of damage, and extent of damage, etc.)
- Creation of earthquake hazard maps and risk maps (e.g., analysis of probability and scale of disaster, extent of impact, expected areas of damage, and extent of damage, etc.)

### 2) Considering Land Use in response to Disaster Hazard

In order to realize a disaster-resilient urban structure, it is important to regulate and guide land use within disaster-hazard areas to reduce the number of areas vulnerable to damage caused by disasters. In areas where disaster risk is serious and extensive damage is assumed to occur, new development should, in principle, be restrained until safety measures are taken, and it is desirable to promote the relocation of residences, etc., already located in the area to safer areas. However, since there is a need to continue to develop in high-hazard areas in ASEZ due to geographical constraints, the acceptable level of hazard should be considered, and uses (residential, business, public, etc.) and land use regulations should be allocated considering the protection of human life as the top priority.

For flooding, the flood hazard maps prepared in this MP should be used for land use planning considerations.

In addition, " high-density urban areas," such as areas with a high density of buildings on narrow sites, areas with inadequate open spaces, and areas with many old buildings, are considered vulnerable to disaster hazards. In such areas, there is a tendency for damage caused by fire or collapse to spread, restrictions on evacuation sites and routes relative to population density, and limited access to rescue operations and assistance, which is highly necessary for improvement.

[Needed actions]

- Creation of risk-informed land use plan based on various hazards
- Designation of disaster risk zones (red zones) based on hazard maps, etc.
- Introduction of land use and building regulations in disaster risk zones (red zones)
- Reallocation of important public facilities and facilities for vulnerable groups
- Eliminating high-density urban areas (Al-Shalaleh, Old City, Al-Kazan, East Region-Industrial South, Al-Radwan, Al-Naser, Al-Rawdah Middle, and Al-Remal.)

### 3) Strengthening buildings and infrastructure to cope with disaster risks

In order to mitigate the damage caused by disasters, it is important to strengthen the disaster resilience of buildings and infrastructures to reduce human suffering and impact socioeconomic activities. Based on the identified disaster risks at the city and district levels, the impact on important buildings and infrastructure, economic activities, and the life of residents should be evaluated, and a combination of structural and non-structural countermeasures should be implemented after considering the priority of countermeasures based on the time required, urgency, and cost-effectiveness.

Regarding flooding, since hazard areas exist throughout ASEZ, including future development areas, the target will be to increase the size of safe areas by implementing appropriate flooding mitigation measures. Efforts will also be made to combine green infrastructure and effectively utilize water resources.

Regarding earthquakes, not only human casualties due to damage to buildings and structures but also damages to roads, ports, and lifelines (electricity, water, sewage, gas) will have a

significant impact on emergency recovery and industrial restoration after the disaster, a strategic approach is necessary.

[Needed actions]

- Development or update of design standards and guidelines for buildings and infrastructure in consideration of disaster risk
- Implement flood mitigation measures (dams, embankments, drainage channels, artificial ponds, stormwater drainage systems, ground elevation, road network realignment, etc.)
- Creation of green infrastructure to both reduce flood damage and utilize valuable water resources (rainwater catchment systems, Low Impact Development tools (LIDs), retention ponds, underground water tanks for harvesting and temporarily storing the water as detention tanks, swale infiltration trenches, infiltration wells, sidewalk pervious pavement, permeable paving, sink gardens, open space gardens. Etc., etc.)
- Enhancement of disaster resistance and redundancy of critical infrastructure (ports, airports, highways, etc.)
- Seismic reinforcement of housing, public buildings, tourist facilities, infrastructure and lifelines
- Promotion of liquefaction countermeasures for coastlines and reclaimed land
- Promotion of geotechnical disaster countermeasures (landslides, steep slope collapses)
- Promotion of anti-fire countermeasures against fires caused by earthquakes, etc. (securing fire spread prevention zones, fire-fighting water supply)

### (2) Promoting safe and secure evacuation and emergency response

#### 1) Ensuring secure evacuation actions

When a disaster occurs, rapidly evacuating people to a safe place is one of the most important actions to protect their lives. Prompt evacuation to safe places prevents the escalation of damage and danger and allows smooth, efficient, and effective rescue operations by the rescue team.

An early warning system (EWS) is an effective means of encouraging rapid evacuation. In addition, to encourage people to act calmly and reduce confusion and panic during evacuation, it is important to formulate and disseminate an evacuation plan beforehand and to conduct evacuation drills. Particularly, since many tourists and foreigners visit ASEZ without geographical knowledge or language barriers, it is desirable to enhance their safety by providing appropriate disaster information.

[Needed actions]

- Development and dissemination of evacuation plans (clearly indicating appropriate routes, emergency evacuation sites, instructions, etc.)
- Upgrade flood EWS (including meteorological radar, EW data analysis system, EW transmission system with sirens, ICT (e.g., area mail via cell phones))
- Installation of systems and applications to promptly transmit evacuation warnings and disaster information (e.g., to residents including children and elderly, foreign tourists,

and foreign workers)

- Education on appropriate evacuation actions and procedures, Periodic evacuation and disaster drills
- Assistance for people needing support who have difficulty evacuating quickly (e.g., evacuation in advance, etc.)

### 2) Securing safe space for evacuation

In order to ensure safe evacuation, it is important to provide evacuation facilities in easily accessible locations and to secure evacuation routes that enable people to reach those facilities safely in the event of a disaster.

Evacuation facilities should include evacuation sites, temporary places for immediate evacuation, and shelters, which provide support and accommodation for evacuees in an ongoing disaster. Shelters provide evacuees with food, water, medical care, sanitation, and other livelihood support.

Providing a safe evacuation environment is expected to ease the stress and psychological burden of disaster victims, and the recovery and reconstruction process will proceed more smoothly. In developing these facilities, consideration will be given to the elderly, the physically challenged, and other people with special needs during a disaster.

[Needed actions]

- Securing safe evacuation sites (parks, open spaces, etc.) in each neighborhood
- Securing shelters (public facilities, schools, community centers, open spaces, etc.) and placement of basic supplies and equipment (medical services, food and beverages, generators, etc.)
- Securing safe evacuation routes (widening evacuation roads, preventing road blockage by reinforcing buildings and block walls along evacuation routes, undergrounding power lines, preventing utility poles and other dangerous objects from collapsing, providing lighting for nighttime evacuation, making such routes barrier-free, etc.)
- Installation of guide signs and information boards indicating evacuation sites and evacuation routes
- Elimination of areas where evacuation is difficult in the event of a disaster
- Securing temporary housing in case of prolonged evacuation

### 3) Establishing spaces and functions that enable rapid disaster response activities

In order to mitigate the damage caused by disasters, it is important to realize rapid rescue and firefighting activities. Roadways are paths used for initial rescue and firefighting activities and serve as emergency transportation routes for emergency relief supplies.

In addition, to conduct emergency activities in urban areas, it is desirable to establish parks and open spaces to serve as activity bases, as well as heliports to enable access if the road network is cut off.

[Needed actions]

- Form a road network at least 6m wide to serve as a route for emergency activities and take measures to prevent road blockage.
- Designation of emergency transportation roads (roads to be used on a priority basis for the rapid rescue of disaster victims, provision of livelihood support, and supply of goods such as medical supplies and food in the event of a disaster).
- Development of a regional disaster prevention base
- Development of heliports

### (3) Structuring organizations, people, and companies to be resilient to disasters

#### 1) Increasing Disaster Management Capability of ASEZA

To become a resilient city, building a system that enables local authorities to quickly and effectively engage in recovery and reconstruction efforts immediately after a disaster strike is necessary. To this end, it is necessary to formulate an emergency response plan and a business continuity plan (BCP) to create awareness among officials and establish a partnership with various entities, including the national government, neighboring local governments, companies, and private organizations. In addition, the necessary means of financing (public-private partnerships, etc.) should be considered to promote steady hard measures.

[Needed actions]

- Establishment of an integrated disaster information database and platform (to record and monitor detailed measurement of rainfall, loss, damage, inundated areas, flood depth, extent of flooding, dam reservoir sedimentation, erosion of major wadis and flood channels, etc.) to accumulate and utilize disaster-related data.
- Strengthening of ASEZA's Disaster Risk Management Unit
- Organization of a disaster risk management headquarters
- Development of a disaster response plan for ASEZA
- Formulation of Business Continuity Plan (BCP) for ASEZA, ADC, etc.
- Investigation of business methods for disaster reduction measures

#### 2) Improving Disaster Risk Management Capacity of Residents and Companies

In disaster risk management, it is essential to improve the capacity of residents and businesses to protect their own lives and property and to contribute to the recovery of the local community. Self and mutual aid are important in a disaster, and they require advanced preparation and training. In addition, to restore industrial functions as quickly as possible, companies must develop business continuity plans (BCP) to prevent business interruption and build a disaster-resistant management structure. These efforts will ensure the safety and security of residents and businesses and contribute to the sustainable development of the local economy.

[Needed actions]

- Promoting disaster prevention education for residents and businesses (fostering

understanding of disaster risk and coping methods, promoting disaster prevention stockpiling and preparedness, etc.)

- Develop community disaster prevention plans in cooperation with residents (emergency disaster response activities focusing on local needs and risks, self and mutual disaster prevention activities from ordinary times, etc.)
- Training of voluntary disaster reduction organizations, disaster reduction volunteers, etc.
- Promotion of developing business continuity plans (BCPs) for companies (protection of critical operations and assets, ensuring the safety of employees and customers, communication of information and recovery response in the event of a disaster, etc.)

**3) Promoting pre-disaster recovery**

In order to enable the early start of recovery after a disaster, it is effective to promote a precautionary approach to design the post-disaster recovery process in advance, based on assumptions. Through pre-disaster reconstruction, the possibility of prompt and smooth recovery of livelihoods and economic activities lost due to disasters can be increased, and issues and improvements in reconstruction can be identified and resolved or improved.

[Needed actions]

- Consideration of reconstruction assistance structure and division of roles in partnership with the national government, military, fire departments, police, medical institutions, etc.
- Identification and securement of human resources (experts), technology, and information necessary for reconstruction
- Consideration of stockpiling relief supplies (food and daily living necessities) and receiving arrangements
- Consideration of emergency medical system
- Consideration of disaster debris disposal system
- Estimation of reconstruction costs and consideration of means of financial support
- Consideration of reconstruction processes and procedures

### 7.5.2 Proposed Flood Management Strategies in the Very High-Risk Areas

ASEZA and ADC have tried to combat flash floods significantly in existing and newly developing areas by implementing engineering (hard measures) and non-engineering (soft measures). Along the Wadi channels, various dams have been constructed, and improvements and protections have been put in place for the Wadi channels, dikes, floodwalls, and elevated bridges to replace culvert crossings. However, these engineering measures are designed for specific return periods and may need to be upgraded to deal with extreme climate change events. Additionally, non-engineering measures, such as the early warning system in Aqaba, require substantial upgrades.

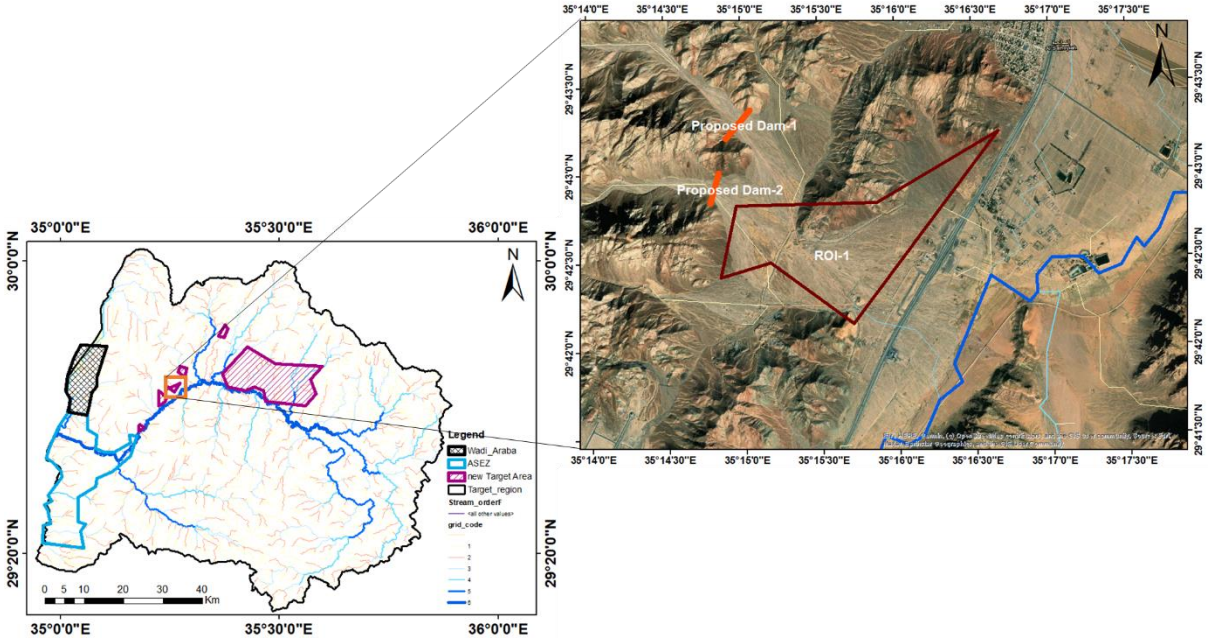
#### (1) Proposed Mitigation Measures in some of the Newly Developing Areas

Flood control engineering measures consist of both hard and soft interventions. Hard measures

focus on slowing down and controlling the release of floodwater in line with the drainage capacity, which may include flood storage, cutting the flood peak, and harvesting floodwater for groundwater recharge. Supporting structures such as dams and localized flood interventions like dikes, high embankments, and concrete walls along the river channels are also utilized to shape the floodplains. In addition, there are semi-hard measures like diversion tunnels, artificial groundwater recharge wells, enhancing infiltration, low-impact development, and landscaping measures such as creating green spaces with trees and plants near buildings and roads. Terracing, or cutting sloped areas into flat surfaces, is also used to reduce water velocity and soil erosion.

### 1) Proposed dams for Al-Quwaira

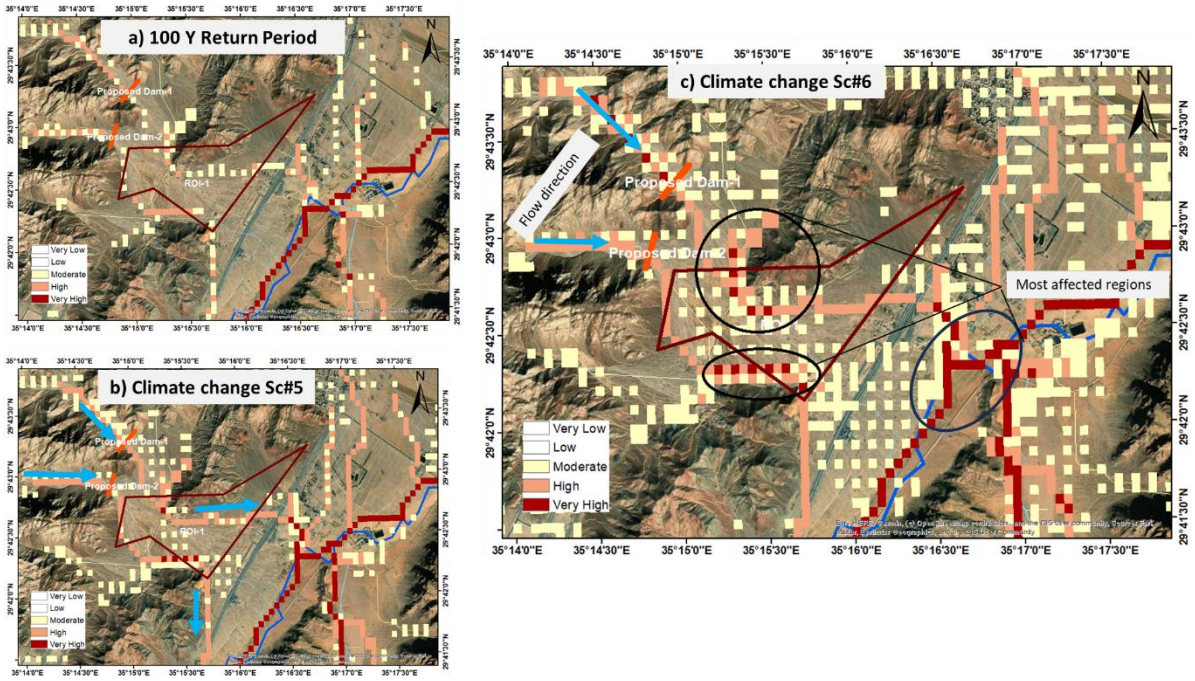
The area of Al-Quwaira is facing numerous challenges following the onset of urbanization, involving the construction of roads, drainage channels, surrounding walls, and other infrastructures in the area. The recent flood storms 2023 had multiple impacts on the new industrial areas. For instance, in Al-Quwaria , the southwest walls surrounding the developing areas of Al-Quwaria collapsed due to flash floods. After the flood, the alignment of the flood drainage channel was adjusted. However, in October 2023, a severe storm caused flooding in downstream villages. Local communities are opposing the new channel alignments. In response, the JICA flood expert and the ADC chief Engineer visited the site and proposed mitigation measures based on a detailed design from a high-resolution flood analysis. The following is an example of the proposed mitigation measures with dams constructed in the area. Figure 7.59 shows the locations of the proposed two storage dams in Al-Quweria areas.




Source：Created by the JICA Study Team

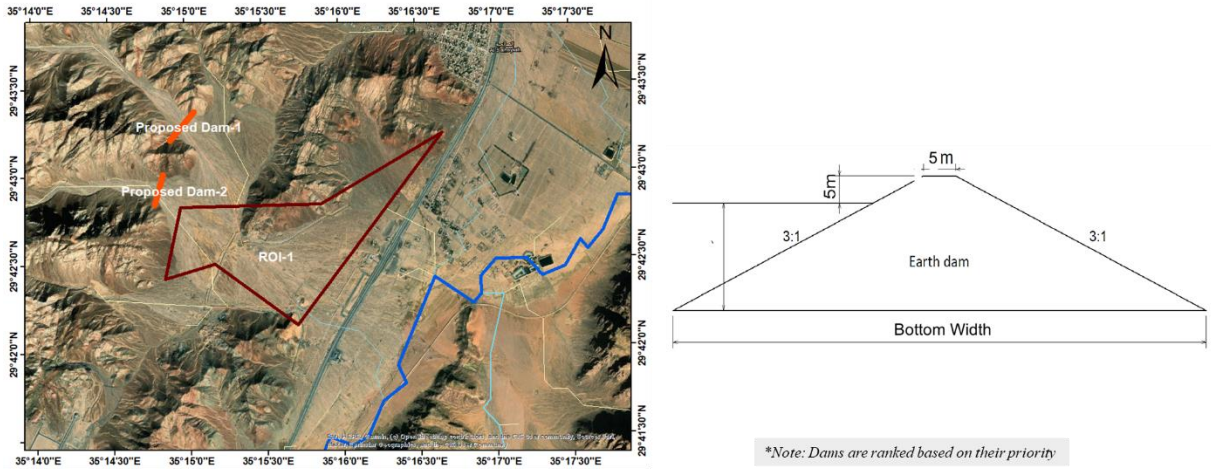
**Figure 7.59 Location maps of the proposed dams for protecting and harvesting the flash floods in the Al-Quwaira industrial zone.**

Figure 7.60 depicts the layout of two proposed dams, focusing on the affected areas in Al-Quwaira. This is overlaid on a flood hazard map, representing three scenarios under climate change impacts in scenarios #5 and #6. Three Wadis tributaries primarily influence the affected area, with two contributing significantly to flood discharge during extreme events in scenario #6. Figure 7.61 depicts the design of the two proposed dams, including their geometries and cross sections.




Source：Created by the JICA Study Team

**Figure 7.60 The layout of the dam sites with a zoom-in on the affected areas in Al-Quwaira overlaid on the flood hazard map for the following scenarios: a) 100-year return period without considering the impacts of climate change; b) 100-year return period under the impacts of climate change (Scenario #5); c) 100-year return period under the impacts of climate change (Scenario #6)**

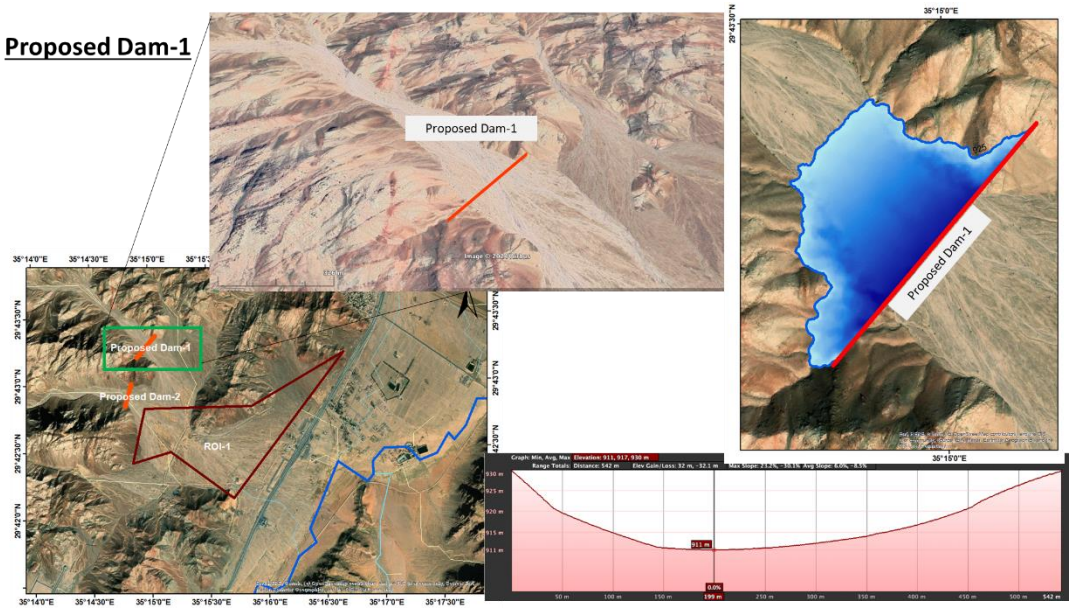



| Proposed dams | Dam Height | Dam length | Dam width | | Volume (m3) |
|---|---|---|---|---|---|
| | | | Top (Level) | Bottom (Level) | |
| **Dam1** | 19 m | 542 m | 5 m (930m) | 119m (911m) | 657963 |
| **Dam2** | 23 m | 467m | 5 m (915m) | 143m (892m) | 809664 |

Source：Created by the JICA Study Team

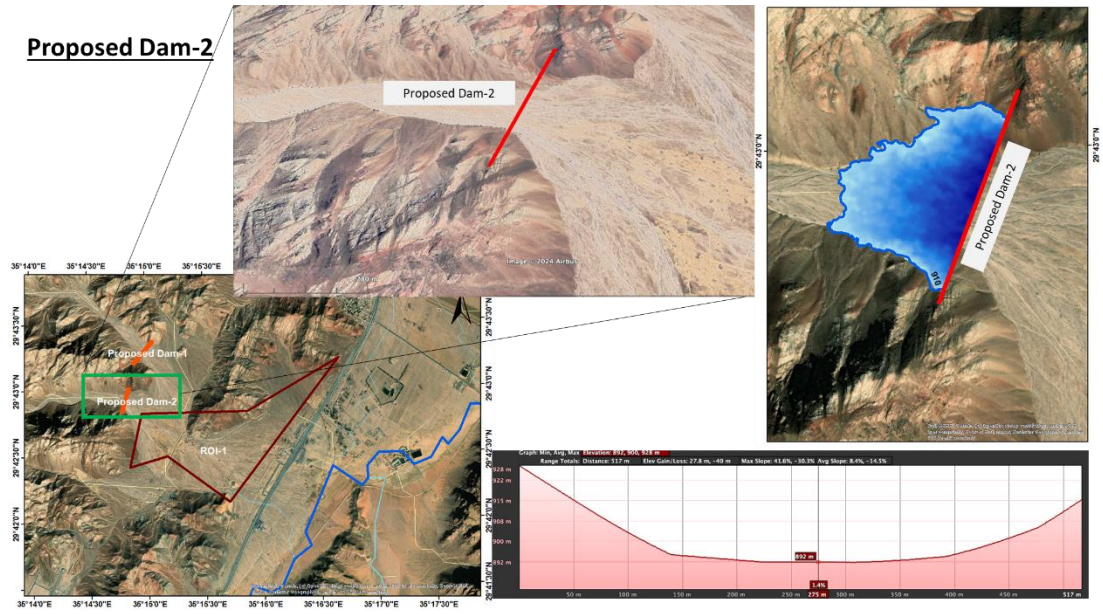
**Figure 7.61 The tentative geometries and sections of the proposed dams**

The extent of the proposed reservoir dams and their outlines are shown in Figures 7.62 and 7.63.




