CHAPTER 2

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2.1 Key Issues for the Project and Objectives

2.1.1 Problems of Market Function

Some of the facilities at Banda Beach Market were forced to move out since the channel improvement project of Dar es Salaam Port was carried out in 1997. At present, about 500 shops are being operated temporarily at the Banda Beach area. As shown in Figure 2.1.1, most of the fish retail shops and grocery shops are operated at an inland area where a land property rights has not been settled, while fish processing shops, ice plant facilities, and some restaurants are situated along the shore.

Since the shops are distributed at the inland area without restrictions, the following problems have taken place, causing some obstacles on the market operations.

- Fish is currently discharged on the beach, north of the Project site. Fish retail shops are situated about 150m north of the discharging point. Therefore, the distance between the retail shops and the discharging point is long and fish circulation in the market is not efficient.
- There is no fish landing facility so that the fish catch is currently unloaded on the beach or fishermen go into the sea to unload fish catch from medium size fishing ships. This is one reason why fish circulation is not efficient.
- After the auctions, unsold fish is tentatively transported to fish stock facilities or fish retail shops. The fish will be auctioned again on the next day. However, not enough freezing facilities have been established in the existing market. So, some of the unsold fish is transported to Kariakoo Market where freezing facilities are equipped. This results in degrading fish quality or losing fish.
- It is desirable that fish processing shops, fuel retail shops, vegetable/grocery shops, and cafeterias be situated nearby each other. However, the existing shops are distributed without restrictions and the pathways are not well developed, making bad sanitary conditions and inefficient fish circulation.
- At present, some of the shops do not have proper land right and occupy the inland area illegally. Since DCC originally envisioned constructing a new fish market at a different place, sufficient infrastructure facilities such as water, electricity, road pavement, parking, and garbage yard have not been developed near Banda Beach. This is also one of the reasons why as efficient fish circulation has not been formulated.

2.1.2 Problems of Degrading Fish Quality or Fish Loss

The present Banda Beach Market lacks fishery facilities, resulting in degrading fish quality and losing some of the fish catch. This may affect the sufficient supply of fishery foods to the citizens especially in the Dar es Salaam area.

- Fish unloading at Banda Beach has been carried out in a primitive way. Small fishing vessels (3-5m in length) without engine moor at the beach and the fish catch is unloaded by hand. On the other hand, middle size fishing vessels (8-10m in length) with engine have a draft of 1-1.5m, so that they are not able to moor directly at the beach, necessitating anchoring about 10m away from the beach to keep the necessary draft. As a result, fishermen need to go into the sea to unload catch fish and transport it to the auction area. It takes about 1.8 hours to unload catch fish, resulting in degrading fish quality in the sun. Ideally, fish containers with a capacity of 20-30kg are used. However, fish containers are not available in the market. That is one of the reasons why unloading fish catch takes so long.
- Since the fish catch is being auctioned on the beach, the fish quality is degraded and sanitary conditions are bad. The existing auction hall is situated about 70m away from the shoreline at low tide, having some problems such as 1) far from the unloading area, 2) insufficient space, and 3) unnecessary undulations in the auction hall. Thus, few auctions have been taken place.
- The portion of fish catch that doesn't sell in the auction, is transported to provisional ice insulated boxes. However, there are insufficient ice insulated boxes available in the existing market, so the fish quality may be degraded or fish lost. Only one company deals with ice at site, although it doesn't stock the unsold fish.
- The 100 shops situated near the Market are barrack-type, most of which are provisional. Since water facilities are not well established in the area, tables in the shops are not sufficiently cleaned. Thus, it is difficult to keep the good quality of catch fish.