Source：Created by the JICA Study Team

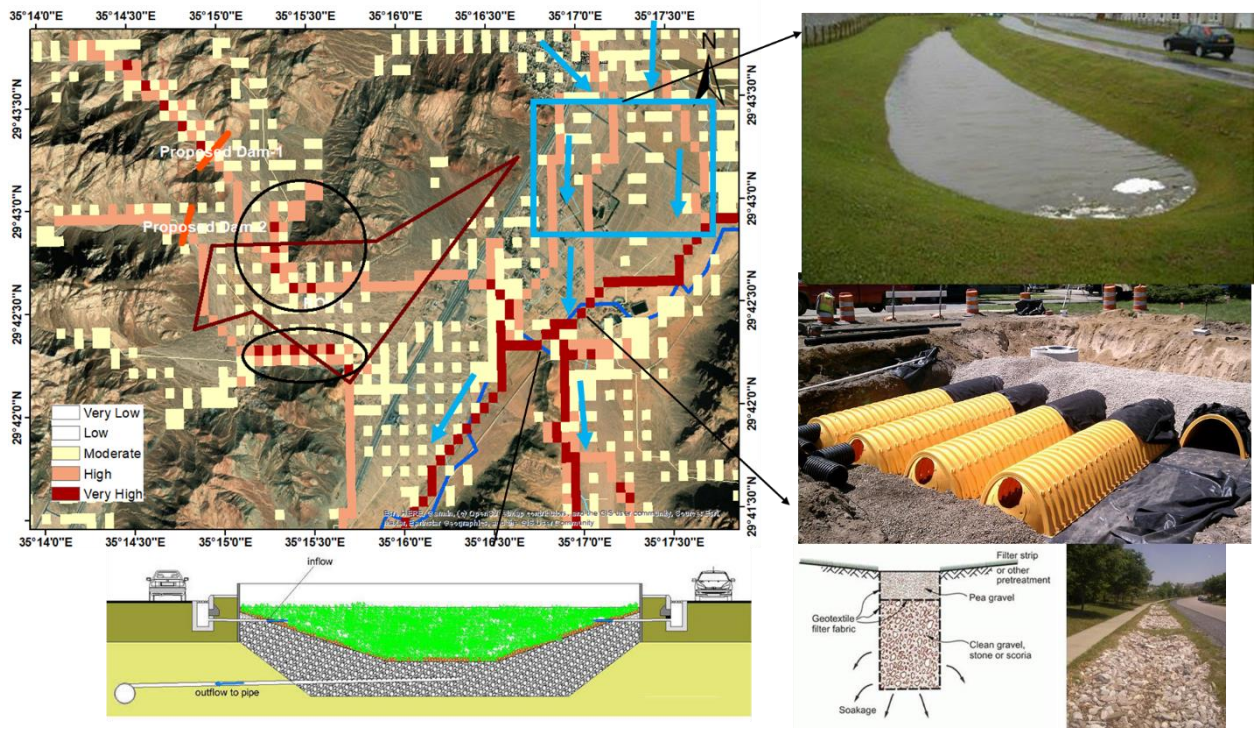
**Figure 7.62 The characteristic and layout of the reservoir dam 1**




Source：Created by the JICA Study Team

**Figure 7.63 The characteristic and layout of the reservoir dam 2**

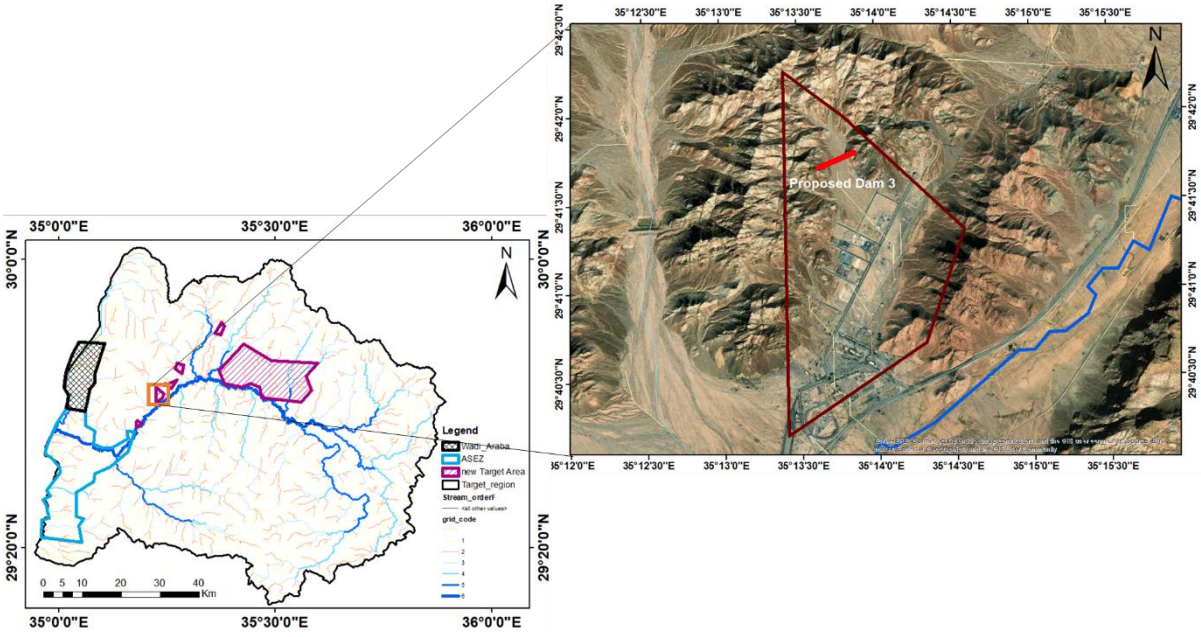
The industrial area of Al-Quwaira is impacted by floodwater from the northeast of Wadi as depicted in Figure 7.64. However, due to its slightly hilly slope, it cannot accommodate another dam site. Hence, it is recommended that this area be developed as a greener landscape, emphasizing the concept of increasing permeability and infiltration. This can be achieved through nature-based solutions such as low-impact development and landscape measures as shown in the pictures in Figure 7.64.




Source：Created by the JICA Study Team

**Figure 7.64 Proposed measures to improve permeable soils for runoff water using green infrastructures, water harvesting tanks, and low-impact development tools (LID)**

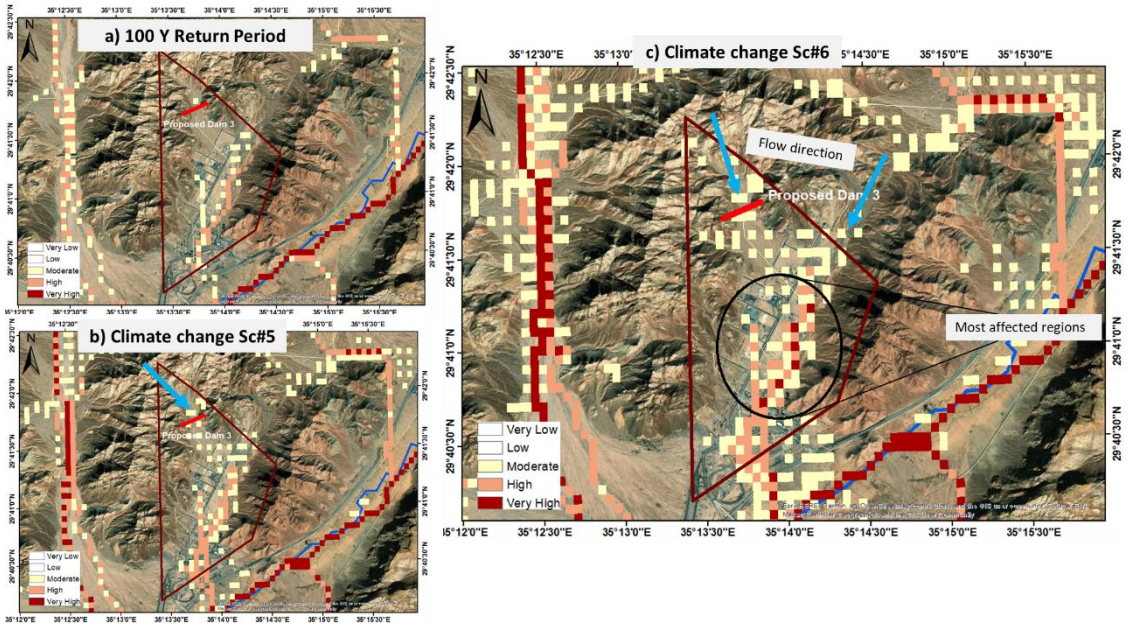
The logistics and trucking services area has a moderate risk of flooding. However, the surrounding roads have a high risk. Therefore, we propose a potential dam for flood mitigation measures, as shown in Figure 7.65.




Source：Created by the JICA Study Team

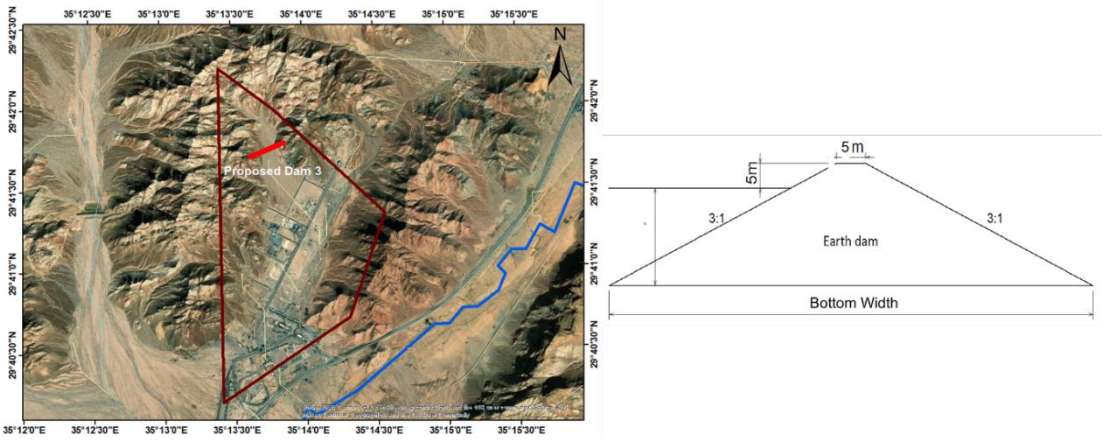
**Figure 7.65 Location maps of a potential dam site for flash flood protection in the logistics and trucking services area.**

In Figure 7.66, you can see the layout of the proposed dam and its impact on the affected areas within the logistics and trucking services area. This is superimposed on a flood hazard map depicting three scenarios under climate change impacts: scenarios #5 and #6. Two Wadis tributaries mainly influence the affected area, with only one significantly contributing to flood discharge during extreme events in scenario #6. Figure 7.67 illustrates the design of the proposed dam, including its geometry and cross-section.




Source: Created by the JICA Study Team

**Figure 7.66 The layout of the dam site with a zoom-in on the affected areas in logistics and trucking services area overlaid on the flood hazard map for the following scenarios: a) 100-year return period without considering the impacts of climate change; b) 100-year return period under the impacts of climate change (Scenario #5); c) 100-year return period under the impacts of climate change (Scenario #6)**

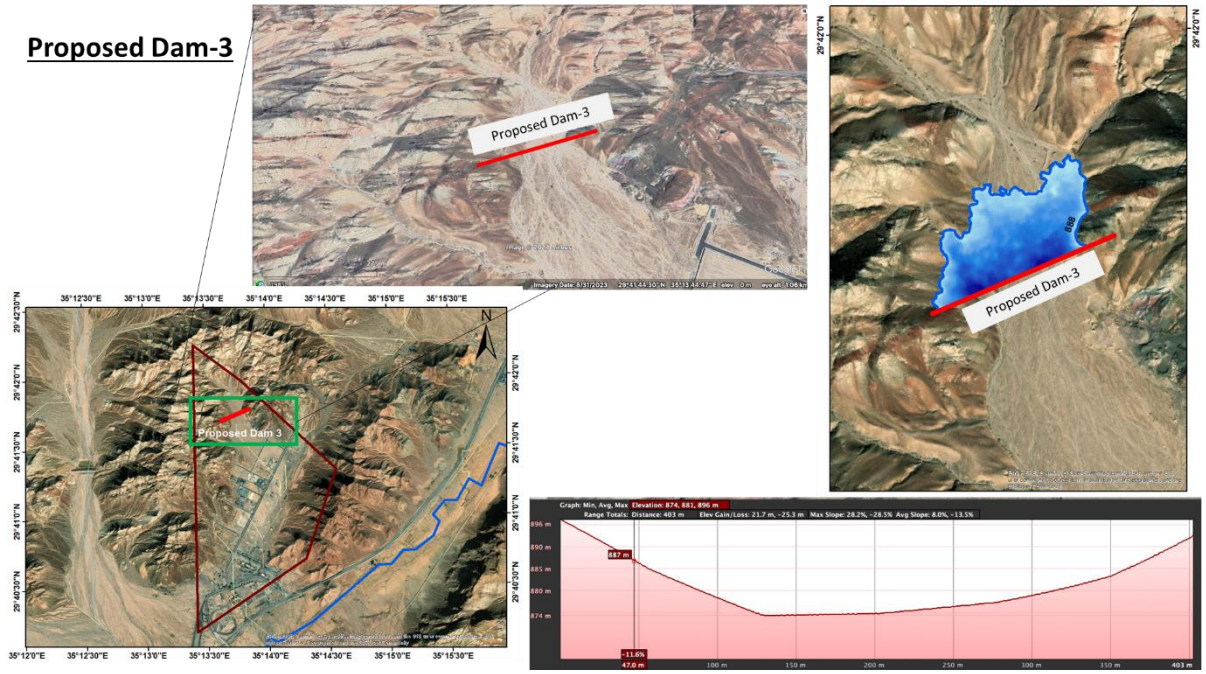



| Proposed dams | Dam Height | Dam length | Dam width | | Volume ($m^3$) |
|---|---|---|---|---|---|
| | | | Top (Level) | Bottom (Level) | |
| Dam3 | 19 m | 383 m | 5 m (893m) | 119 m (874m) | 317951 |

Source：Created by the JICA Study Team

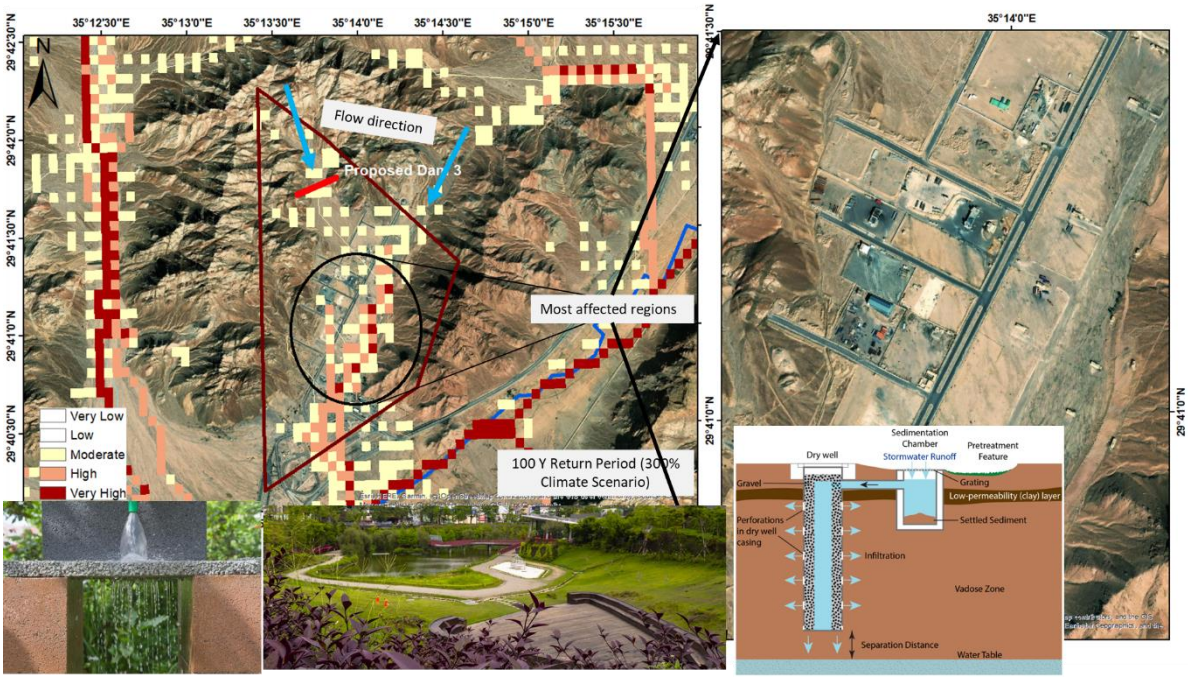
**Figure 7.67 The tentative geometry and section of the proposed dam in logistics and trucking services area**

Figure 7.68 illustrates the extent of the proposed reservoir dam. Figure 7.69 overviews nature-based solutions to enhance permeable soils for managing runoff water, including green infrastructures, water harvesting tanks, and low-impact development tools (LID) in logistics and trucking services.




Source：Created by the JICA Study Team

**Figure 7.68 The characteristic and layout of the reservoir dam in the logistics and trucking services area.**




Source：Created by the JICA Study Team

**Figure 7.69 Proposed measures to improve permeable soils for runoff water using green infrastructures, water harvesting tanks, and low-impact development tools (LID) in the logistics and trucking services area.**

**(2) Proposed Mitigation Measures in some of the Aqaba city scale**

Urban planning tools have recently been crucial in scientific Flood Risk Reduction (FRR) research. These tools have the potential to significantly minimize the impact of extreme rainfall events on public safety. We will discuss various interventions that primarily fall under flood avoidance and reduction categories, including:

- Land use control
- Building codes
- Floodproofing and building elevation
- Sustainable infrastructure for stormwater management

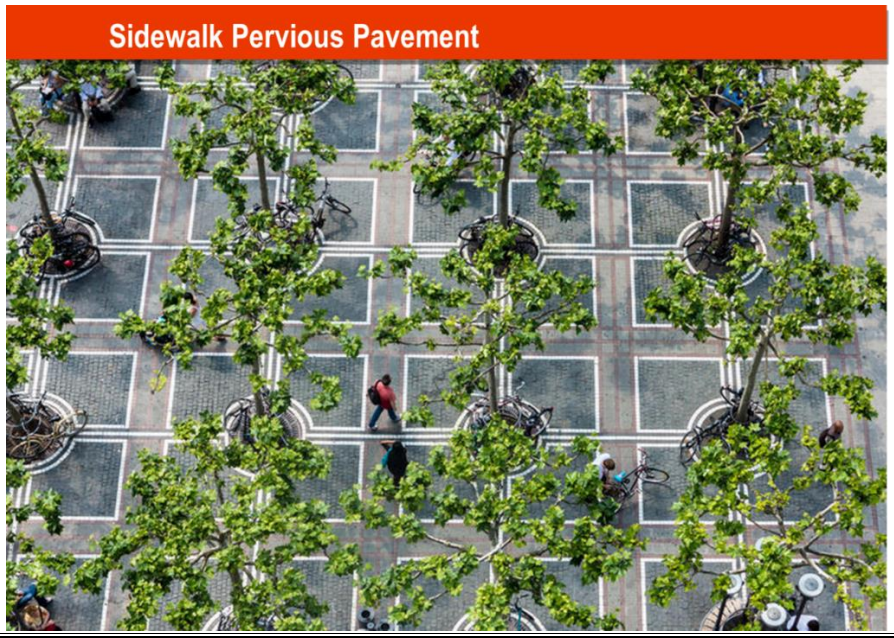
It is essential to manage floods at an urban scale within the floodplain. This can be achieved by integrating nature and flood considerations into land use planning. It requires coordinating the efforts of stakeholders within the disaster risk management division. Integrating land use planning and road networks with smart infrastructures can help mitigate and delay runoff water during extreme storms. Spatial planning is crucial for developing a risk-informed urban expansion while avoiding flood-risk areas, considering developed flood hazard maps and inventory. Zoning land use for suitable development areas and designating green developments for high-risk zones can be promoted through semi-engineering and natural-based solutions. Shifting from gray infrastructure to green infrastructure for mitigation measures is also vital. The complexity of urban stormwater management has increased in recent decades, leading to the utilization of various concepts, tools, and techniques to reduce flood risk. Experts from different disciplines, such as urban drainage, architecture, landscape architecture, urban design and planning, sociology, ecology, and economics, have integrated to address this issue. Some urban planning tools, strategies, and techniques for flood management include best management practices (BMPs) and low-impact development (LID), green infrastructure, nature-based solutions, and sponge cities.

The primary common goals for all these tools, strategies, and techniques are to:

- Reduce runoff volumes and flow rates from impermeable surfaces
- Control the urbanization impact on flooding
- Provide opportunities for using runoff water on-site
- Improve water quality and reduce runoff pollution
- Protect natural watercourse flow systems
- Create wildlife habitats in urban watercourses
- Support evapotranspiration and natural groundwater recharge

The following Table 7.16 to 7.18 summarize several proposed projects for reducing flood risk in Aqaba City on an urban scale.

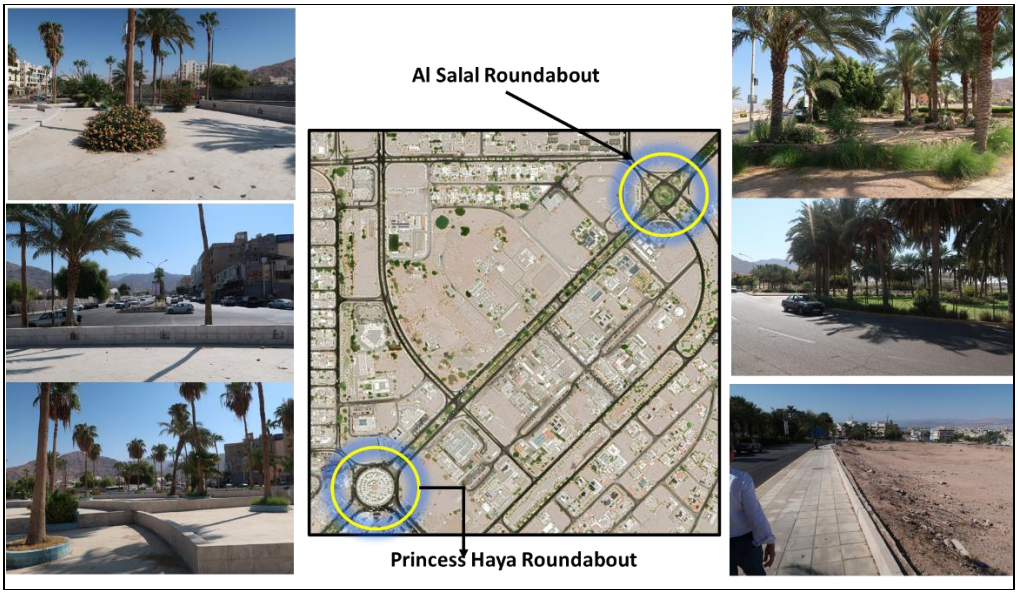
**Table 7-16 Establishment of Sidewalk pervious pavement and typical bioretention cell in the area in front of Oryx Hotel**

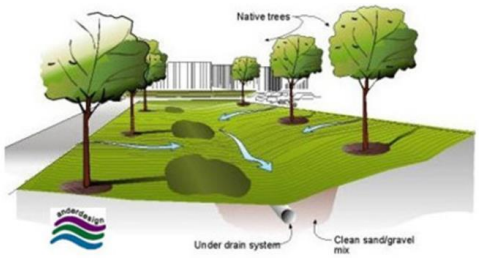
| | |
|---|---|
| **Project Title** | Establishment of Sidewalk pervious pavement and typical bioretention cell in the area in front of Oryx Hotel |
| **Location** | AL SHARIF SHAKIR BIN ZAYD STREET, Aqaba, Jordan<br>  |
| **Area** | 3581 $m^2$ |
| **Coordinates** | 3,896,037.120 3,444,553.045 Meters “Popular_Visualisation_CRS_Mercator” |
| **Project Objective** | To implement techniques for Sidewalk pervious pavement and external flood control systems to mitigate flood risks and enhance water management. |
| **Project Elements** | Sidewalk pervious pavement<br>**bioretention cell**<br>  |

| | |
|---|---|
| |  Sample Connection Between Wadi Water and Sea  Sample Connection Between Wadi Water and Sea  Sample Connection Between Wadi Water and Sea  Sample Connection Between Wadi Water and Sea |
| **Project Budget/Cost** | $267,731.50<br>Covering:<br>- Site Preparation and Excavation: $26,857.50 (3581 $m^2$ * $7.5 average)<br>- Sub-base Preparation: $14,324.00 (3581 $m^2$ * $4 average)<br>- Drainage System Installation: $17,500.00 (500 linear meters * $15 average) + $10,000.00 (10 inlets/outlets * $1,000 average)<br>- Pervious Pavement Installation: $143,240.00 (3581 $m^2$ * $40 average) https://extension.psu.edu/rain-gardens-bioretention-cells-a-stormwater-bmp<br>- Flood Control Systems: $30,000.00 (1000 $m^2$ swales/bio-retention)<br>- Finishing Work: $35,810.00 (3581 $m^2$ * $10 average) |
| **Project Funding** | - ASEZA funds<br>- International grants and loans (e.g., from JICA, the World Bank, UNDP)<br>- Private sector contributions (e.g., environmental NGOs, local businesses) |
| **Project Implementation Authority** | - ASEZA and ADC |
| **Project Maintenance Responsibility** | - Collaborating Agencies: ASEZA, Ministry of Water and Irrigation, Environmental Protection Agency<br>- ASEZA Environmental |
| **Project Timeline** | - Start Date: January 2025<br>- End Date: January 2026<br>**Justification for Timeline**:<br>- **Design and Planning** (6 months): Ensuring comprehensive planning and stakeholder engagement<br>- **Construction** (9 months): Building bio-retention cells, porous pavements |

| | |
|---|---|
| | - **Implementation** (9 months): Developing sink parks and waterfront enhancements |
| **Expected Outcomes** | - Reduced flood risk in key areas of Aqaba<br>- Improved groundwater recharge through bio-retention techniques<br>- Enhanced urban green spaces with sink parks<br>- Increased community awareness and engagement in flood management practices |

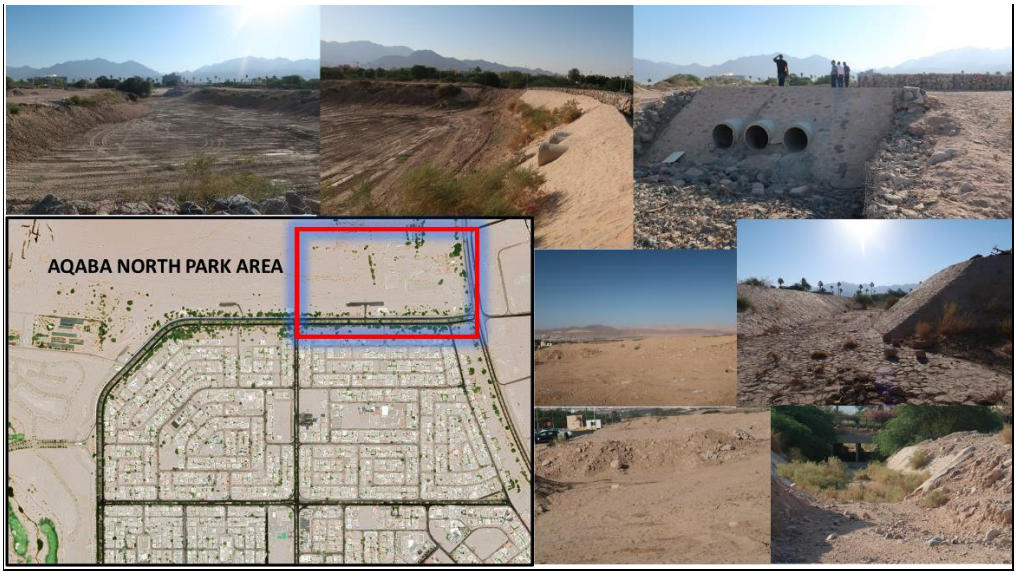
**Table 7-17 Small Retention Park with Bio-Retention Techniques in Aqaba**

| | |
|---|---|
| **Project Title** | Small Retention Park with Bio-Retention Techniques in Aqaba |
| | Aqaba Special Economic Zone Authority (ASEZA), Jordan |
| **Location** |  |
| **Area** | 205,760.376609802 $m^2$ |
| **Coordinates** | 29.5322° N, 35.0063° E |
| **Project Objective** | To implement a small retention park utilizing bio-retention techniques to mitigate flood risks and enhance water management |
| **Project Elements** | - **Bio-retention cells**: Capture and treat stormwater runoff using landscaped depressions filled with soil, sand, and plants. |
| **Project Sample** |  |

| | |
|---|---|
| |  <br>*Typical examples of landscaped retention basins*<br>  <br>*Typical examples of landscaped retention basins*<br>     <br>*Examples of detention basins*<br>  <br>*Typical examples of landscaped retention basins* |
| **Project Budget/Cost** | Estimated total cost: $3.5 million<br>- Bio-retention cells: $1.2 million<br>- Continuous porous pavement: $0.8 million<br>- Underground water storage tanks: $0.6 million<br>- Sink parks: $0.5 million<br>- Waterfront enhancements: $0.4 million |
| **Project Funding** | - ASEZA funds<br>- International grants (e.g., from the World Bank, UNDP)<br>- Private sector contributions (e.g., environmental NGOs, local businesses) |
| **Project Implementation Authority** | - ASEZA and ADC |
| **Project Maintenance Responsibility** | - Collaborating Agencies: ASEZA, ADC<br>- ASEZA Environmental Directorate |
| **Project Timeline** | - Start Date: January 2025<br>- End Date: December 2027<br>**Justification for Timeline**:<br>- **Design and Planning** (6 months): Ensuring comprehensive planning and stakeholder engagement<br>- **Construction** (18 months): Building bio-retention cells, porous pavements, and underground tanks<br>- **Implementation** (12 months): Developing sink parks and waterfront enhancements<br>- **Monitoring and Evaluation** (12 months): Assessing performance and making adjustments |

| | |
|---|---|
| **Expected Outcomes** | - Reduced flood risk in key areas of Aqaba<br>- Improved groundwater recharge through bio-retention techniques<br>- Enhanced urban green spaces with sink parks<br>- Increased community awareness and engagement in flood management practices |
| **Key Stakeholders** | - Local communities<br>- Government agencies<br>- Environmental organizations<br>- Academic and research institutions |
| **Project Risks** | - Data collection challenges due to extreme weather conditions<br>- Potential delays in funding allocation<br>- Coordination issues among collaborating agencies |

**Table 7-18 Small Retention Park with Bio-Retention Techniques in Aqaba North Park area**

| | |
|---|---|
| **Project Title** | Small Retention Park with Bio-Retention Techniques in Aqaba |
| | Aqaba Special Economic Zone Authority (ASEZA), Jordan |
| **Location** |  |
| **Area** | 205,760.376609802 $m^2$ |
| **Coordinates** | 29.5322° N, 35.0063° E |
| **Project Objective** | To implement a small retention park utilizing bio-retention techniques to mitigate flood risks and enhance water management |
| **Project Elements** | - **Bio-retention cells**: Capture and treat stormwater runoff using landscaped depressions filled with soil, sand, and plants. |
| **Project Sample** | N/A |
| **Project Budget/Cost** | Estimated total cost: $3.5 million<br>- Bio-retention cells: $1.2 million<br>- Continuous porous pavement: $0.8 million<br>- Underground water storage tanks: $0.6 million<br>- Sink parks: $0.5 million<br>- Waterfront enhancements: $0.4 million |

| | |
|---|---|
| **Project Funding** | - ASEZA funds<br>- International grants (e.g., from JICA, World Bank, UNDP)<br>- Private sector contributions (e.g., environmental NGOs, local businesses) |
| **Project Implementation Authority** | - Lead Institution: [Name of the University or Research Institute] |
| **Project Maintenance Responsibility** | - Collaborating Agencies: ASEZA, Ministry of Water and Irrigation, Environmental Protection Agency<br>- ASEZA Environmental Management Division |
| **Project Timeline** | - Start Date: January 2025<br>- End Date: December 2027<br>**Justification for Timeline**:<br>- **Design and Planning** (6 months): Ensuring comprehensive planning and stakeholder engagement<br>- **Construction** (18 months): Building bio-retention cells, porous pavements, and underground tanks<br>- **Implementation** (12 months): Developing sink parks and waterfront enhancements<br>- **Monitoring and Evaluation** (12 months): Assessing performance and making adjustments |
| **Expected Outcomes** | - Reduced flood risk in key areas of Aqaba<br>- Improved groundwater recharge through bio-retention techniques<br>- Enhanced urban green spaces with sink parks<br>- Increased community awareness and engagement in flood management practices |
| **Key Stakeholders** | - Local communities<br>- Government agencies<br>- Environmental organizations<br>- Academic and research institutions |
| **Project Risks** | - Data collection challenges due to extreme weather conditions<br>- Potential delays in funding allocation<br>- Coordination issues among collaborating agencies |

### (3) Proposed upgrade for the early warning system in Aqaba

The current early warning system needs significant improvements to provide accurate and timely warnings for flash floods. The proposed upgraded Early Warning System (EWS) should include a hydrological model to simulate flash floods in the Wadi system. It should also install an X-band radar for early rainfall detection, supported by an automated observation system for rainfall that triggers WFF. In addition, water level and sediment movement sensors should be installed to detect the occurrence of WFF. It is important to establish a specialized department (disaster prevention division within the smart city or a separate unit) to process this disaster prevention information, connect it to flood forecasting and warning using ICT, and allocate specialized staff.

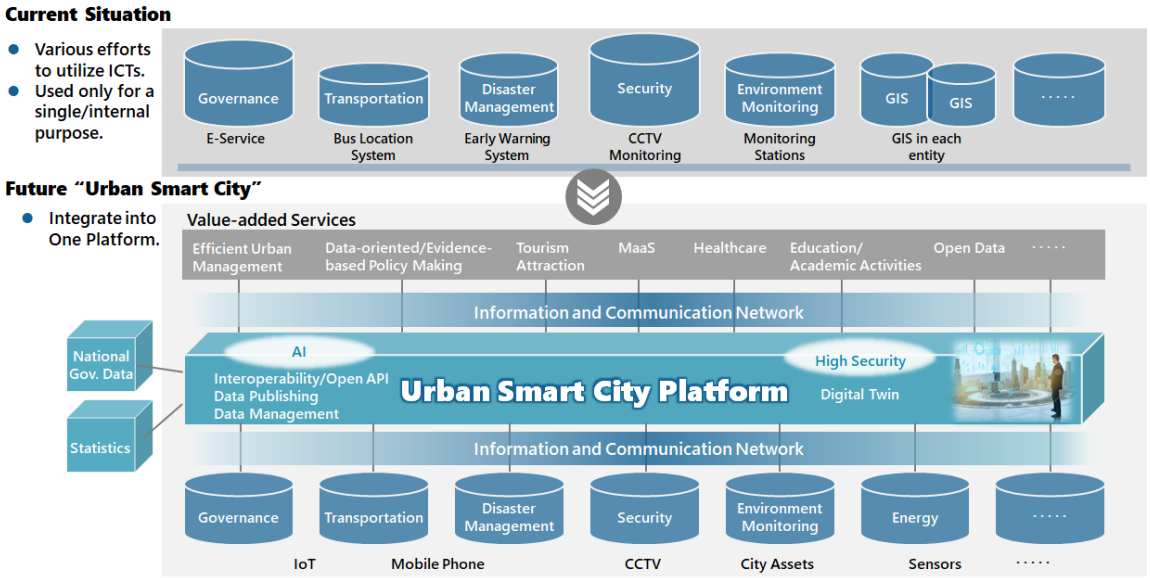
## 7.6 Smart City

ASEZ is expected to develop as an engine of economic growth in Jordan in the future, receiving various industries, tourists and investments, as well as a growing city that welcomes a diverse range of people as residents. More efficient urban management is required to make this growth sustainable and to make the city Livable, Lovable and Attractive. This requires urban services that make the best use of ICT technologies and the best use of the data obtained through these activities. In other words, “Smart City” initiatives are required.

### 7.6.1 Challenges and directions to implement “smart city” in ASEZ

ASEZA, ADC and relevant organizations are each taking various initiatives to make use of ICTs in various fields; CCTV monitoring system for security, Early Warning System (EWS) for disaster management, water management system by SCADA for water management, etc. On the other hand, each of these activities also faces a number of challenges, such as insufficient use of the ICTs introduced and the fact that they are only used for a single purpose and no consideration is given to their use in other fields or to their linkage. Furthermore, the appropriate management and accumulation of data through these activities and the utilization of data (including disclosure to citizens) are very limited.

On the other hand, each of these activities is considered to be linked to the sectoral activities of the Smart City. It is necessary to upgrade these activities and link them together in a cross-sectoral manner to make them into activities that can be called “Smart City”.




Source：Created by the JICA Study Team

**Figure 7-70 Current status and future direction of smart city initiatives in ASEZ**

### 7.6.2 Proposal of ASEZ smart city vision and strategies

#### (1) Steps towards the realization of smart city in General

In general, the steps to be taken towards the realization of a smart city are as shown in the figure below:

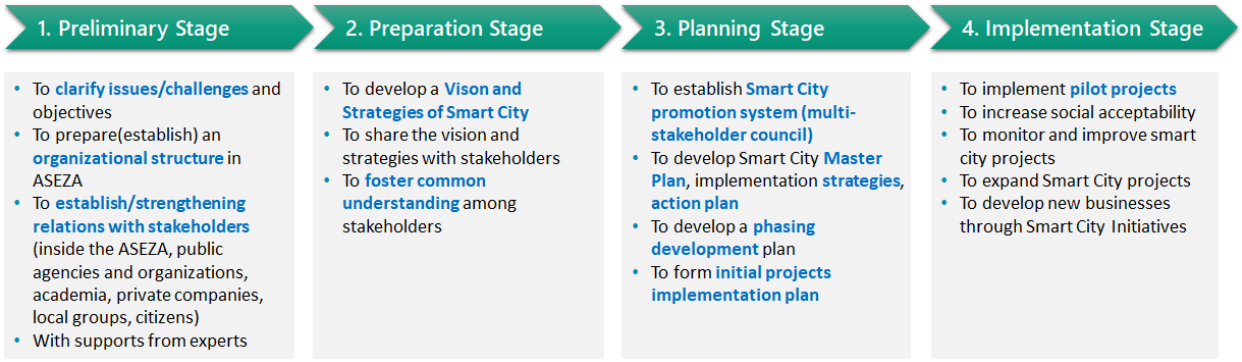
1. Preliminary stage

2. Preparation stage

3. Planning stage

4. Implementation stage

When working on "smart city" in the ASEZ, it is necessary to build a smart city vision and strategies for the ASEZ based on the analysis of its issues and strengths, and to formulate a concrete plan and projects to be implemented based on this vision and the strategies. The following are some of the key issues that need to be addressed.




Source：Created by the JICA Study Team referring "Smart City Guide Book" (Cabinet Office, Japanese Government)
（https://www8.cao.go.jp/cstp/society5_0/smartcity/index.html）

**Figure 7-71 Steps towards the realization of smart city**

#### (2) Proposal of ASEZ smart city vision

ASEZ Master Plan aims to create the city with the vision of "Authenticity and Promising opportunities", having three urban development strategies which are "Full of Smile ~from expansion-oriented to value-driven development~", "Full of Investment Opportunities ~ From Labor intensive to high value-added tourism, industries and education~", "Full of Green and Nature ~ From gray infrastructure to green Infrastructure~".

ASEZ Smart City initiatives are the enabler to realize those vision and strategies with an innovative and sustainable advanced technology, including data integration and information systems, information technology network infrastructure, as well as IoT (Internet of Things) and other advanced ICTs to improve public services, efficiency, and quality of life.

Based on the current situation, challenges and directions organized as above, a smart city vision for ASEZ is proposed as follows. By developing a vision for ASEZ smart city, we can clarify the direction of ASEZ smart city.

-ASEZ Smart City Vision (Proposed)-

a city with seamlessly integrating advanced Information and Communication Technologies (ICT) and profound wisdom to drive the efficient city management and city services with citizen's centric approach to realize livable and lovable city of ASEZ.

The statement of ASEZ smart city vision as above is devised on the basis of the following ideas

**Table 7-19 ASEZ Smart City Vision**

| ASEZ Smart City Vision | Explanatory Notes |
|---|---|
| **a city with seamlessly integrating advanced Information and Communication Technologies (ICT)** | *the city effectively incorporates cutting-edge Information and Communication Technologies, like smart sensors, data analytics, high-speed networks, and the Internet of Things (IoT), in a manner that ensures these technologies work together harmoniously.*<br>*The goal is to create a digital infrastructure that enhances various aspects of urban life, from transportation and healthcare to energy management and public safety, etc.* |
| **and profound wisdom** | *This refers to a city's capacity to apply not just technology but also deep insights and knowledge. It involves drawing upon the collective intelligence of city officials, experts, and residents to make informed decisions and solve complex urban challenges. The wisdom here represents the ability to think critically, adapt, and foresee future needs, transcending mere technological solutions.* |
| **to drive the efficient city management and city services** | *Efficiency is a key objective. The integration of advanced ICT and wisdom should actively contribute to the effective management of the city and its services. The technologies and knowledge should empower city authorities to optimize operations, reduce waste, enhance responsiveness, and improve overall quality of life for residents.* |
| **with citizen's centric approach** | *the city's development and services are designed with the primary focus on the needs, preferences, and well-being of its residents. It involves actively engaging the community in decision-making processes, fostering transparency, and providing services that cater to their demands and desires, thus ensuring that the city is built for the people, by the people.* |
| **to realize livable and lovable city of ASEZ.** | *This is the ultimate objective of Smart City Initiatives. The aim is to create an urban environment in ASEZ that is not only functional but also offers a high quality of life and fosters affection and pride among its residents. The concept is to create a city that people are happy to live in, work in, and connect with emotionally.* |

Source：Created by the JICA Study Team

### (3) ASEZ Smart City Development Strategies (Proposed)

There are three layers of smart city development; physical infrastructure, data platform, and Smart City application (Smart City Service Domains).

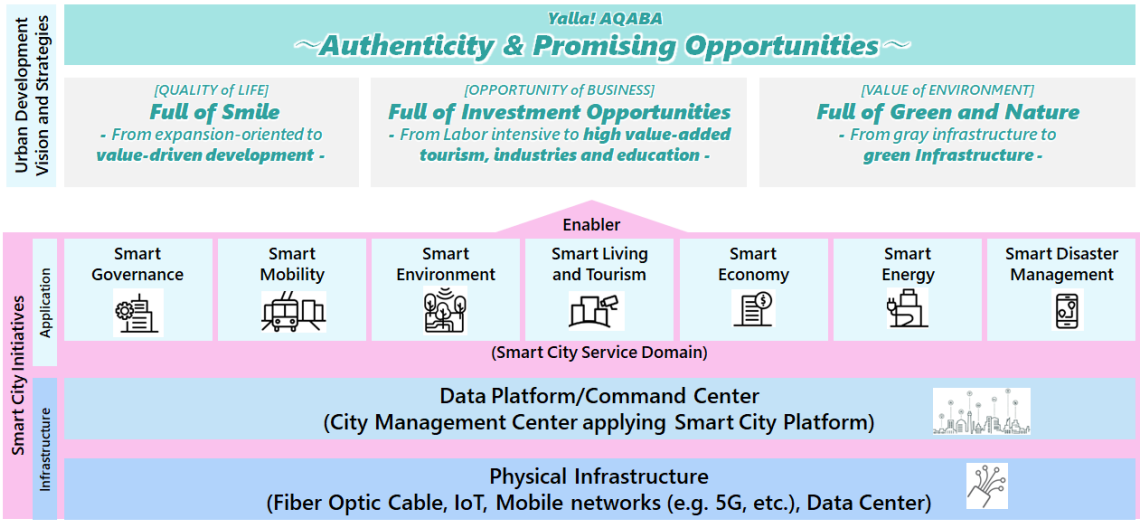
The first layer is Physical infrastructure which includes fiber optic cable network, latest generation mobile networks, Internet of Things (IoT), data center, etc.