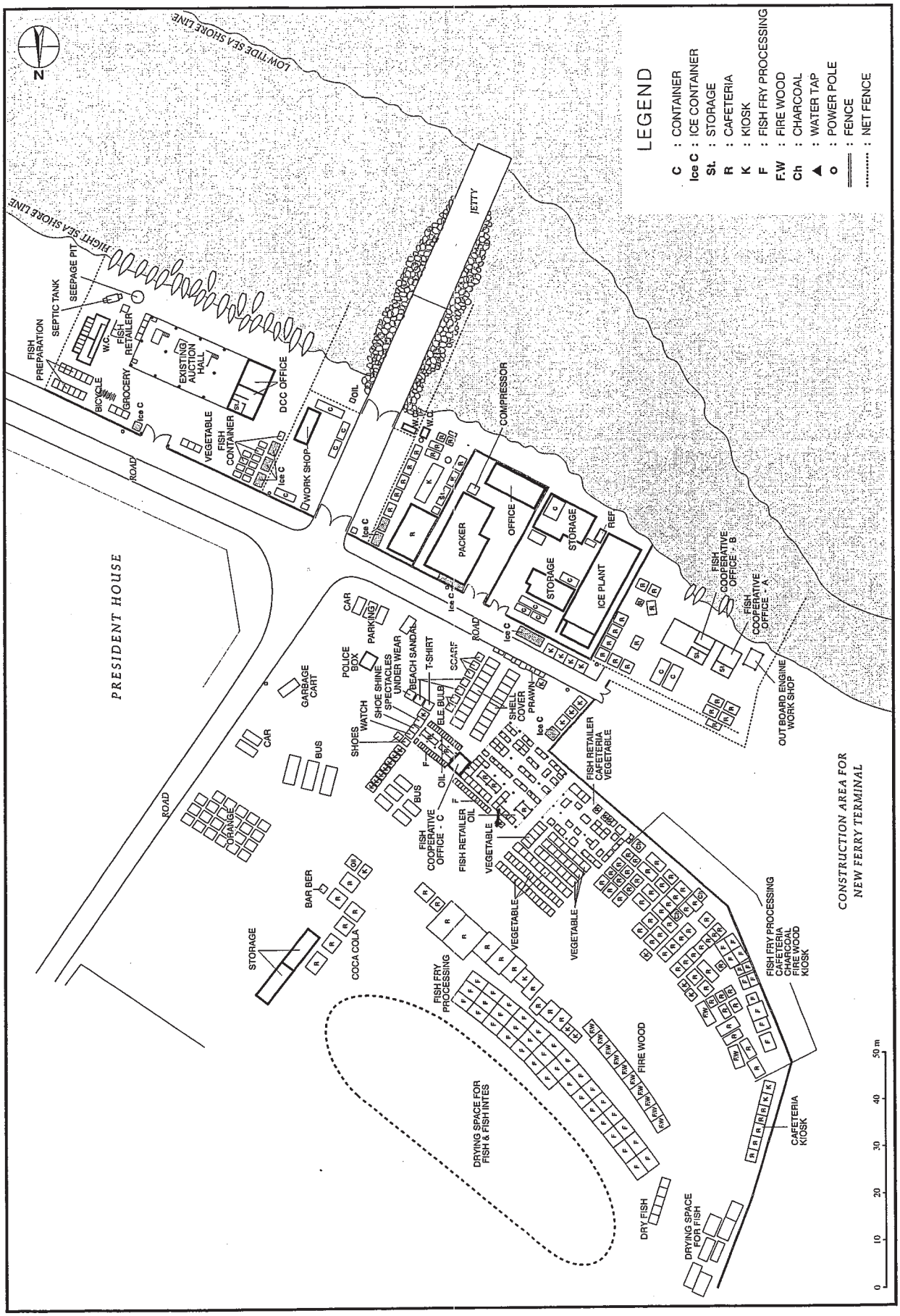


Figure 2.1.1 Existing Shops at Banda Beach

2.1.3 Problems of Sanitary Conditions in the Market

Since water and sewage facilities have not been established in the existing market, it is difficult to keep good sanitary conditions as explained below.

- There are 10 water faucets in the existing market, all of which are operated individually. The water pressure is low and some of the water faucets run only in the morning and at night. The water is sold by local firms by bucket. Water of a 20L bucket costs 50 Tsh. Water of 60-100L per shop is consumed per day for cleaning tables in the shops.
- Sewage facilities are equipped in some parts of Dar es Salaam City, but they are not equipped with septic tanks. While a sewage pipe was installed about 1km north of the existing fish market, the pipe doesn't pass near the market. There is a public toilet in the market, although it is almost useless.
- Flood discharging facilities have not been established in the market and some temporary ditches are provided near the shops. However, in the case of flood, the shops may be inundated.

The market has a garbage cart and a local company collects garbage two or three times a week and dumps it to a dumping site. Most of the garbage is used paper. Guts of fish are collected in another ways and used for birds' foods. The garbage collection system is functioning well, so that the same system will be applied in the Project.

2.1.4 Results of Interview Survey

In order to grasp the existing situation of the market activities, an interview survey covering a total of 198 retailers and buyers was conducted from July 23 to 25, 1999 during the field survey. The results obtained from this survey are given below.