The second layer is the data platform/command center which will provide integrated services in carrying out city operations and management monitoring process and city activities with accurate data.

The third layer is smart city applications (Smart City Service domains) which includes seven smart city domains, namely governance, mobility, environment, living and tourism, economy,

energy, and disaster management. The interconnectivity of various layers and applications of a smart city can support the smooth implementation of a smart city.

Besides, in order to realize efficiently develop, introduce and operate smart city, it is necessary to develop an organizational structure to take charge of smart city management.




Source：Created by the JICA Study Team

**Figure 7-72 Three layers of smart city initiatives**

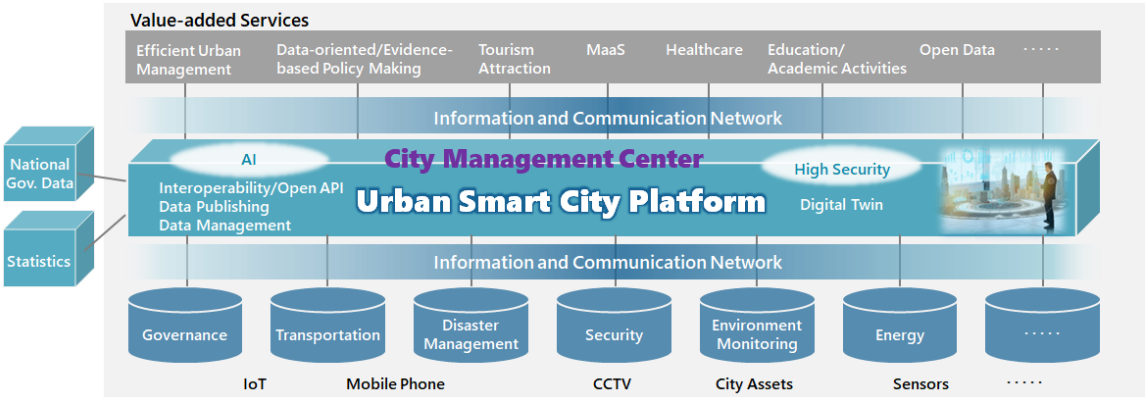
As the strategies to realize ASEZ Smart City, the second layer of the data platform, the third layer of the data platform/command center, and the organizational and operational setup will be proposed since the first layer of physical infrastructure has been implemented or will be implemented following the implementation of each smart city application.

### 1) Establishment of a data platform for efficient urban management

Establishment of a data platform is for collecting and analyzing data necessary for the operation of ASEZA. Through the data platform, more efficient urban management will be achieved by collecting and analyzing the data necessary for urban management.

In introducing ICT and establishing a data platform, it is important to ensure security. Efforts will be made after sufficient security measures have been implemented to prevent data leakage and hacking.

These data will be used for regular monitoring of the various activities of the Urban Development Master Plan and ASEZ, and as indicators for evaluating and improving these activities.




Source：Created by the JICA Study Team

Figure 7-73 Structure of a Data Platform (Image)

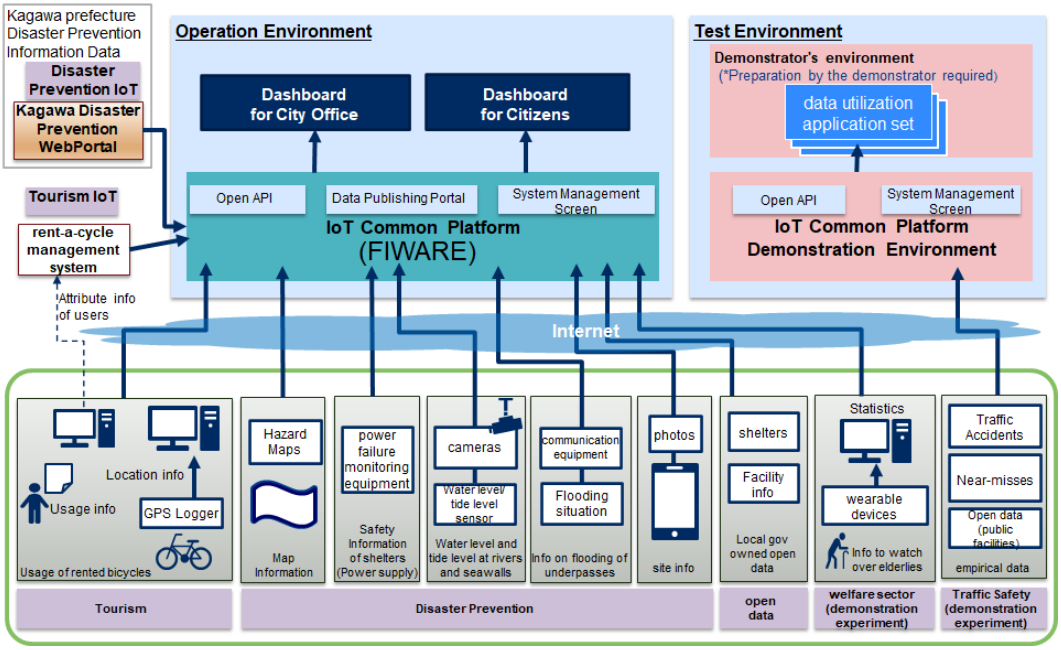
### a) Example of Data Platform (1) Takamatsu City OS

Takamatsu city in Japan has implemented IoT common platform that was built in 2017 to promote the city's efforts to realize a smart city. Figure 7-74 shows an overall system image of the IoT common platform The IoT common platform is a so-called “City OS” that aggregates and utilizes a wide variety of distributed data, and the city is working to solve local issues by collecting and utilizing data from multiple fields on this IoT common platform.

The lower part shows data acquired from sensors, etc. The collected data is centrally displayed on a dashboard, an application built on the IoT common platform, and is used for analysis and other purposes. Information on disaster prevention is also useful for citizens, so a dashboard for citizens has also been built and is widely available as open data.

The IoT Common Platform is building a demonstration environment that allows diverse actors from industry, academia, the private sector and government to utilize data freely. In the demonstration environment, new applications are being developed and implemented in various fields, with the aim of creating new services that will lead to solutions to the city's regional issues.

The IoT Common Platform has been developed by “FIWARE”. FIWARE is the underlying software developed and implemented under the EU's Next Generation Internet Public-Private Partnership Program (FI-PPP) and is used in a number of cities and companies, mainly in Europe, for systems that enable smart cities.




Source：Takamatsu city

Figure 7-74 System Overview of the Takamatsu IoT Common Platform

### b) Example of Data Platform (2) Dubai [7]

The Smart Dubai Initiative was launched in 2013 by His Highness Sheikh Mohammed bin Rashid Al Maktoum, Vice President and Prime Minister of the UAE, Ruler of Dubai, with an ambitious vision to make Dubai the happiest and smartest city on Earth.

The Smart Dubai Office was formed in 2015 and tasked with overseeing Dubai's smart transformation and accomplish the leadership's vision. The Office's mandate consists of a series of objectives to fulfil, from smart-city planning, improving user experience, and digital enablement, to enhancing tech literacy in government entities, data governance, participating in the global agenda, and leading the global smart-city sector. Since its establishment, Smart Dubai has launched a series of initiatives and strategies to achieve its vision and help Dubai become a global benchmark for smart city development. Key initiatives launched by Smart Dubai include the Dubai Data Initiative, Dubai Blockchain Strategy, Dubai AI Roadmap, Digital Wealth Initiative and most recently the Dubai Paperless Strategy.

In June 2021, Digital Dubai was established by His Highness Sheikh Mohammed Bin Rashid Al Maktoum, Vice-President & Prime Minister of the UAE, and Ruler of Dubai, bringing together the expertise of four entities – Dubai Electronic Security Center, Dubai Statistics Center, Dubai Data Establishment, Smart Dubai Government Establishment, - to ensure the city collaboratively achieves the vision of the city's leadership to make Dubai a globally leading digital economy.

[7] https://www.digitaldubai.ae/

Digital Dubai is to develop and oversee the implementation of policies and strategies that govern all matters related to Dubai's information technology, data, digital transformation, and cyber-security. The entity has been entrusted with four key tasks - accelerate digital transformation of the city through strategic partnerships with governments and private sector entities, increase the Emirate's digital economy contribution to the city's GDP, build and develop digital competencies of national talent, and maintain and develop Dubai's digital wealth whilst accelerating Dubai's cybersecurity efforts.

Regarding the data platform, they have established "Dubai Pulse" which is the single source for data on Dubai, gathered from various sources, and available in multiple formats including CSV files, KML files for earth browsers, and API-compatible files.
(https://www.dubaipulse.gov.ae/)

On the other hand, Dubai Municipality is developing GIS-based platform namely "GeoDubai".

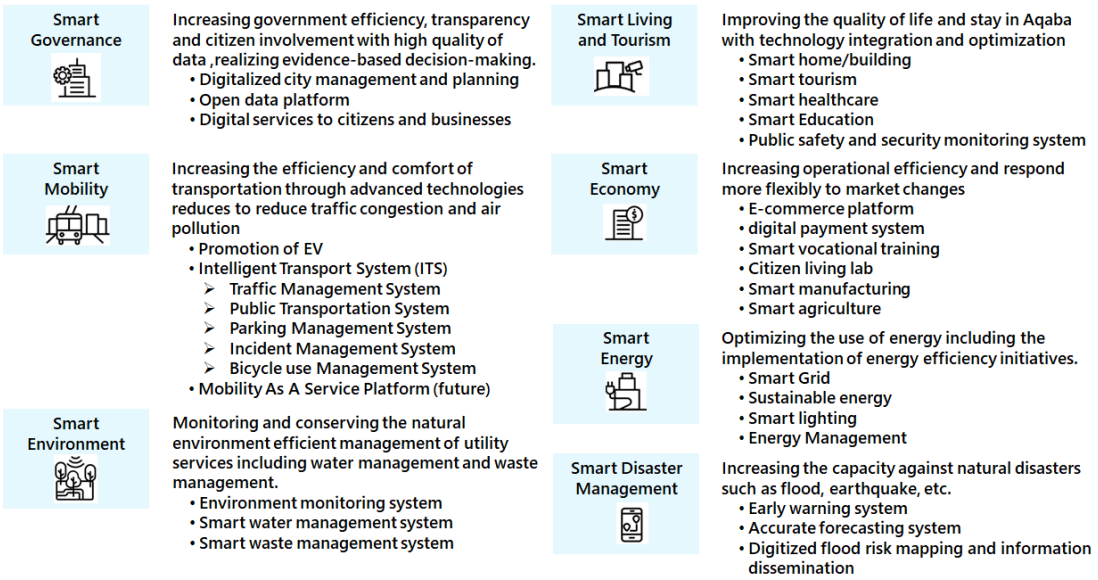
GeoDubai[8] is conceptualized, designed, implemented and managed by the Geographic Information Systems Center (GISC) in Dubai Municipality. Its main aim is to provide unified and comprehensive base-map geospatial data layers of the Emirate of Dubai to its stakeholders. The geospatial map data, provided by GeoDubai, are meant to serve as a core platform for all stakeholders. In particular terms, GeoDubai serves its stakeholders with geospatial services that help them in making smarter decisions.

The website is also unique in source providing and delivering high-quality geospatial maps for the emirate of Dubai as well as outstanding professional and technical services.

[8] https://geodubai.dm.gov.ae/en/Pages/default.aspx

**2) Smart City application (Smart City Service Domains): Implementation and upgrading of smart services in each domain**

The aim is to improve the quality of life of residents by providing smart services using ICT technology in each domain, namely governance, mobility, environment, living and tourism, economy, energy, and disaster management by upgrading existing services.




Source: Created by the JICA Study Team

Figure 7-75 Seven Smart City Service Domains (Proposed)

Although specific services in each domain shall be further considered in the future, here are the proposed initiatives for each domain.

**a) Smart Governance**

Smart Governance is a system for utilizing information and communication technology to increase effectiveness, efficiency, transparency, and public participation with high quality of data to realize evidence-based decision making. This domain includes digitalized city management and planning, open data platform, digital services to citizens and businesses (automating administrative processes, providing online public services), and strengthening communication between government institutions.

***[Digitalized city management and planning]***

Digitalized city management and planning involves leveraging advanced technologies to optimize urban operations, enhance decision-making, and improve the overall quality of life for residents. This approach incorporates various activities that utilize digital tools and data analytics to create more efficient, sustainable, and responsive urban environments. Here are some key activities involved in digitalized city management and planning:

Geographic Information Systems (GIS): Use of GIS for mapping and analyzing spatial data to inform urban development, zoning, and land-use planning. This helps in identifying optimal locations for infrastructure projects and green spaces. The master plan will be incorporated to this system and the progress of the implementation of the projects can be monitored regularly.

Predictive Analytics (in future): Leveraging big data obtained from various smart city

initiatives and predictive models to forecast urban growth, traffic patterns, and environmental changes, enabling proactive planning and resource allocation.

***[Open data platform]***

An "open data platform" refers to a system or a set of services designed to facilitate the accessibility, sharing, and utilization of data by making it freely available to everyone. Here are some key activities and functions of an open data platform:

- Data Collection and Aggregation: Gathering data from various sources such as government agencies, public institutions, private sector, and community groups. Combining data from multiple sources to provide comprehensive datasets.
- Data Management: Storing large volumes of data securely and efficiently. Ensuring data accuracy and consistency by removing errors and validating entries.
- Data Publishing: Organizing data into catalogs that are easily searchable and accessible. Providing detailed descriptions and context for each dataset, including source, date of collection, and data structure.
- Data Accessibility and Distribution: Offering APIs that allow developers to access and use the data programmatically. Providing data in various formats (e.g., CSV, JSON, XML) to accommodate different user needs. Creating user-friendly interfaces and tools to help non-technical users access and interpret the data.
- Data Visualization and Analysis: Offering tools for creating charts, graphs, and maps to help users understand the data. Providing platforms and software for data analysis, enabling users to draw insights and make data-driven decisions.
- Collaboration and Community Engagement: Hosting forums and discussion boards for users to share insights, ask questions, and collaborate on data-related projects. Organizing events to encourage developers and data enthusiasts to create innovative solutions using the open data.
- Policy and Advocacy: Establishing policies for data usage, privacy, and security to ensure responsible use of the data. Promoting the benefits of open data to the public and encouraging the adoption of open data practices across sectors.

***[digital services to citizens and businesses]***

"Digital services to citizens and businesses" encompass a range of activities designed to improve the efficiency, accessibility, and convenience of public and private sector interactions through the use of digital technologies. These services aim to streamline processes, reduce costs, and enhance the overall user experience for both citizens and businesses.

* The Jordanian government offers an electronic government service app called "SANAD," which provides access to various services by logging in with a personal ID. ASEZA is planning to use "SANAD" soon.

***(Examples of KPIs)***

Here are some examples of KPIs that can measure the performance of these initiatives:

- Citizen Satisfaction Index (CSI):

Description : This KPI measures the overall satisfaction of citizens with the digital services provided by the city. It is typically collected through surveys and feedback forms.

Purpose : To gauge how well the digital services meet the needs and expectations of the citizens.

Measurement : Percent of positive responses from citizen satisfaction surveys.

- Digital Service Uptake Rate:

Description : This KPI tracks the percentage of citizens and businesses actively using the available digital services.

Purpose : To measure the adoption and penetration of digital services among the target population.

Measurement: (Number of digital service users / Total potential users) * 100.

-Open Data Utilization Rate:

Description : This KPI measures the frequency and extent to which the open data platform is accessed and utilized by various stakeholders, including developers, researchers, and the general public.

Purpose : To assess the effectiveness and relevance of the open data platform.

Measurement: Number of data downloads or API calls per month.

-Service Delivery Efficiency:

Description : This KPI evaluates the time taken to deliver various digital services to citizens and businesses, from request to completion.

Purpose : To measure the efficiency and speed of digital service delivery.

Measurement: Average time taken to process and complete service requests.

-Data Quality and Accuracy Index:

Description : This KPI assesses the quality and accuracy of the data being managed and utilized within the digitalized city management system.

Purpose : To ensure the reliability and usefulness of the data for decision-making and planning.

Measurement: Percent of data entries meeting predefined quality and accuracy standards.

**b) Smart Mobility**

The Smart Mobility domain includes the application of technology to increase transportation efficiency and comfort, as well as reduce environmental impact. The scope of Smart Mobility includes land (public bus and rail services), water (sea taxi, ferry service) and air transportation modes as well as pedestrians. These transportation elements require some radical transformation with the use of disruptive technologies based on highly intelligent transportation systems (real-time information, remote monitoring, electric vehicles, light railway, efficient connection of each transportation mode, transit-oriented development

(TOD), etc.)

***[public bus services (E-Bus, Bus system)]***

The efficiency of public bus services in ASEZ can be significantly enhanced through the implementation of electric vehicle (EV) buses, an advanced bus management system, and a modern e-payment system.

***[On-street parking control and Parking Management]***

On-street parking control and parking management help regulate the availability and use of parking spaces to ensure efficient use of urban space, reduce congestion, and promote sustainable transportation.

On-street parking control involves the regulation and management of parking spaces located on public streets, including Parking Meters, Time Restrictions, Permit Parking, No Parking Zones, Loading Zones, and proper enforcement of parking regulations.

***[Bicycle use Management]***

"Bicycle use management" refers to the strategies, policies, and practices implemented to promote, regulate, and facilitate the use of bicycles within ASEZ. This management encompasses a variety of aspects aimed at creating a safe, efficient, and attractive environment for cycling. The component of Bicycle use Management includes:

- Infrastructure Development (Bike Lanes and Paths well-connected with key destinations, Parking Facilities, Integration with Public Transport, etc.)
- Safety Measures (Traffic Regulations, Safety Campaigns, Maintenance of Paths, etc.)
- Policy and Regulation (Incentives, Bicycle-Friendly Policies, Monitoring and Evaluation, etc.)
- Community Engagement (Cycling Events, Education Programs, Advocacy Groups, etc.)
- Technology Integration (Bike-Sharing Programs, Apps and Navigation Tools, Data Collection, etc.)

***[Traffic Monitoring and Management System]***

A Traffic Monitoring and Management System is a sophisticated framework designed to oversee, regulate, and optimize traffic flow in ASEZ. These systems leverage various technologies and methodologies to enhance road safety, reduce congestion, and improve overall transportation efficiency.

ASEZA has installed more than 500 CCTVs in ASEZ and monitored in the control room in ASEZA. CCTVs is managed by the video monitoring system (VMS) which is now used for security purpose only. VMS, however, can be used for traffic monitoring and management when some functions will be added on the VMS. It is recommended to study further whether the current CCTVs and VMS can be used for Traffic Monitoring and Management System.

***(Examples of KPIs)***

Here are some examples of KPIs that can measure the performance of these initiatives:

(Public Bus Services (E-Bus, Bus System))

- Ridership Numbers

Description : This KPI measures the total number of passengers using the bus services over a specified period, typically daily, weekly, or monthly.

Purpose : To gauge the adoption and popularity of the bus service among the public. High ridership indicates a successful service that meets public transportation needs.

Measurement: Data collection through ticket sales, electronic fare systems, and passenger counting systems.
Reporting in terms of total ridership numbers or percentage changes over time.

-Average Waiting Time

Description : The average time passengers wait at bus stops before boarding a bus.

Purpose : To assess the efficiency and reliability of the bus service. Shorter waiting times improve user satisfaction and can increase ridership.

Measurement: Using GPS data from buses to track arrival times.
Surveys and feedback from passengers about their wait times.
Reporting average wait times in minutes.

(On-Street Parking Control and Parking Management)

-Parking Space Utilization Rate

Description : The percentage of available parking spaces that are occupied at any given time.

Purpose : To understand parking demand and optimize the supply. High utilization rates can indicate efficient use of parking resources or a need for more spaces.

Measurement: Using sensors or manual counts to track occupancy.
Calculating the number of occupied spaces divided by the total number of spaces.
Reporting as a percentage.

-Parking Violation Rate

Description: The number of parking violations recorded within a specific period.

Purpose : To measure compliance with parking regulations and the effectiveness of enforcement strategies.

Measurement: Tracking violations through automated systems, parking attendants, or enforcement officers.
Counting the number of violations over time.
Reporting as the number of violations per day, week, or month.

(Bicycle Use Management)

- Bicycle Usage Rate

Description : The number of bicycle trips made within a specific period.

Purpose : To measure the popularity and adoption of bicycling as a transportation

mode.

Measurement: Using sensors at docking stations, mobile app data, or manual counts.
Counting total trips taken over the period.
Reporting as the number of trips per day, week, or month.

-Average Trip Duration

Description : The average time spent on each bicycle trip.

Purpose : To understand usage patterns and ensure that bicycles are being used efficiently.

Measurement: Tracking trip durations via bicycle sharing systems or GPS data.
Calculating the total duration of all trips divided by the number of trips.
Reporting in minutes.

(Traffic Monitoring and Management System)

- Average Traffic Speed

Description : Measures the average speed of vehicles on key routes.

Purpose : To assess the efficiency of traffic flow and identify congestion areas.

Measurement: Using GPS data from vehicles, traffic sensors, or cameras.
Calculating the average speed over a specific period.
Reporting in kilometers per hour (km/h) or miles per hour (mph).

-Travel Time Reliability Index (TTRI)

Description : Measures the consistency and predictability of travel times on key routes.

Purpose : To ensure that travel times are reliable, which is crucial for planning and user satisfaction.

Measurement: Using traffic data to compare actual travel times to expected travel times.
Calculating the ratio of actual travel time to the expected travel time.
Reporting as an index value (lower values indicate more reliable travel times).

### c) Smart Environment

The Smart Environment domain includes the role of technology to monitor the natural environment preserving nature for future generations, and the efficient management of utility services such as waste management, water supply.

In ASEZ, it can be said that Environment monitoring system and Smart water management system has been already installed and operated, smart waste management is elaborated here.

***[Smart Waste Management]***

Smart Waste Management leverages technology and data analytics to optimize the collection, transportation, and processing of waste. The primary goal is to make waste management more efficient, cost-effective, and environmentally friendly, applying Sensors and IoT Devices for

Vehicle Tracking, data analytics, operation management, etc.

***(Examples of KPIs)***

Here are some examples of KPIs that can measure the performance of these initiatives:

(Smart Waste Management)

-Recycling Rate

Description: The Recycling Rate measures the percentage of total collected waste that is diverted to recycling facilities. This KPI tracks the effectiveness of waste sorting and recycling efforts.

Purpose: Enhances resource recovery and reduces landfill use.
Meets environmental regulations and goals for recycling.
Encourages better waste segregation habits among the public.

Measurement: Data Collection: Track the amounts of recyclable and non-recyclable waste collected.

-Operational Cost per Ton of Waste Collected

Description: The Operational Cost per Ton of Waste Collected measures the total cost incurred for collecting, transporting, processing, and disposing of one ton of waste. This KPI provides insights into the financial efficiency of waste management operations.

Purpose: Identifies opportunities to reduce operational expenses.
Highlights areas where resource use can be optimized.
Aids in financial forecasting and budget allocation for waste management services.

Measurement: Track all operational costs, including labor, fuel, maintenance, and processing fees.

**d) Smart Living and Tourism**

Smart Living and Tourism is the concept of using the latest technology in everyday life to improve the quality of life focusing on efficiency, safety, security, and public health, as well as comfort in daily life, which will also improve the experiences in Aqaba for tourists.

***[Smart home/building]***

Smart home/Building refers to a residential or commercial structure that utilizes internet-connected devices to enable the remote management and automation of various systems and appliances. These systems are designed to improve convenience, security, energy efficiency, and overall quality of life for the occupants. ASEZA may be able to promote to install smart home/building to new development areas.

Here are some applications for Smart home and building:

- Automation and Control: Lighting, Heating, Ventilation, and Air Conditioning (HVAC), Security (Smart locks, cameras, and alarm systems), Appliances (refrigerators, washing

machines, and ovens, etc.)

- Energy Efficiency: Smart Meters and Energy Monitoring, Solar Panels and Battery Storage,
- Safety and Security: Smart Locks and Doorbells, Sensors (Smoke detectors, carbon monoxide detectors, and water leak sensors), Surveillance Systems (Cameras and motion sensors)
- Convenience and Lifestyle: Voice Assistants, Entertainment Systems, Smart Home Hubs.

***[Smart tourism]***

Smart tourism refers to the integration of advanced technologies and data-driven approaches to enhance the travel and tourism experience for both visitors and service providers. The concept leverages the Internet of Things (IoT), big data, artificial intelligence (AI), and other innovative technologies to create more efficient, personalized, and sustainable tourism services.

***[Smart healthcare]***

"Smart healthcare" refers to the application of modern technology and digital solutions to improve healthcare services, enhance patient care, and streamline healthcare processes. It encompasses a wide range of innovations and technologies aimed at making healthcare more efficient, personalized, and accessible.

ASEZA may be able to promote to install Smart healthcare to the existing and new development areas.

Here are some applications for smart healthcare:

- Wearable Devices and Sensors: Fitness Trackers, Medical Sensors
- Telemedicine: Virtual Consultations, Remote Monitoring
- Electronic Health Records (EHRs): Digital Patient Records, Data Integration
- Artificial Intelligence (AI) and Machine Learning: Diagnostics and Imaging, Predictive Analytics
- Internet of Things (IoT): Connected Devices, Smart Home Healthcare
- Mobile Health (mHealth): Health Apps, Patient Engagement
- Robotics and Automation: Surgical Robots, Automation in Hospitals.

***[Smart Education]***

Smart Education refers to the integration of advanced technology and innovative teaching methods to enhance the learning experience. This concept aims to make education more accessible, personalized, efficient, and engaging.

ASEZA may be able to promote to install Smart education to educational facilities in ASEZ.

Here are some key components and benefits of Smart Education:

- Digital Learning Tools: E-books and E-textbooks, Online Courses and MOOCs (Massive Open Online Courses), Learning Management Systems (LMS)
- Interactive Technologies: Smartboards and Interactive Whiteboards, Tablets and Laptops.

- Personalized Learning: Adaptive Learning Software, Artificial Intelligence (AI)
- Collaborative Learning Platforms: Virtual Classrooms, Social Learning Networks
- Gamification: Educational Games, Badges and Leaderboards

***[Public safety and security monitoring system]***

Public Safety and Security Monitoring System is an integrated framework designed to ensure the safety and security of individuals, property, and infrastructure in public and private spaces. It involves the use of various technologies and practices to monitor, detect, and respond to potential threats, emergencies, or criminal activities.

ASEZA has installed CCTV network for security purpose, and it could be improved responding to security demand.

### e) Smart Economy

The Smart Economy domain is a smart city concept that covers the development of economic activities and industries, and human resources. The application of advanced technology in the industrial sector aims to increase operational efficiency and respond more flexibly to market changes. On the human resources side, the upskilling approach is the basis for preparing the workforce to face continuous evolution.

***[E-commerce platform]***

E-commerce platform is a software application that enables businesses to conduct online sales and manage their digital storefronts. These platforms provide the necessary tools for setting up and operating an online store, handling various aspects of e-commerce such as product listings, shopping cart functionality, payment processing, order management, and customer services.

ASEZA can develop their own E-commerce platform or can utilize an existing E-commerce platform to sell out local products both domestic and overseas so that local economy is expected to be stipulated.

***[Smart vocational training]***

Smart vocational training refers to the use of advanced technologies and innovative methods to enhance the effectiveness and efficiency of vocational education and training (VET) programs. This approach aims to better prepare individuals for the workforce by aligning training with the current and future needs of industries, leveraging digital tools, and adopting flexible, personalized learning pathways.

ASEZA may be able to promote to Smart vocational training working together with private sector and locals.

Key elements of smart vocational training include digital Tools and Platforms utilizing online learning platforms, virtual reality (VR), augmented reality (AR), and simulation software, Data Analytics and AI, Industry Collaboration partnering with businesses and industries, Modular and Flexible Learning, Competency-Based Education, Lifelong Learning and Continuous Development, Blended Learning Approaches.

***[Citizen living lab]***

Citizen Living Lab is an innovative and participatory approach to urban planning and development that involves citizens directly in the process of creating, testing, and refining new ideas, technologies, and policies in real-world settings. The concept is rooted in the Living Lab methodology, which emphasizes open innovation, collaboration among multiple stakeholders, and real-life experimentation.

ASEZA can implement “Citizen living lab” in a new development area working together with academia and local industries.

***[Smart manufacturing]***

Smart manufacturing is an advanced approach to manufacturing that uses cutting-edge technologies to enhance the efficiency, flexibility, and quality of production processes. It involves the integration of various digital technologies and data analytics to create highly adaptable and optimized manufacturing environments.

ASEZA may be able to promote to install Smart manufacturing to industrial facilities in ASEZ.

***[Smart agriculture]***

Smart agriculture, also known as precision agriculture or digital farming, refers to the use of advanced technologies and data-driven approaches to optimize agricultural practices. The goal is to increase the efficiency, productivity, and sustainability of farming operations. This involves integrating various modern technologies such as the Internet of Things (IoT), big data, artificial intelligence (AI), robotics, and satellite imagery into the agricultural processes.

ASEZA may be able to promote to install Smart agriculture working with academia and private sector in ASEZ.

***(Examples of KPIs)***

Here are some examples of KPIs that can measure the performance of these initiatives:

(E-commerce Platform)

-Conversion Rate

Description: Conversion rate measures the percentage of website visitors who take a desired action, such as making a purchase, signing up for a newsletter, or filling out a contact form.

Purpose : The primary purpose of measuring conversion rate is to assess the effectiveness of the e-commerce platform in turning website visitors into customers. It helps in evaluating the performance of marketing campaigns, website design, user experience, and product offerings.

Measurement: Conversion Rate = (Number of Conversions / Number of Visitors) * 100b.

-Average Order Value (AOV)

Description: Average Order Value (AOV) calculates the average amount spent by

customers in a single transaction on the e-commerce platform.

Purpose : AOV helps in understanding customer purchasing behavior and identifying opportunities to increase revenue per transaction. It can inform pricing strategies, cross-selling, and upselling efforts.

Measurement: AOV = Total Revenue / Number of Orders.

-Customer Lifetime Value (CLV)

Description : Customer Lifetime Value (CLV) estimates the total revenue a business can expect from a single customer over the duration of their relationship.

Purpose : CLV provides insights into the long-term profitability of acquiring and retaining customers. It helps in prioritizing customer acquisition efforts, improving customer retention strategies, and maximizing the lifetime value of customers.

Measurement: CLV can be calculated using various methods, such as: CLV = (Average Purchase Value * Purchase Frequency) * Customer Lifespan or by using predictive modeling techniques to forecast future revenue from individual customers.

(Smart Vocational Training)

-Completion Rate

Description : Completion rate measures the percentage of participants who successfully complete a vocational training program.

Purpose : Completion rate indicates the effectiveness of the training content, delivery methods, and participant engagement. It helps in assessing the overall success and impact of the training program.

Measurement: Completion Rate = (Number of Participants Who Completed Training / Total Number of Participants) * 100

-Skill Acquisition Rate

Description : Skill acquisition rate assesses the speed at which participants acquire new skills or knowledge during the vocational training program.

Purpose : Skill acquisition rate helps in evaluating the efficiency of the training program in upskilling individuals and preparing them for the workforce. It enables adjustments to training methods and content to improve learning outcomes.

Measurement: Skill Acquisition Rate can be measured through pre and post-training assessments, surveys, or evaluations to gauge the level of skill improvement among participants.

-Job Placement Rate

Description: Job placement rate tracks the percentage of participants who secure employment in their respective fields after completing the vocational training program.

Purpose : Job placement rate reflects the success of the training program in bridging the skills gap and facilitating employment opportunities for participants. It demonstrates the program's effectiveness in preparing individuals for the workforce.

Measurement: Job Placement Rate = (Number of Participants Employed After Training / Total Number of Participants) * 100

(Citizen Living Lab)

-Participation Rate

Description : Participation rate measures the level of engagement and involvement of citizens in lab activities, such as workshops, surveys, or experiments.

Purpose : Participation rate indicates the degree of community engagement and collaboration within the living lab environment. It helps in assessing the effectiveness of outreach efforts and the inclusiveness of the participatory process.

Measurement: Participation Rate = (Number of Participants / Total Population) * 100.

-Implementation Rate

Description : Implementation rate tracks the percentage of ideas or solutions generated within the living lab that are actually implemented by relevant stakeholders or authorities.

Purpose : Implementation rate reflects the real-world impact and influence of the living lab initiatives on decision-making and policy formulation. It assesses the lab's effectiveness in driving actionable outcomes and positive changes in the community.

Measurement: Implementation Rate = (Number of Implemented Ideas / Total Number of Generated Ideas) * 100

-Satisfaction Score

Description : Satisfaction score gathers feedback from citizens participating in the living lab to assess their satisfaction with the process, outcomes, and overall experience.

Purpose : Satisfaction score provides insights into the perceptions, attitudes, and experiences of citizens involved in living lab activities. It helps in identifying strengths, weaknesses, and areas for improvement to enhance participant satisfaction and engagement.

Measurement: Satisfaction Score can be obtained through surveys, interviews, or feedback forms using Likert scales or other rating systems.

(Smart Manufacturing)

-Overall Equipment Effectiveness (OEE)

Description: Overall Equipment Effectiveness (OEE) measures the efficiency of manufacturing operations by combining metrics like availability,

performance, and quality.

Purpose : OEE provides a comprehensive assessment of equipment utilization, production efficiency, and quality performance. It helps in identifying areas of improvement and optimizing manufacturing processes.

Measurement: OEE = Availability * Performance * Quality

-Defect Rate

Description: Defect rate tracks the percentage of defective products or components produced during manufacturing.

Purpose : Defect rate indicates the quality and reliability of manufacturing processes. It helps in identifying root causes of defects, implementing corrective actions, and reducing waste.

Measurement: Defect Rate = (Number of Defective Units / Total Number of Units Produced) * 100

-Cycle Time

Description : Cycle time measures the time it takes to complete one cycle of production, from the initiation of the manufacturing process to the delivery of the final product.

Purpose : Cycle time reflects the speed and efficiency of manufacturing processes. It helps in identifying bottlenecks, optimizing production flow, and reducing lead times.

Measurement: Cycle Time = Total Production Time / Number of Units Produced

(Smart Agriculture)

-Crop Yield

Description : Crop yield measures the quantity of agricultural produce harvested per unit area of land.

Purpose : Crop yield indicates the productivity and efficiency of agricultural practices. It helps in optimizing resource allocation, maximizing output, and ensuring food security.

Measurement: Crop Yield = Total Harvested Crop Quantity / Total Land Area

-Water Usage Efficiency

Description : Water usage efficiency tracks the amount of water consumed per unit of crop yield.

Purpose : Water usage efficiency reflects the sustainability and environmental impact of agricultural practices. It helps in conserving water resources, mitigating drought risks, and promoting sustainable agriculture.

Measurement: Water Usage Efficiency = Total Water Consumed / Total Crop Yield

-Crop Health Monitoring

Description : Crop health monitoring utilizes technologies such as sensors or drones to monitor the health and condition of crops.

Purpose : Crop health monitoring enables early detection of pests, diseases, or nutrient deficiencies, allowing for timely interventions and management strategies. It helps in optimizing crop yield, quality, and resilience.

Measurement: Crop health can be assessed through various indicators, such as plant vigor, leaf color

**f) Smart Energy**

The Smart Energy domain covers the optimization of the use of energy including the implementation of energy efficiency initiatives focusing on environmental sustainability. The Smart Energy domain also covers promotion of the use of sustainable energy such as solar power, hydrogen, biomass, wind power.

ASEZA needs to consult with NEPCO and/or EDCO to implement Smart Energy activities while ASEZA will be able to promote Smart Energy initiatives.

**g) Smart Disaster Management**

Smart Disaster Management refers to the utilization of advanced technologies and data-driven approaches to enhance preparedness, response, and recovery efforts in the face of natural or man-made disasters. It involves the integration of various technologies, including artificial intelligence, Internet of Things (IoT), remote sensing, and big data analytics, to improve the effectiveness and efficiency of disaster management processes.

***[Early warning system]***

Early Warning System (EWS) is a mechanism or set of procedures designed to detect and anticipate potential risks or threats before they escalate into significant problems or crises. The primary goal of an Early Warning System is to provide timely information and alerts to decision-makers, stakeholders, or the general public, enabling them to take proactive measures to mitigate or prevent the impending risks.

ASEZA and ADC has installed EWS already in ASEZ and it is recommended to improve their activities applying latest know-hows under proper institutional arrangement.

EWS typically functions for Risk Identification, Data Collection and Analysis, Threshold Setting, Early Warning Signal Generation, Dissemination and Communication, Response and Action, and Monitoring and Evaluation.

***[Accurate forecasting system]***

An accurate forecasting system is a method, or a set of techniques used to predict future events, trends, or outcomes based on historical data, statistical analysis, and other relevant factors. The goal is to make reliable predictions that can help businesses, governments, or individuals make informed decisions and plans for the future.

Accurate forecasting system integrates data, analysis, modeling, validation, and continuous improvement processes to generate reliable predictions that can support decision-making and planning activities.

***[Digitized flood risk mapping and information dissemination]***

Digitized flood risk mapping and information dissemination refer to the use of digital technology to create maps that illustrate areas prone to flooding and to disseminate this information to relevant stakeholders and the general public. This involves using geographic information system (GIS) technology to create detailed maps that identify areas susceptible to flooding. GIS allows for the integration of various data sources such as topography, land use, hydrology, and historical flood data to assess flood risk. These maps can depict flood zones, potential flood depths, floodplain boundaries, and other relevant information.

Digitized flood risk mapping and information dissemination play a crucial role in enhancing flood preparedness, reducing property damage, and saving lives during flood events. By leveraging digital technology and data-driven approaches, communities can better understand and manage their flood risk.

***(Examples of KPIs)***

Here are some examples of KPIs that can measure the performance of these initiatives:

(Early Warning System)

-Lead Time:

Description : Lead time refers to the duration between the detection of a potential disaster event and the issuance of the warning to the at-risk population or relevant authorities.

Purpose : The lead time KPI assesses the effectiveness of the early warning system in providing sufficient time for individuals and communities to prepare and take appropriate actions before a disaster strikes.

Measurement: Calculate the average lead time for warnings issued by the system over a specific period, such as days or hours. This can be done by recording the time of detection and the time of warning issuance for each event and then calculating the difference.

-False Alarm Rate:

Description : The false alarm rate measures the percentage of warnings issued by the system that do not result in an actual disaster event.

Purpose : This KPI evaluates the accuracy and reliability of the early warning system by assessing its tendency to issue false alarms, which can lead to complacency or unnecessary panic among the population.

Measurement: Divide the total number of false alarms by the total number of warnings issued within a specific timeframe, then multiply by 100 to obtain the false alarm rate percentage.

-Response Rate:

Description : The response rate KPI measures the percentage of individuals or relevant authorities who receive and respond to the warnings issued by the early warning system.

Purpose : This KPI evaluates the effectiveness of the system in communicating warnings to the intended recipients and prompting them to take timely actions to mitigate the impact of the disaster.

Measurement: Survey or collect data on the number of individuals or organizations that received the warnings and subsequently took appropriate actions (e.g., evacuation, preparedness measures). Divide the number of respondents by the total number of warnings issued and multiply by 100 to obtain the response rate percentage.

(Accurate Forecasting System)

-Forecast Accuracy:

Description: Forecast accuracy measures the percentage of correct forecasts made by the system compared to the total number of forecasts issued.

Purpose : This KPI assesses the reliability and effectiveness of the forecasting system in predicting potential disaster events with precision, which is essential for informing decision-making and risk mitigation efforts.

Measurement: Compare the forecasted outcomes with the actual events observed within a specific timeframe. Divide the number of correct forecasts by the total number of forecasts made and multiply by 100 to obtain the forecast accuracy percentage.

-Prediction Horizon:

Description : The prediction horizon refers to the time range within which forecasts remain accurate and reliable.

Purpose : This KPI evaluates the capability of the forecasting system to provide early warnings with sufficient lead time for preparedness and response activities.

Measurement: Determine the duration between the issuance of a forecast and the occurrence of the corresponding event. Track the percentage of forecasts that remain accurate within predefined time intervals (e.g., 24 hours, 72 hours).

-Error Margin:

Description : The error margin measures the deviation between forecasted outcomes and actual events, expressed as a percentage or absolute value.

Purpose : This KPI quantifies the level of uncertainty associated with the forecasts generated by the system, providing insights into the reliability and precision of the predictions.

Measurement: Calculate the difference between the forecasted value and the actual outcome for each event. Aggregate these differences and compute the average error margin or determine the maximum acceptable deviation from the actual outcome.

(Digitized Flood Risk Mapping and Information Dissemination

-Accessibility:

Description : Accessibility evaluates the ease of access to digitized flood risk maps and relevant information by stakeholders, such as government agencies, emergency responders, and the general public.

Purpose : This KPI assesses the effectiveness of the information dissemination system in ensuring that critical data and resources are readily available to support decision-making and disaster preparedness efforts.

Measurement: Monitor metrics such as website traffic, download statistics, or user feedback to gauge the accessibility and usability of digitized flood risk maps and information dissemination platforms.

-Update Frequency:

Description : Update frequency measures how often flood risk maps and information are refreshed or revised to reflect changes in risk levels, land use, or other relevant factors.

Purpose : This KPI ensures that stakeholders have access to current and reliable data for informed decision-making and risk assessment.

Measurement: Track the frequency of updates to flood risk maps and information dissemination platforms, such as the number of updates per month or the time interval between successive updates.

-User Engagement:

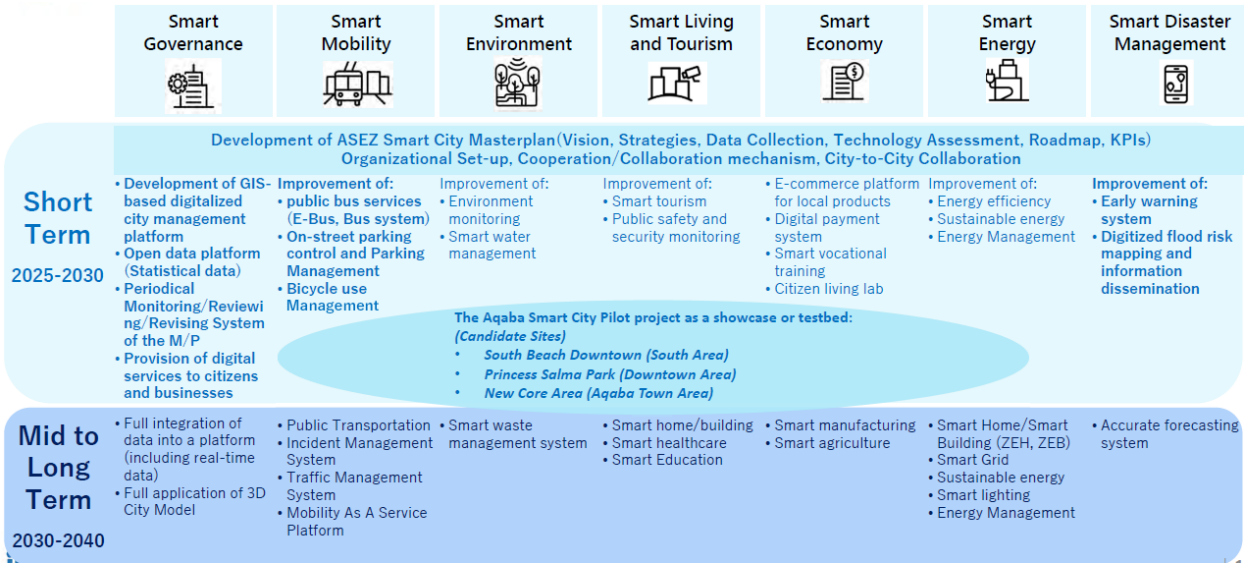
Description : User engagement assesses the level of interaction and involvement with digitized flood risk maps and information dissemination platforms, indicating the effectiveness of these systems in raising awareness and promoting proactive measures for disaster management.

Purpose : This KPI evaluates the impact and reach of information dissemination efforts, providing insights into the effectiveness of communication strategies and the extent of stakeholder engagement.

Measurement: Monitor metrics such as website engagement (e.g., page views, session duration), social media interactions (e.g., likes, shares, comments), or user surveys to assess user engagement with digitized flood risk maps and information dissemination initiatives.

### 3) Phasing Development of Smart City Initiatives

The figure below summarizes the phasing Development of Smart City Initiatives for each domain. This proposed plan is based on what was recognized through this study, and the specific activities in each smart city domain should be decided with consideration of the current technical level, staff capacity, available technology, budget, etc. It is also important to create a master plan that comprehensively integrates these activities and to foster common understanding within relevant stakeholders.




Source：Created by the JICA Study Team

Figure 7-76 Phasing Development of Smart City Initiatives (Proposed)

### 4) Organizational and operational setup

*Establishment of a 'Smart City Unit', establishment of a 'City Management Centre' and appointment of a 'Smart City Officer'.*

#### a) Principles of organizational setup

In order to efficiently develop, introduce and operate smart city, it is necessary to develop an organizational structure to take charge of smart city management. In establishing the organizational and operational structure, a cross-sectoral, citizen-participatory organizational and operational structure will be considered, aiming to provide more comprehensive and needs-oriented services and systems, and to realize efficient and effective urban management.