Table 2.1.1 Breakdown of Respondents and Their Number

Trader	Number (men)
Fresh fish retailers	47
Fish fry processors	26
Fishermen	50
Buyers (professionals) from town	38
Buyers (consumers) from town	37
Total	198

Summary of the interview survey results of fresh fish retailers

- Number of Respondents: 47 respondents, 39 males (8 unknown)
- The average number of years of working experience is 13.7 years. The number of staff members is mainly two members (23 cases) and the average is 1.8 members.
- Fish is purchased only from auctions and the average purchase amount is 32,200Tsh (about 53kg based on an estimated average price of 610Tsh).
- Nearly 84 % of the customers of a retail shop are general consumers and the average number per day is 10.5 people.
- Four out of 34 retailers (11%) responded that they were forced to dispose of leftover fish which had deteriorated in quality. However, generally all leftover fish is stored in ice and the average amount of ice used per day is one block (30kg/shop).
- The ratio of respondents who are members of any associations is 53.2% and this is the highest finding among the all group of traders.
- The most commonly expressed demand by 80 % of the respondents is the installation of toilets. This is followed by a demand for a continuous supply of ice (70%), and a warehouse or storage space (57%).

Summary of the interview survey results of fried fish processors

- Number of respondents: 26 processors. Average number of staff member is 1.9, all men.
- Average working experience at Banda Beach: 6.4 years
- Due to consigned processing, leftover fish and storage problems do not exist; ice is not used.
- Average number of customers per day per shop: 13.7 %
- The membership in associations was a low 21.7 %.
- 92 % of the respondents listed the installation of toilets as their first demand, followed by the provision of clean water (73 %)

Summary of the interview survey results of buyers

- Number of Respondents: 38 people, 75 % women
- Fried fish are sold in 18 markets and other area in the city and is widely distributed
- Buyers purchase fish at Banda Beach at an average of 4.8 days per week. The foremost reason (63 %) why they purchase the fish there is the

convenient location.

- All fish are purchased at the auction. The amount of fish purchased at one time is 14,000Tsh (23kg at a unit price of 600Tsh) which is half the amount purchased for fresh fish retail activities.
- About 32.2 % of the respondents use ice for transporting their fish from the market to their homes. The average volume of ice used per day is 0.3 blocks (10kg).
- Approximately 89 % of the buyers rate the freshness of the fish as "good" or "normal". However, 68 % rate the sanitary environment as "poor".
- About 35 % of the buyers pointed out security problems and 11 % of them need scales.

Summary of the interview survey results of fishermen

- Number of Respondents: 50
- Nearly 73 % of the fishermen reside in Kiganboni district on the opposite shore. Only 10.8 % of the fishermen belong to an association.
- The average number of fish landings is 2.7 times per week, per boat and the average fish landing volume during the peak season is 122,000Tsh and 53,900Tsh during the lean season. The foremost reasons for landing the fish catch at Banda Beach are the large number of customers (53 %), closeness to their homes (26 %), and good prices (21 %).
- Nearly 92 % of the fishermen stated that the quality of the marketed fish was good and none of the fishermen disposed of their fish due to a loss in fish quality.
- Nearly 40 % preserve their fish in ice and the average volume of ice purchase at one time was 70 blocks (2,100kg). In contrast, those who do not use ice are engaged in one-day fishing trips and do not feel that lowered fish freshness at normal temperatures is an issue.
- The average amount of time required for fish landing is 1.8 hours and nearly 60 % of the respondents finish their work within one hour.
- Nearly 80 % of fishermen request to improve the ice supply system.

Summary of the interview survey results regarding parking

The open lot of about 1,000m^2 located near the entrance/exit of the temporary ferry ramp is presently used as a parking area. According to a survey on the number of parked vehicles conducted during the field survey, a maximum of 19

small cars such as taxis and vans and a maximum of 37 large vehicles such as micro buses, trucks, and buses or a total of 56 vehicles were counted. The number of vehicles was especially high during the morning and evening hours. According to the interview survey, 92 % of the buyers and 79 % of the market retailers come to the market by car which appears to be an important means of transportation.

Summary of the interview survey results

The problems of the existing market as pinpointed by retailers and users (198 people) and the expectations of retailers with regard to the services of the new market are shown in Tables 2.1.2 and 2.1.3.