In developing the organizational and operational structure, the following points should be considered.

- Design of the organizational structure: roles and responsibilities of each department and team, inter-organizational relationships and communication flows, personnel allocation, etc.
- Securing and developing human resources: clarifying roles and responsibilities within the organization, recruiting and deploying personnel with the necessary skills and knowledge, and implementing periodic training and education.

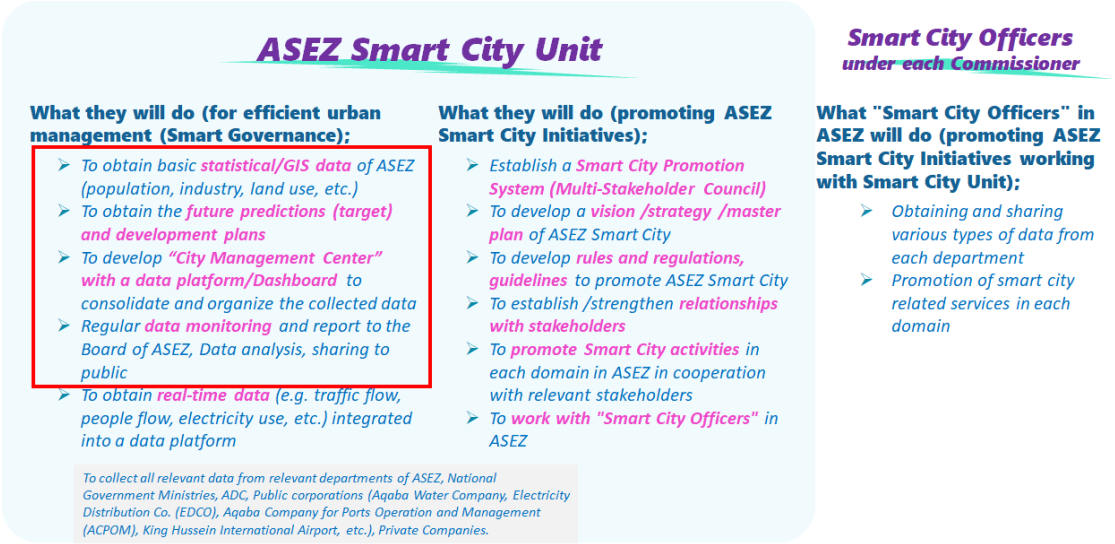
- Implementing project management: introducing processes and tools for planning, executing and evaluating projects, and managing the progress and quality of each project.
- Establishment of governance: appropriate communication and coordination with internal and external stakeholders, sharing of project progress and results, risk management, etc.
- Monitoring and improvement: regular monitoring of the organization's operations and project progress, identification of problem areas, and continuous monitoring and improvement.

**b) Proposal to establish "Smart City Unit"**

In ASEZA, establishment of 'Smart City Unit' (tentative name) is proposed.

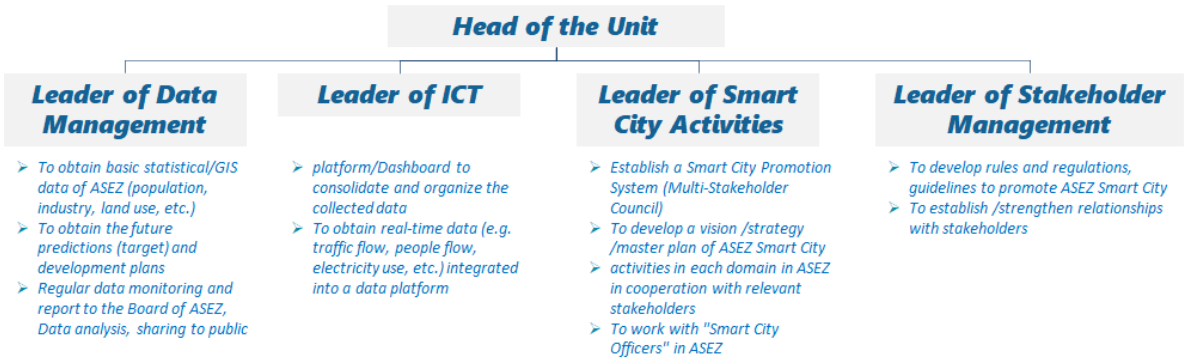
'Smart City Unit' will collect and manage various data centrally as a 'City Management Centre' and to lead various activities related to smart city in ASEZ. It will also lead various activities related to smart city activities in ASEZ.

In addition, a 'Smart City Officer' will be appointed and assigned to other organizations, aiming for cross-organizational smart city initiatives.




Source：Created by the JICA Study Team

Figure 7-77 Role of ASEZ Smart City Unit and Smart City Officer (Proposed)



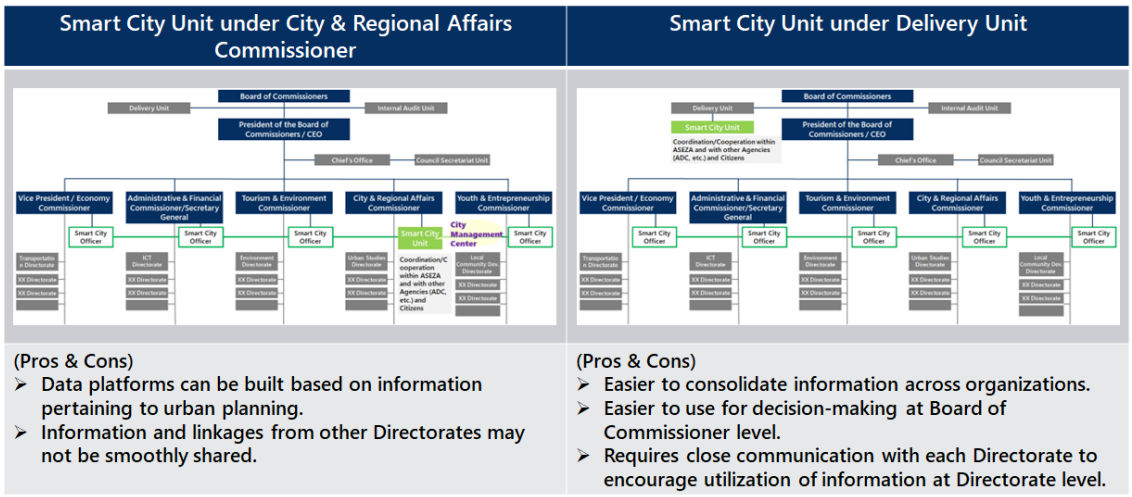

Source：Created by the JICA Study Team

Figure 7-78 Organizational Structure of ASEZ Smart City Unit (Proposed)

There are two ideas where to establish “Smart City Unit” as shown in the figure below.

One of the ideas is to establish “Smart City Unit” under City & Regional Affairs Commissioner, and another idea is to establish “Smart City Unit” under or in Delivery Unit.

In either form, it is important to establish a system and mechanism to ensure that the latest information is constantly updated and that such data is seamlessly shared within ASEZA. In order to facilitate the smooth introduction of cross-organizational smart city activities and the smooth sharing of up-to-date data, it is desirable to establish a smart city officer (unit) under each Commissioner.




Source：Created by the JICA Study Team

**Figure 7-79 Establishment of a 'Smart City Unit', establishment of a 'City Management Centre' and appointment of a 'Smart City Officer' (Proposed)**

### c) Multi stakeholder engagement

In order to realize Smart City, cross-organizational efforts are essential and the main factor for success, and it is necessary to work in close cooperation with ASEZA and ADC. Therefore, it is desirable to establish a promotion organizational structure consisting of ASEZA and ADC as shown on the left in the figure below.

It is also desirable to build an organization that includes a variety of stakeholders in order to build a system for implementation in collaboration with academia, private companies, etc.


Source：Created by the JICA Study Team

**Figure 7-80 Establishment of a ASEZ Smart City Promotion Team (left) and Muti Stakeholder Engagement (right) (Proposed)**

### 7.6.3 Road Map for realizing ASEZ Smart City

In this master plan, the concept of a smart city vision and strategy are proposed. In order to actually realize a smart city in ASEZ, however, creating a smart city master plan that includes a more detailed analysis of the current situation, selection of the most suitable technology, etc. is necessary and with building a system in which all stakeholders can work in the same direction.

Based on the content considered in this master plan, it is necessary to proceed with specific initiatives toward the introduction of smart city initiatives based on the following steps.

#### (1) Phase 1: Preliminary Assessment and Planning

##### 1) Stakeholder Engagement:

- Identify and engage key stakeholders including local government authorities, urban planners, community representatives, technology experts, environmental specialists, and private sector partners.
- Conduct workshops, focus groups, and surveys to gather input and insights from residents and businesses about their needs, aspirations, and concerns.

##### 2) Data Collection and Analysis:

- Collect relevant data about Aqaba City's infrastructure, demographics, energy consumption, traffic patterns, waste management, water supply, and other relevant aspects.
- Analyze the data to identify key challenges and opportunities for implementing smart city solutions.

##### 3) Vision and Strategy Development:

- Formulate a clear and comprehensive vision for the smart city project, considering the local context and aspirations.

- Define specific goals, objectives, and KPIs for the project.

**4) Technology Assessment:**

- Evaluate the feasibility and suitability of various smart technologies such as IoT sensors, data analytics, renewable energy systems, smart grids, and more.
- Identify potential partners and suppliers for these technologies.

**(2) Phase 2: Detailed Planning and Design**

**1) Infrastructure Design:**

- Develop detailed plans for upgrading and integrating the city's infrastructure, including energy-efficient buildings, smart lighting, waste management systems, water conservation measures, and efficient public transportation.

**2) Digital Infrastructure:**

- Establish a robust digital infrastructure, including high-speed broadband connectivity and a central data hub for collecting, analyzing, and disseminating data.

**3) Policy and Regulatory Framework:**

- Develop and update relevant policies, regulations, and standards to support the implementation of smart city technologies and ensure data privacy and cybersecurity.

**4) Public-Private Partnerships (PPPs):**

- Identify opportunities for collaboration with private sector entities for funding, expertise, and technology deployment.
- Establish PPP agreements and frameworks that ensure the sustainable development and operation of smart city solutions.

**(3) Phase 3: Implementation and Integration**

**1) Pilot Projects:**

- Identify specific pilot projects that align with the smart city vision and goals, such as smart Transportation, Smart Governance, energy efficient buildings, and digital citizen services.
- Deploy and test these projects in selected areas of the city.

**2) Technology Deployment:**

- Roll out selected smart technologies across the city based on the success of pilot projects.
- Ensure seamless integration and interoperability of different systems to maximize efficiency and effectiveness.

**3) Capacity Building and Training:**

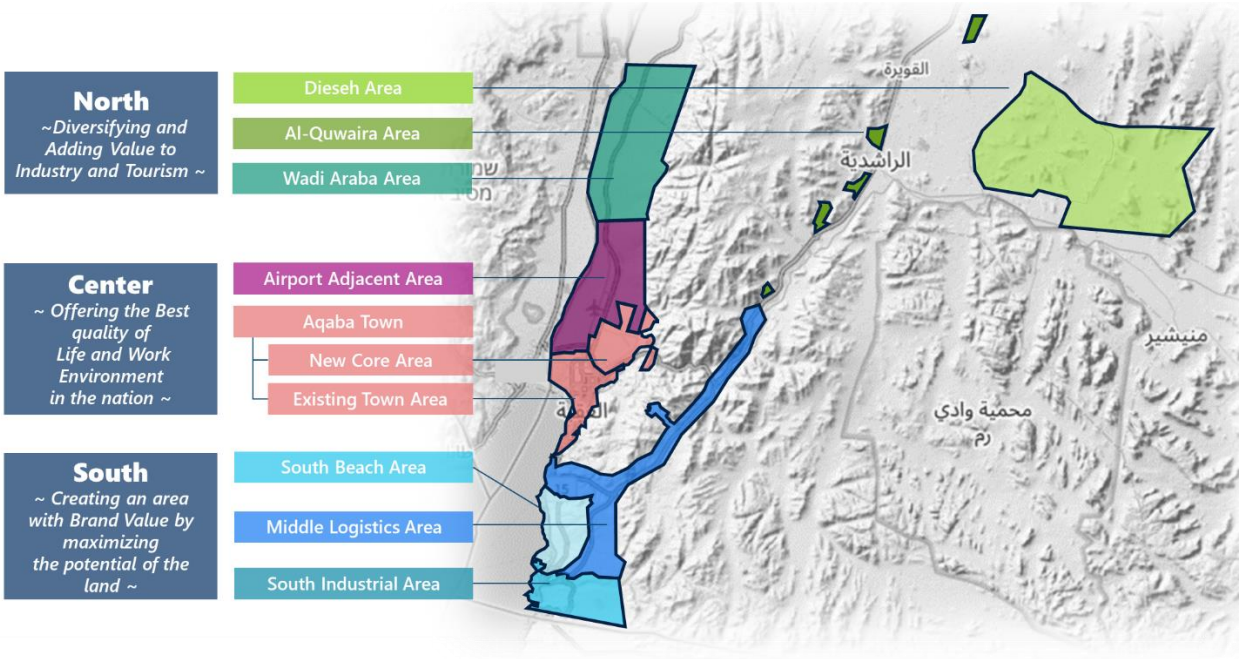
- Train local personnel, city officials, and community leaders on the operation and maintenance of smart city solutions.
- Promote digital literacy and awareness among citizens.

# Chapter 8 Zone Development Policy

To realize the vision and development strategies presented in Chapter 4, the land use, urban design, and sectoral strategies presented in Chapters 5 to 7 will be specifically incorporated into each zone and organized as a Zone Development Master Plan.

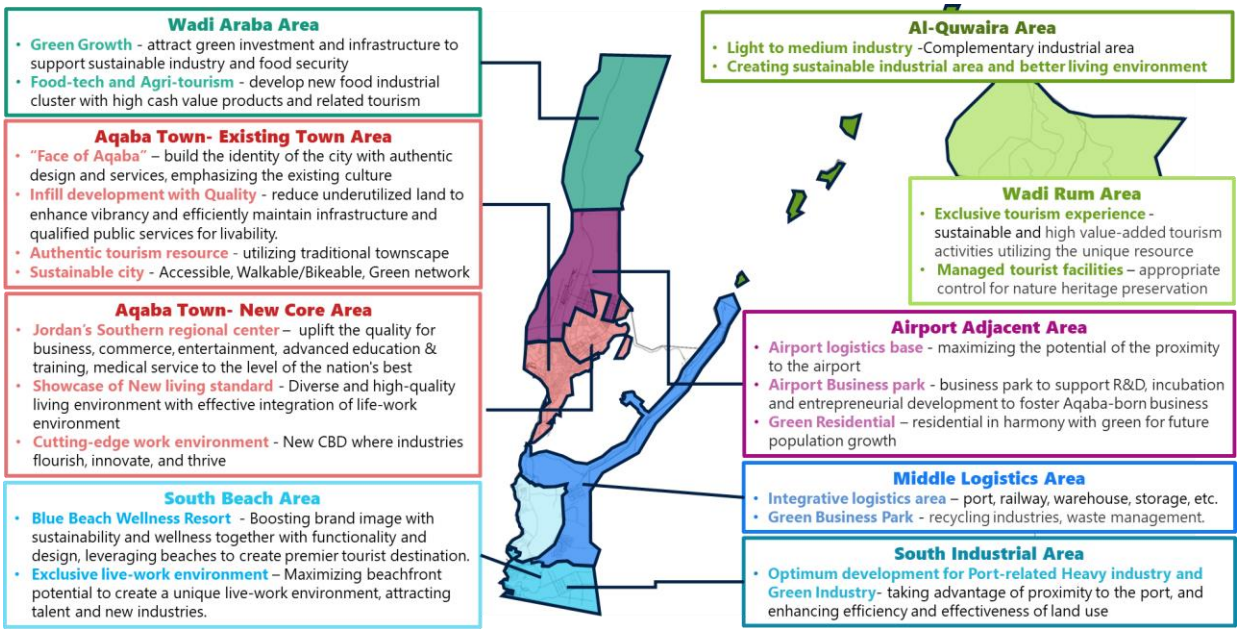
## 8.1 Zone Setting

Considering the characteristics of the areas, the area will be divided in nine zones.




Source: JICA study team

**Figure 8-1 Map of the Zones**




Source: JICA study team

**Figure 8-2 Outline of the Zone development Policy**

## 8.2 Development Policy by Zone

### (1) Aqaba Town 1 – Existing Town Area

#### 1) Characteristic of the area

- The area consists of a downtown area with a concentration of restaurants, markets, and open spaces, and surrounding residential areas where most of the existing residentials are located.
- It is also a Waterfront gateway for tourists with beach, gated resorts, hotels, commercial facilities, archaeological sites.
- Some areas have concentrations of old, low-quality housing - Old Town, Shallalah.
- Marsa Zayed development is planned which will bring a new lifestyle to the area.

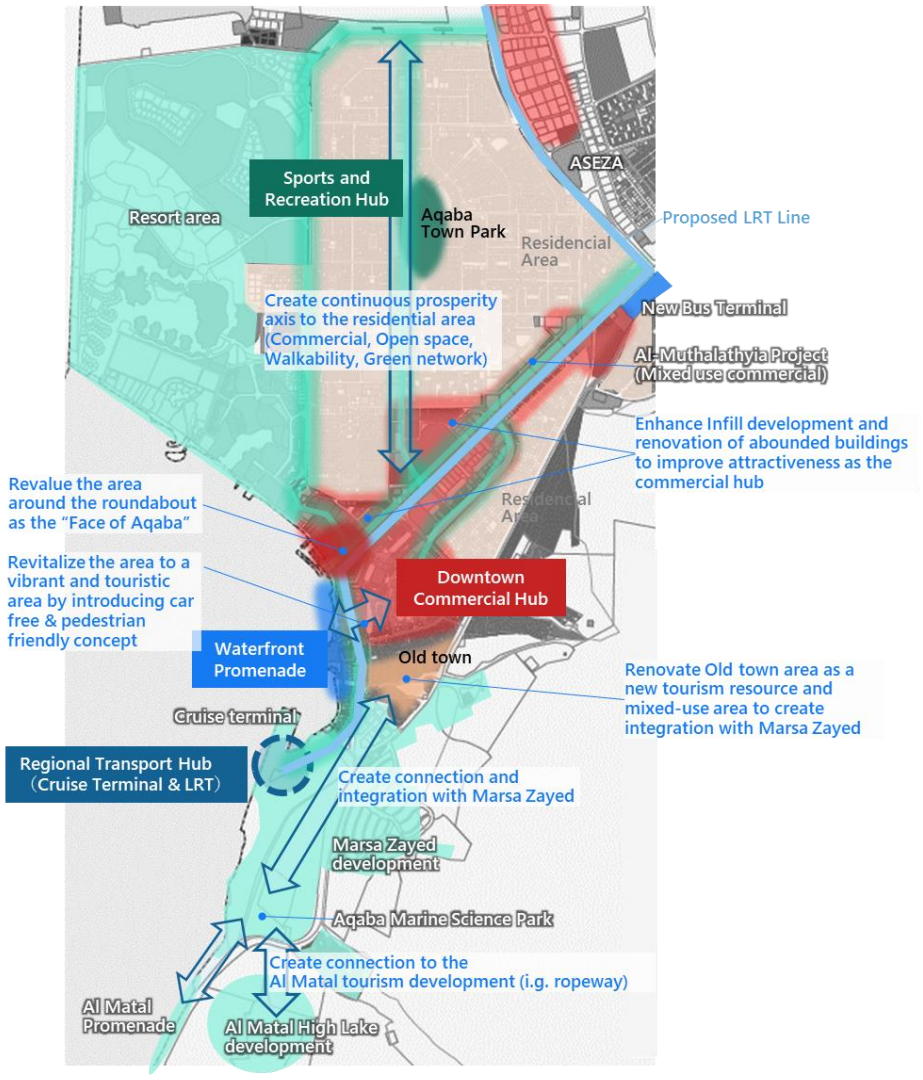
**【Main projects planned in the area】**

- Saraya - Luxury Hotel and Residence
- Alya - Luxury Residence
- Aqaba Town Park
- Al-Muthalathyia Land Project
- Marsa Zayed Project – Retail, Hotels, Residence (Standard to Luxury), Schools, University, Vocational Training, Hospital, Wellness, Day care, Data center, etc.
- Aqaba Marine Science Park
- New Cruise Terminal and Marina
- Al Matal High Lake Project
- Al Matal Promenade

#### 2) Development Direction

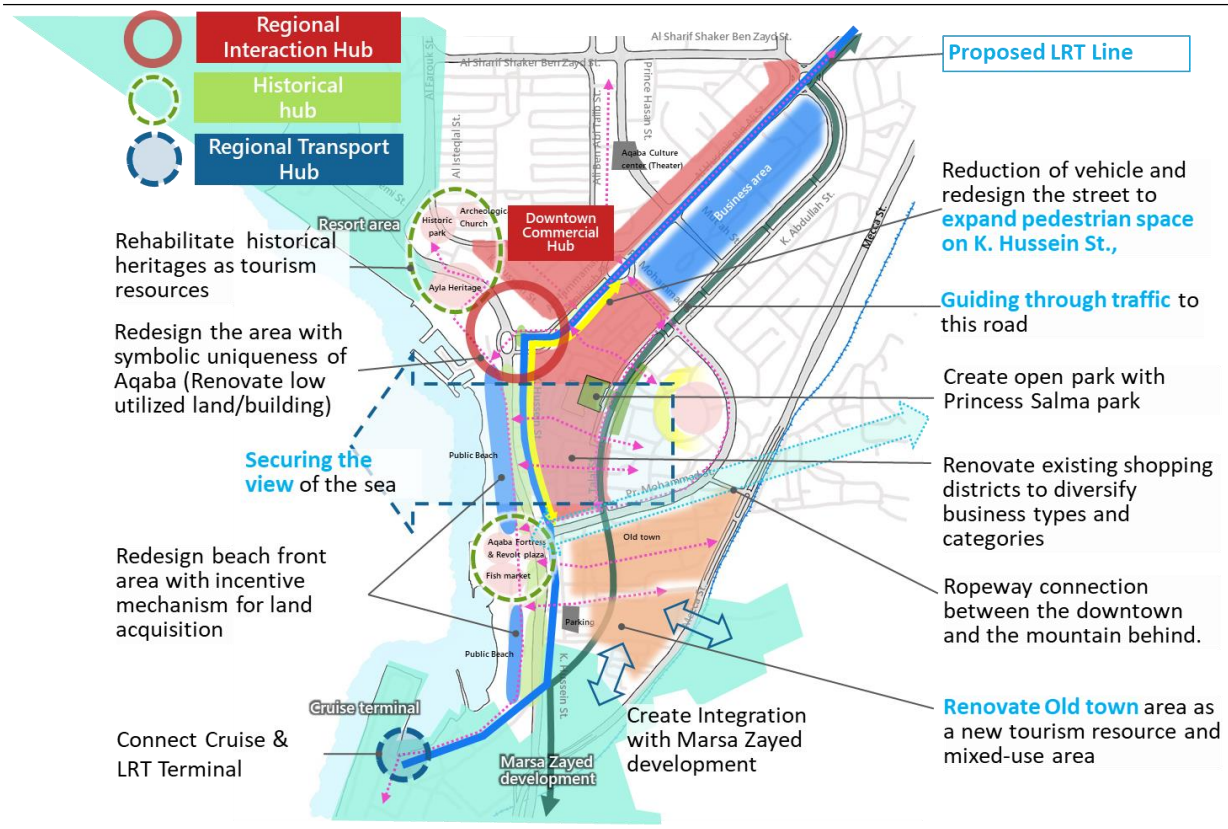
- Creating a symbolic environment as the face of Aqaba, by building the identity of the city with authentic design and services, emphasizing the existing culture and resources (public beach, plaza, downtown and historical heritages), to generate appealing spaces for both residents and visitors.
- As a central hub with numerous residential and hotel complexes, emphasis will be placed on revitalizing unused land and updating deteriorating buildings to enhance urban services such as commerce, business, culture, and entertainment, effectively catering to the diverse needs of citizens and visitors alike.
- Waterfront will be designed as a recreational space where everyone can feel and enjoy the sea that characterizes Aqaba. Buildings that obstruct views and access should be controlled.
- Downtown will be transformed into a tourist resource by diversifying the types of businesses and industries in the existing shopping district and improving the landscape by utilizing traditional design. In addition, an attractive town centered on Princess Salma Park will be formed with a series of open spaces that can be enjoyed on foot.
- Old Town and the Shallalah district, distinguished by their historic charm and sea views, will be considered as new tourism assets for redevelopment and effective utilization, particularly given their adjacency to the Marsa Zayed area.

- The cruise terminal, which will be a symbolic facility welcoming many tourists, should be developed in considerate design while also ensuring future connectivity with LRT, etc.
- To improve circulation in the area, road realignment of K. Hussein St. and improvement of K. Abdullah St., as well as bypass improvements to guide passing traffic and on-street parking measures will be implemented to improve the pedestrian environment.
- Efforts will be directed towards improving public transport (LRT, bus, etc.), pedestrian network, bicycle lanes, water transport and green spaces to enhance convenience and connectivity with the surrounding. A ropeway will be considered as a new tourist resource.
- In residential areas, promoting infill development, maintaining infrastructure, securing open spaces, expanding public services, and creating vibrant spaces will aim to enhance quality of life and streamline urban management, while also focusing on enriching sports and recreational facilities as leisure hubs for citizens.
- Consider installing water storage tanks at roundabouts and intersections at risk of flooding.
- Dense urban areas with many old houses such as Old City, Al-Kazan, Al-Radwan, Al-Naser, Al-Rawdah Middle, Al-Remal, and Al-Shallaleh needs further study to be improved or relocated due to high earthquake risk, lack of services and need of architectural upgrade.




Source: JICA study team

**Figure 8-3 Development Concept Image**




Source: JICA study team

**Figure 8-4 Development Concept Image**

### (2) Aqaba Town 2 - New Core Area

#### 1) Characteristic of the area

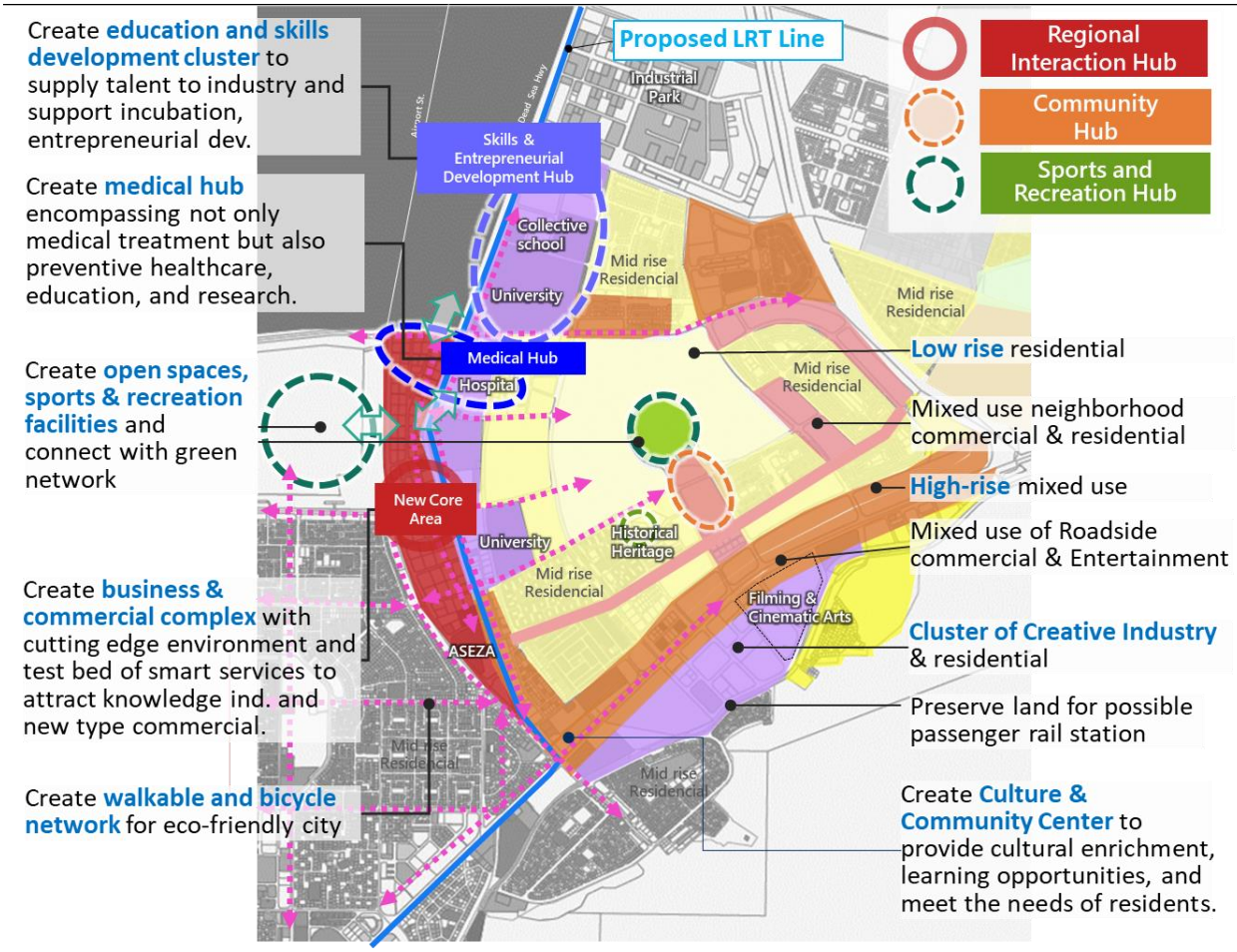
- The North Business District, adjacent to the Existing Town Area, is being developed as a new central business district, where ASEZA will be located, the National Cancer Center, a medical university, and other facilities are being developed.
- Most of the land is currently vacant, but some development is already underway in the residential areas with the planning and development of inexpensive residential plots for young people.
- In the Alshamiya area near the mountain's edge, a housing complex has been built for needy households and labor housing, but urban services are inadequate, and security and poor living conditions are issues.

**【Main projects planned in the area】**

- North Business District
- Vocational Training (Hospitality & Tourism)
- Aqaba Medical Teaching Hospital
- Aqaba affordable housing project
- Development of Investment Zone East & West of the Amman-Aqaba Road
- Aqaba Filming Studios & Institution of Cinematic Arts, Aqaba Media Hub

2) **Development Direction**

- To enhance the regional significance of Aqaba as a key city in southern Jordan, efforts will focus on expanding commercial and business functions through the establishment of new business areas along the Amman-Aqaba Road and within the North Business District. This aims to consolidate higher-order and diversified urban functions, thereby increasing the overall appeal and regional significance.
- Efforts will also target the establishment of Skills & Entrepreneurial Development Hub anchored by existing universities, collective schools, and vocational training institutes, with the aim of elevating educational standards and fostering advanced talent development through industry-academic collaboration.
- Similarly, the formation of a comprehensive Medical Hub by creating extra medical centers, centered around the existing military hospital, national cancer center, and medical universities, will aim to elevate not only medical treatment but also preventive healthcare, education, and research and facilitate the formation of related industry clusters and enhance medical tourism.
- As a next-generation residential area, the district will seek to create a high-quality residential environment that improves on the issues of the existing urban area, and to create a new work and residential environment through the introduction of low-density, mid-rise residential areas and effective mixed use.
- In addition, public transportation, cultural and community services and sports and recreation facilities will be expanded for a richer civic life.
- Since this is a high-traffic area where the Desert Highway and Dead Sea highway intersect, and many schools and hospitals are concentrated along the road, the transportation convenience should be improved by improving intersections, relocating the bus terminal, reorganizing bus routes, and developing LRT, etc.
- The light industrial area near the intersection in the ninth area, where ASEZA-owned warehouses, auto repair, etc. have long been concentrated, will be gradually relocated to the suburbs, and the former sites will be used for residential and commercial facilities.
- Furthermore, to ensure the level of urban services and streamline urban management, infill development in existing urban areas will be promoted. The development of new residential areas will be carried out gradually, carefully assessing demand to avoid overdevelopment.
- Since the area is at risk of flooding, in addition to the canals that are already being developed, measures such as the drainage channels and retention ponds will be implemented in the future. The development of detention tanks for rainwater utilization will also be considered for the drainage channels and the regulating reservoirs that serve as discharge points.




Source: JICA study team

**Figure 8-5 Development Concept Image**

### (3) Airport Adjacent Area

#### 1) Characteristic of the area

- King Hussein International Airport, one of only three airports in Jordan, is located, and expansion is planned to increase the number of passengers.
- On the east side of the airport, there is an industrial park with light industry, but most of the land is reserved for future development and has not been designated for land use.
- The west side of the airport is an area that requires consideration of security concerns due to its proximity to the airport and proximity to the border.

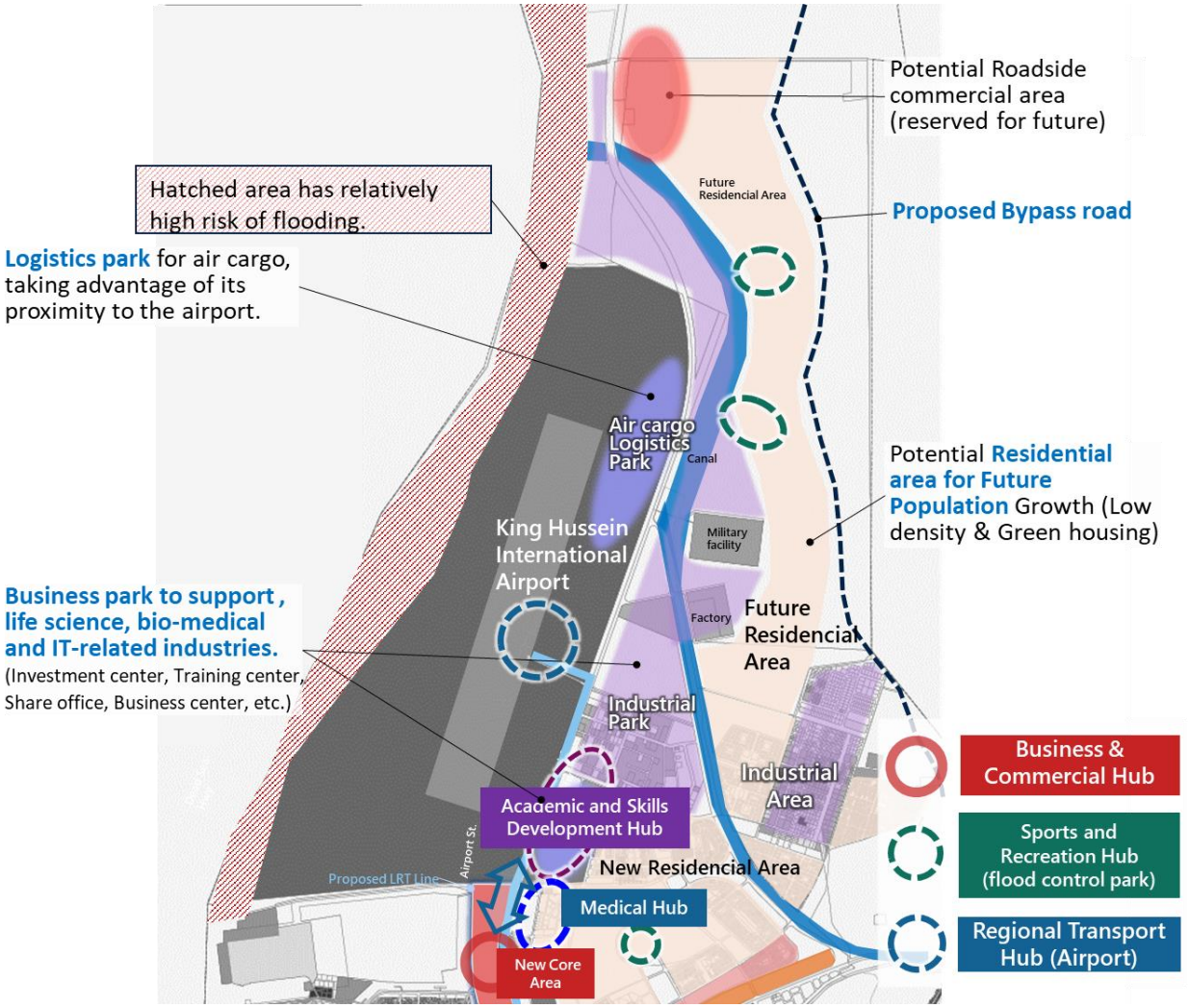
**【Main projects planned in the area】**

- KHIA - Airport Masterplan & Development
- Aqaba International Conventions Center
- The Heritage Aircraft Museum
- Aqaba Agri-Food & Innovation Corridor
- Saraya Project (Pilot Project for Agriculture and Fish Farming)
- International logistic city
- Airport Road Network - South Entrance

- Bird Observatory Project

2) **Development Direction**

- Creating a logistics base and maximizing the advantage to the proximity to the airport.
- Clustering Manufacturing (Food Processing, Pharmaceutical, Cosmetics, etc.) industry near the existing industrial park.
- The area along the main road on the east side of the airport alongside the existing industrial park will be considered for the formation of an airport front business park as a base for new industrial cluster including life science related and IT related industry, creating an open innovation hub including incubation and entrepreneurial support, R&D and test bed functions.
- The mountain side area will be preserved for residential area in harmony with green for future population growth, which is contiguous with the New Core Area. The project will be held in abeyance until the planned residential development in the New Core Area is completed.
- The use for the area west to the airport and near the border will be considered carefully due to safety concerns regarding flood.




Source: JICA study team

**Figure 8-6 Development Concept Image**

### (4) South Beach Area

#### 1) Characteristic of the area

- As an area near the beach, most of the coastline has been developed as a public beach with some services. Luxury resort developments, such as Talabay, are in the area.
- From the beach to Coast Road is a maximum of about four hundred meters wide, and even excluding the conservation area, there is a large area of unused land. However, construction of buildings is not recommended.
- Entertainment facilities such as Entertainment Park, Water Park, Adventure Park, and Diving Center will be developed along the coastal road.
- In the hinterland, the slope continues from Coast Road, which is about 20 m above sea level, to Back Road, which is about 200-300 m above sea level. Although vast resort-tourism sites have been secured in the hinterland, they have not been developed due to a lack of investment attraction.
- Two universities, one in technology and one in medicine, and the Aqaba Digital Hub are located along Back Road.

**【Main projects planned in the area】**

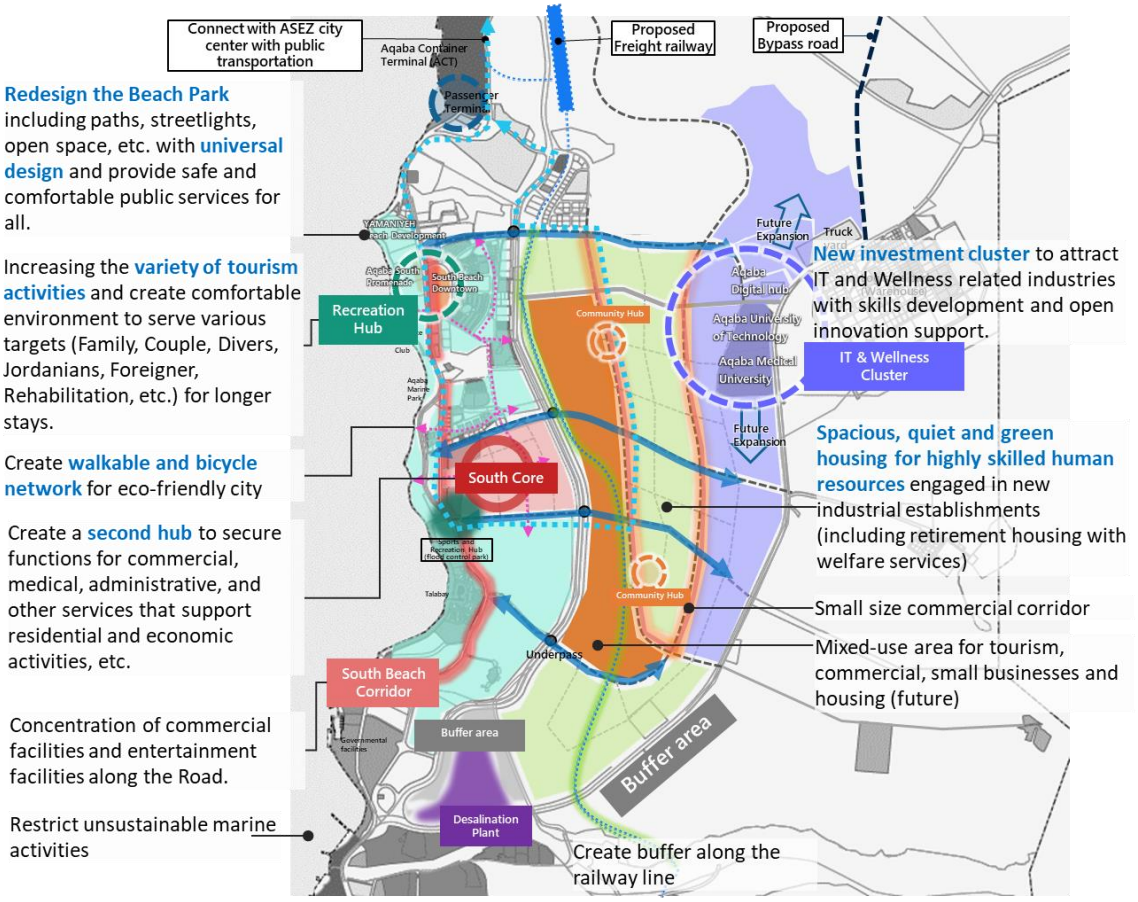
- Yamaniyeh Beach Development Plan
- Aqaba South-Beach Downtown
- Eye of Aqaba - Entertainment Park
- Organizational Plan for The South Beach Services Expansion Area
- Detailed Plan for Bedouin Village District
- Water Park
- Tala bay Resort
- Media City Project / Aqaba Digital HUB

#### 2) Development Direction

- Since the southern beach area is an area that characterizes Aqaba, the only coastline in Jordan, the area should maximize its potential while considering the preservation of the marine environment and contribute to area branding focusing on sustainability and wellness, attracting investment and human resources.
- Increase the variety of tourist activities and create a comfortable environment that can meet the needs of various targets (families, couples, divers, domestic and international, rehabilitators, sports players, etc.) and allow for longer stays.
- In the beach area, public spaces open to visitors, including residents, will be secured, and service functions will be expanded to create more convenient and attractive environment. It is intended to be developed as a universal design beach that can be enjoyed by all.
- Along the Coast Road, forming a shopping street with clustered commercial facilities alongside entertainment venues aims to elevate the resort's attractiveness.
- To attract development to the southern area, a town center will be established to secure functions for commercial, medical, administrative, and other services above a certain scale to

support residential and economic activities, etc., and to develop the necessary infrastructure.

- To create an attractive work and living environment for middle to high class human resources and retirees necessary for the development of Aqaba's industries, an internationally competitive living environment with excellent functionality and design will be developed.
- To maximize the proximity of the entire area to the sea, attention should be paid to ensuring continuous accessibility, views, and landscaping from the sea, along the Coast Road, to the hinterland, Middle Road, and Back Road.
- Create a new knowledge-based industrial hub, including skills development and open innovation for the development of IT, medical and marine wellness industries in an area where two technology and medical universities and a digital hub are clustered.
- It is desirable to connect the with the city center with buses or other public transportation to improve convenience.
- Since the area is dominated by Wadis, when developing the site, a risk analysis based on topography should be conducted to reduce risk by implementing appropriate drainage measures. In particular, the mouths of Wadi where rainwater collects should be restrained from development and maintained as open space.




Source: JICA study team

**Figure 8-7 Development Concept Image**

### (5) Middle Logistics Area

#### 1) Characteristic of the area

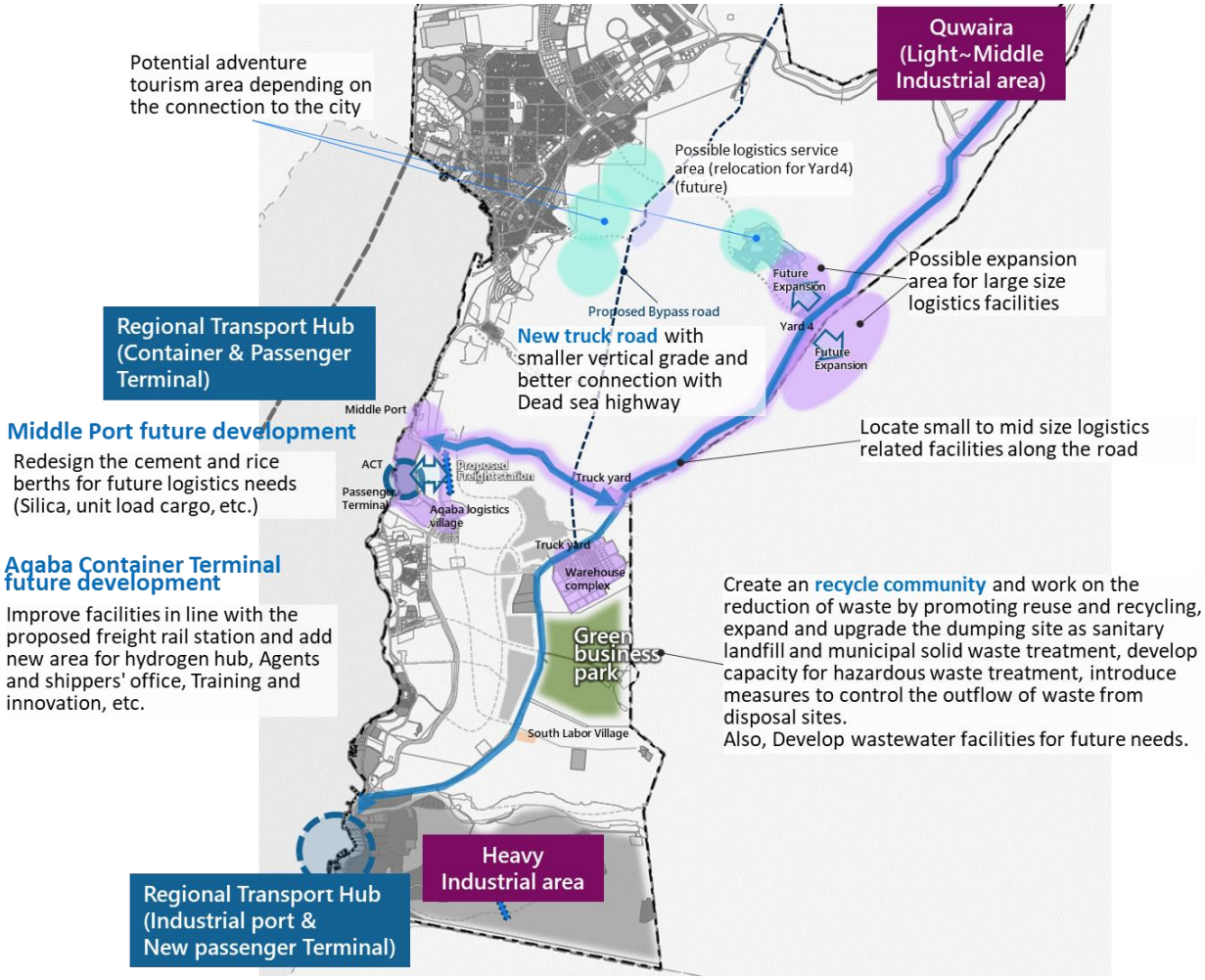
- In addition to logistics-related facilities such as the Aqaba Logistics Village, a ferry terminal and the Aqaba Aquarium are in the vicinity of ACT.
- Logistics-related facilities such as customs (Yard 4), truck yards, warehouses, and service facilities for trucks are being developed along the back road leading from the South Industrial Area to the Desert Highway and along the road leading from ACT to the back road.
- In the hinterland of the back road, there is a waste dumping site, housing for workers in the South Industrial Area, and other insectivorous industrial development.

**【Main projects planned in the area】**

- Aqaba Container Terminal (ACT)
- Aqaba Middle Port
- Vocational Training - Logistics & Maritime
- Back Road Masterplan
- Waste Dumping Site Upgrade Project

#### 2) Development Direction

- Taking advantage of the area's location on the main road connecting the port with all of Jordan, this area will be used as a Logistics Area to support the ACT and the South Industrial Area, and to support industrial revitalization by securing land for a concentration of logistics and distribution business facilities.
- The ACT will be enhanced as a "Center of Excellence for the logistics" and container storage facilities will be expanded to complement the ACT. The Middle port will be converted from the existing berth for rice and cement to a function that meets future logistics demand. In addition, the ferry terminal will be upgraded.
- Since a freight rail station is planned near ACT, the land use will be integrated with the port.
- Near the waste dumping site in the hinterland of the Back Road, sanitary landfill will be introduced, and a Green Solid Waste Management Park will be formed where recycling industries will be concentrated.
- Since the need for development in the hinterland of Back Road depends on future demand, the establishment of a reserved development site will discourage insectivorous development and secure the site for the future.
- In the future, the development of Mountain Bypass Road, which has a gentler slope and can be easily connected to the Dead Sea highway, will be considered as a complement to the Back Road.




Source: JICA study team

**Figure 8-8 Development Concept Image**

(6) **South Industrial Area**

1) **Characteristic of the area**

- Ports for bulk, RORO and other cargo are located.
- The area is home to heavy industries that handle potash and phosphorus, as well as logistics businesses that store petroleum and chemicals, import automobiles, etc.
- It borders Saudi Arabia and is expected to ensure accessibility for future linkage with NEOM.

**【Main projects planned in the area】**

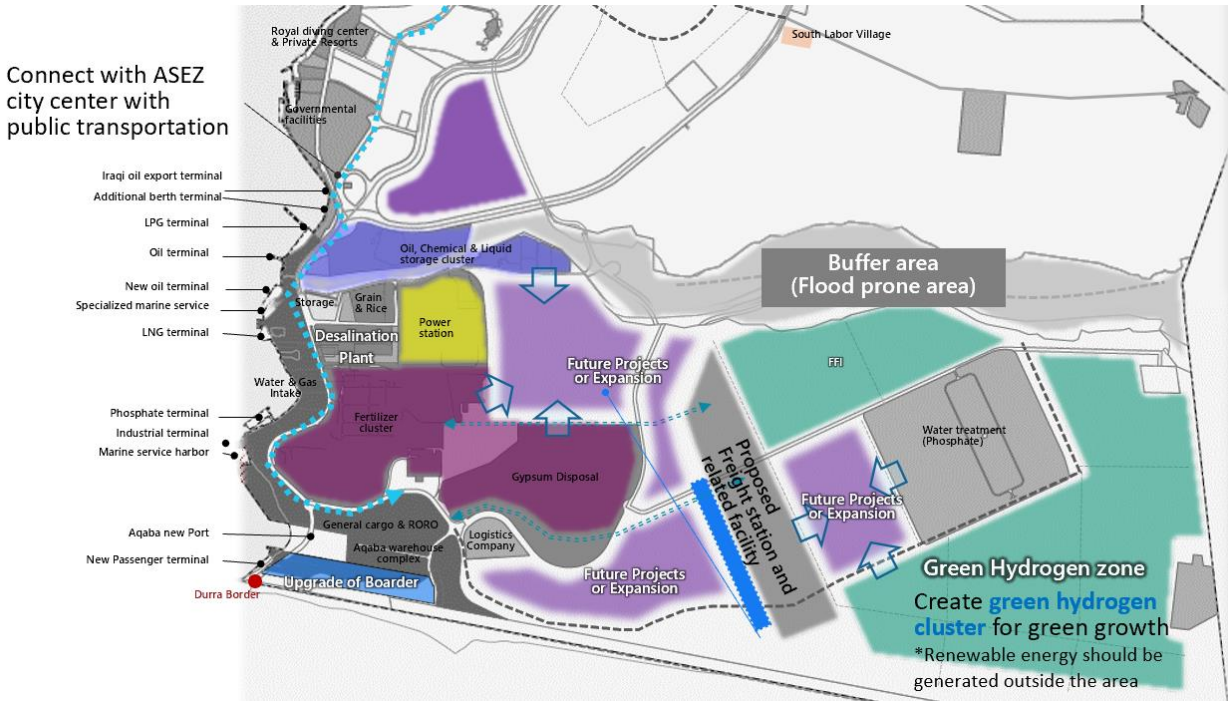
- Green Hydrogen Project
- Aqaba LNG Gas Network for Industrial Zones
- Desalination Plant
- Upgrade of the Durra Border Gate

2) **Development Direction**

- Given the potential future shortage of heavy industrial areas in proximity to the port in the

area, it is essential to prioritize the proximity to the port and sea for relevant industries. As a rule, industries not requiring such proximity will not be permitted to establish themselves in this area. To prevent sprawling developments that decrease the convenience and efficiency of land use within the area, including adjacent light industrial zones, a phased development approach needs to be implemented. (As an alternative to the southern industrial region, the Al Quwaira area will be designated for industrial uses)

- As the only port in the country of Jordan, it will enhance port and logistics functions and improve convenience.
- A freight rail station is planned, and the land use will be integrated with the surrounding area.
- Enhancing efficiency and effectiveness of land use by managing the type and location of industries to be clustered and promoting shared infrastructure, considering the limited coast area available for industrial use.
- The Saudi border will be the gateway to large-scale development like NEOM project and will be enhanced in terms of transportation and logistics.
- Commuter buses, currently operated by individual companies, could be considered for possible conversion to public transportation in the future.
- As the coastal area is a high flood risk area, appropriate measures will be taken.
- As the site is near a tourist resort area, a buffer zone will be secured to ensure mitigate the impact on the environment or safety, and appropriate monitoring and environmental protection measures and safety management will be implemented.




Source: JICA study team

**Figure 8-9 Development Concept Image**

### (7) Wadi Araba Area

#### 1) Characteristic of the area

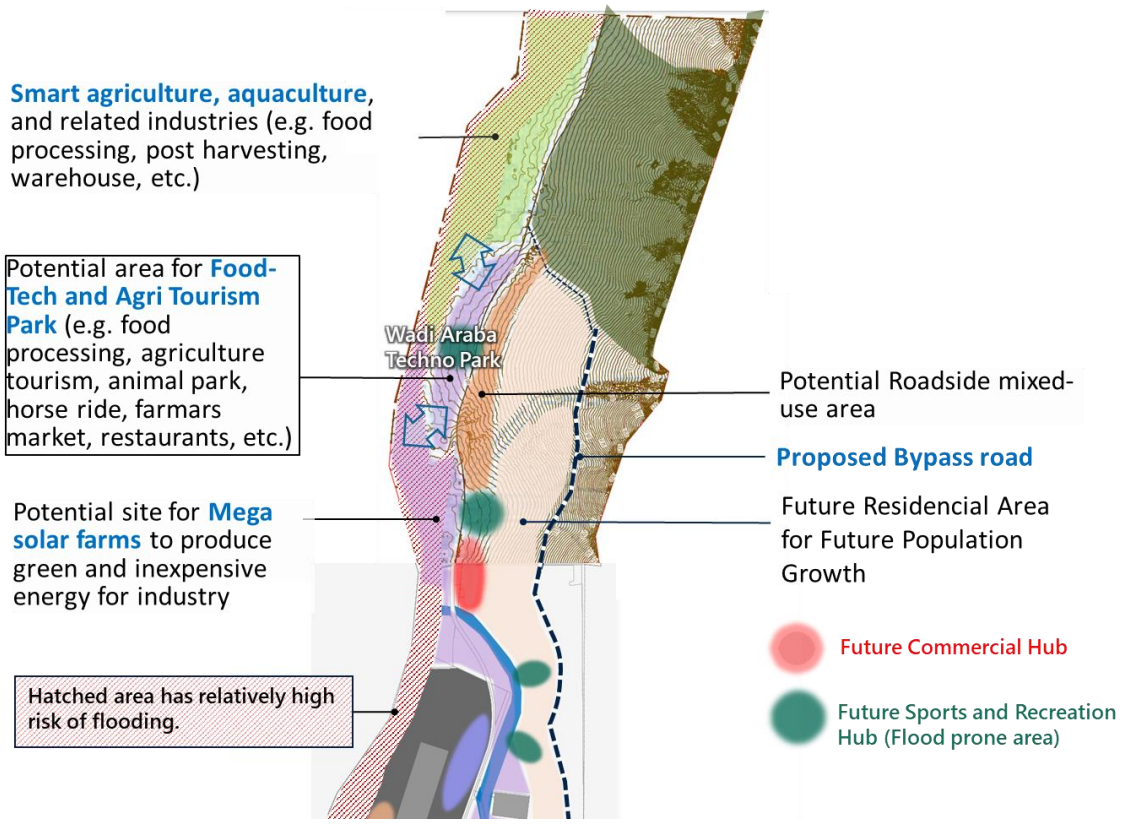
- The area is newly incorporated into ASEZ and is a vast expanse of desert.
- The area near the border is an area that requires consideration of security concerns.

**【Main projects planned in the area】**

- Northern Expansion of Wadi Araba Masterplan

#### 2) Development Direction

- The area west of the Dead Sea Highway, which has a relatively high risk of flooding, is not suitable for permanent buildings. Forming a Green Industrial Area for agriculture and fishery, renewable energy to contribute to Green Growth, food security and decarbonization to bring diversity to Jordan's industries can be considered.
- Create a new food industrial cluster (Food-tech) and Agri-tourism hub. Add value through the production and processing of high cash value products connecting with the manufacturing area near the airport and developing Agri-tourism/recreation to provide new experience and education opportunity. (Based on the Truck Free concept in Aqaba city, it is necessary to keep in mind the transportation routes for cargo generated in this area.)
- The area east of the Dead Sea Highway will be preserved for future residential expansion.
- In the future, consider developing a bypass road that bypasses the mountain side to control the influx of large logistics vehicles from the Dead Sea and other areas into the urban area.




Source: JICA study team

**Figure 8-10 Development Concept Image**

### (8) Al-Quwaira Area

#### 1) Characteristic of the area

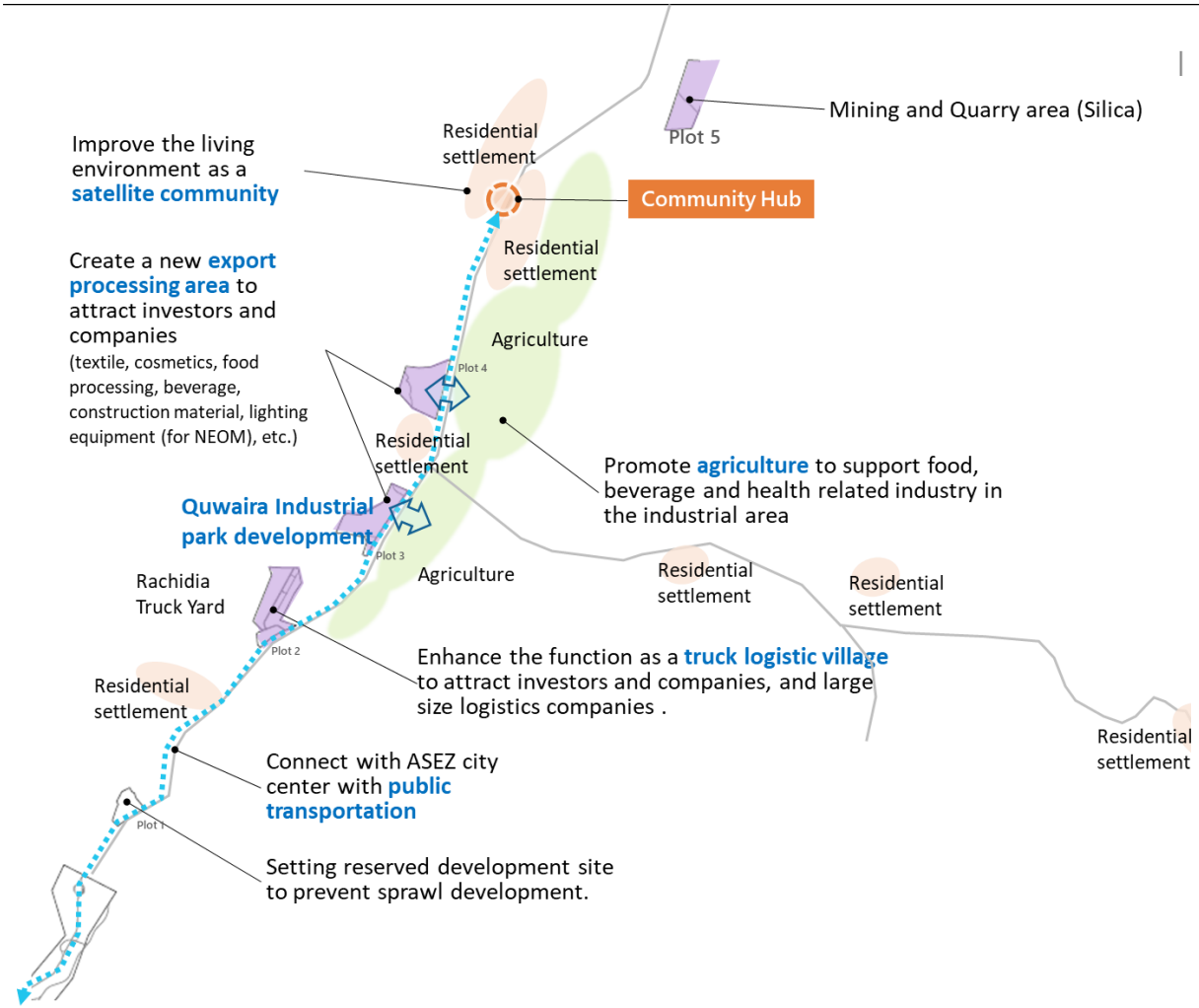
- The area was newly incorporated in ASEZ and is a flat area spreading in a valley between mountains along the Desert Highway.
- Of the five areas, Polt3 is being developed as an industrial park by PBI.

**【Main projects planned in the area】**

- Al Quwaira Industrial Estate (Plot 1-Labor Housing, Plot 2- Rachidia Truck Yard, Plot 3-Medium Industry, Plot 4-Light Industry, Plot 5-Mining and Quarry)

#### 2) Development Direction

- As a complementary industrial area to the South Industrial Area, it will be an alternative location for export processing light to medium industries that do not need to be close to the port. （Garment, textile, cosmetics, food processing, beverage industries, construction material, lighting equipment, etc.）
- Plot two, Rachidia, will continue to strengthen its function as a truck logistics village.
- Plot five is a source of high-quality silica and has potential to concentrate related industries.
- Labor housing is planned for Plot 1, but the location should be changed in consideration of the surrounding living environment, including accessibility to livelihood facilities. Instead, it could be guided to the vicinity of Quwaira settlement, where a settlement has already been formed and a certain population density is observed. The concentration of population will facilitate the formation of community hubs, the development of public transportation, and other improvements to the living environment.
- The area needs to be a clean industrial area due to its proximity to areas with groundwater reserves that support Jordan's drinking water supply.
- Since the area is surrounded by a thriving agricultural industry that uses groundwater, it is desirable to promote the production of agricultural crops as raw materials for the manufacture of food, beverages, and health-related products in the industrial park.
- Since the area is at high risk of flooding and frequently flooded, it is desirable to develop a dam and other flood control measures.
- It is desirable to connect the with the city center with buses or other public transportation to improve convenience.




Source: JICA study team

**Figure 8-11 Development Concept Image**

### (9) Wadi Rum Area

#### 1) Characteristic of the area

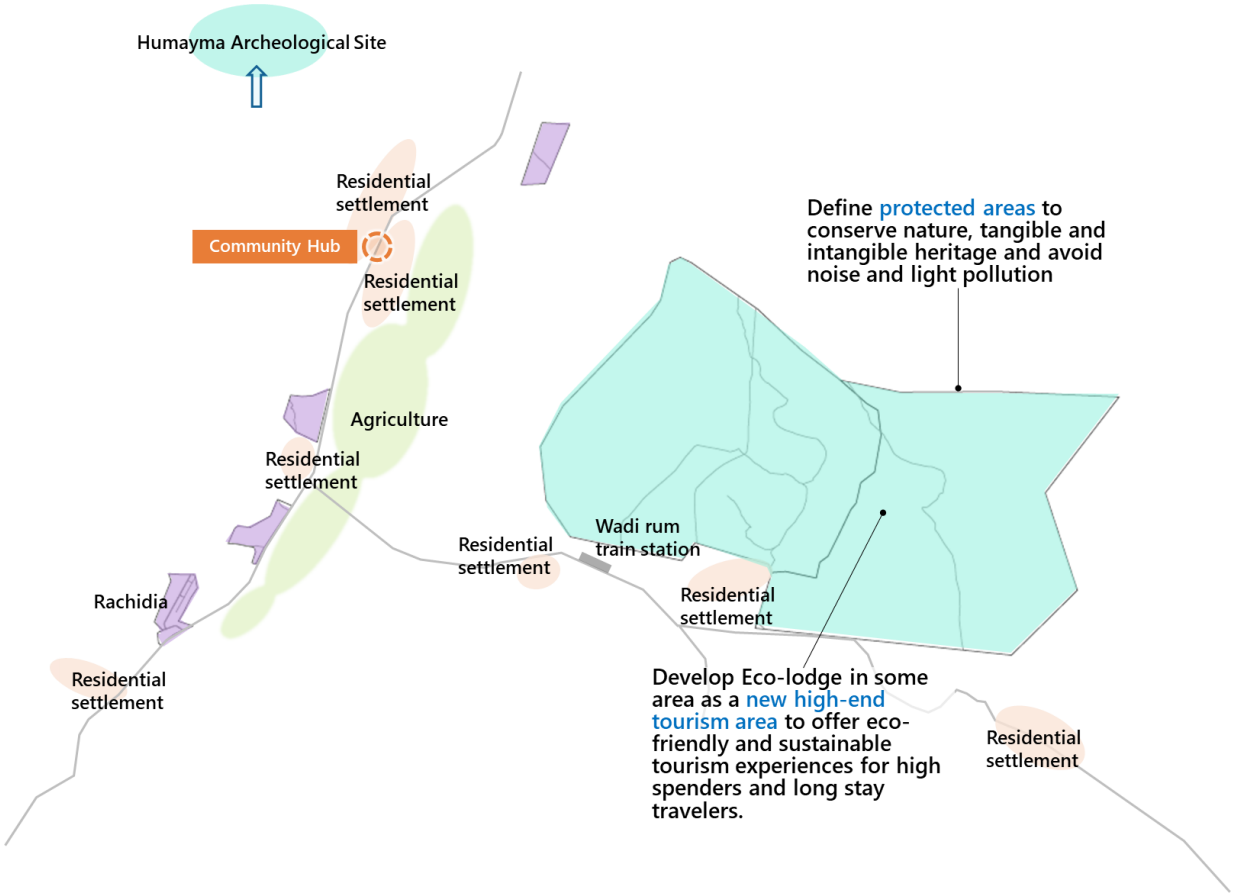
- The newly incorporated ASEZ area with a vast desert area located north of the Wadi Rum World Heritage Area. Several overnight camps for tourists are in the desert.
- Along the road leading from the Desert Highway are scattered villages that were settled by Bedouins.
- Several tourist camps for visitors are located within the desert.

**【Main projects planned in the area】**

- Filmmaking area
- Touristic camps
- Touristic paths
- Upgrading Tourist facilities (Disi museum restoration, Rum village citadel, Arabian desert safari trail, etc.)

2) **Development Direction**

- Securing more attractive and high value-added activities and facilities (e.g., eco-tourism, eco-lodges), utilizing the unique nature and landscape.
- Define protected areas and manage tourist facilities appropriately to preserve the unique landscape and nature, tangible and intangible heritage and avoid noise and light pollution.
- It is desirable to connect the ASEZ center with buses and other public transportation to improve convenience for local residents and tourists.
- The Humayma Archeological Site, an important archaeological site, has not been well managed, and we will promote its conservation and use it as a new tourism resource.




Source: JICA study team

**Figure 8-12 Development Concept Image**