Survey findings show that the major problem of the existing market is the issue of safety and nearly half of the respondents pointed out the numerous thefts that occur in the market. Although this is a common problem raised in any public area like the market where there is a large congregation of people, the existing market is a temporary facility and the lack of adequate storage for personal belongings and valuables is one major factor that has contributed to the problem of safety.

The lack of toilets and the poor sanitary environment were pointed out by 44 % of the respondents, second to the issue of safety. Other issues were concern about prices and the lack of a support system such as loans for retailers, and problems pertaining to the management of the market.

The expectations with regard to the services of the new market include tap water supply, toilets, cleaning, and other services related to improving the environment. In particular, 82.9 % and 60.2 % of the respondents had high expectations for tap water and toilets, respectively. Low ratings were given to the issue of safety despite having been mentioned by a large number of people. This is probably due to the fact that expectations about specific services are much greater than that for countermeasures against difficult safety management.

Other additional services that were pointed out were the need for storage facilities by 60 % of the fresh fish retailers and the supply of ice by 80 % of the fishermen; A difference in perception was seen according to occupation.

Table 2.1.2 Major Problems of Present Market

Type of Problems	Number	(%)
1. Bad security control	99	55.6
2. Unhiginic condition, lack of toilet and water supply	78	43.8
3. Lack of facilities	47	26.4
4. Bad management system	30	16.9
5. No problem	13	7.3
6. Congestion, dis-arrangement	10	5.6
7. Shortage of equipment	7	3.9
8. Others	4	2.2

Table 2.1.3 Services Expected for New Fish Market

Type of services	Number	(%)
1. Clean water	102	82.9
2. Toilet	74	60.2
3. Cleaning	64	52.0
4. Ice supply	55	44.7
5. Storage facility	49	39.8
6.Facility improvement	31	25.2
7. Security	17	13.8
8. Equipment	12	9.8

Source: Interview survey by Study Team, July 1999

In addition, the following concerns about the Project were expressed by market users.

- The concern that newcomers and other business people from the city will enter the market targeting new business opportunities. Therefore, priority should be given to current market retailers in the selection process of leasing shops, etc. in the new market.
- The associations are dependent on membership dues for their management and operations; and there is concern that the system of collecting facility usage fees which will be implemented at the new market will affect association revenues.

2.2 Objectives of the Project

In formulating the development plan of Dar es Salaam Fish Market, due consideration should be given to the strategies of the National Development Plan which are namely, income generation and elimination of poverty. Also, considering the current problems and demands disclosed by the interview survey for the existing fish market, fish circulation and elimination of losing fresh fish should be improved. The following summarizes the current problems and their countermeasures.

- In order to improve the function at the existing market, developing facilities such as an auction hall complex, fish retail shops, other shops, road and parking is essential for efficient fish circulation and stable fish catch.
- In order to supply enough fish to the citizens, minimizing fish loss is the primary countermeasure. Developing a fish landing facility, good sanitary condition shops, water supply facilities and procuring fishery equipment such as carts is urgently required.

- Water supply and sewage facilities have not been well developed in the market, so that sanitary conditions are bad, requiring improvement.
- 92 % of buyers and 79 % of retailers use a car by means of their transportation. Thus, an appropriate parking space is necessary for efficient and swift fish circulation.
- Buyers and retailers have a concern about safety in the market. Thus, fences and other facilities will need to be constructed.
- The existing fish market has been deteriorated by the channel expansion project. As a result, shops moved out without restrictions, affecting the function of the fish market. Thus, the market will improve by this Project.
- Water and sewage facilities have not been developed in the market. Scaling on the beach and insufficient fish retail areas bring bad sanitary conditions. Thus, the sanitary conditions will improve by this Project.
- No fish landing facilities have been established in the market, resulting in time-consuming unloading in the sun. Moreover, due to the lack of cooling facilities in the market, catch fish tends to be deteriorated. Thus, such conditions will improve by this Project.

2.3 Basic Concept of the Project

2.3.1 Outline of GOT's Request and Discussion

(1) Confirmation of Project Site

The Project site designated in the original request of the Government of Tanzania (GOT) was the inner part of the entrance of the Dar es Salaam Port. However, prior to the departure of the Study Team, the Government of Tanzania decided to select a different site which is at Banda Beach for a new fish market after discussions with the State House, Ministry of Lands and Human Settlement, Tanzania Harbours Authority, and Ministry of Natural Resources & Tourism.

The Study Team has carried out a site reconnaissance on the recommended site and other three possible alternative sites (see Fig. 2.3.1).

1) Banda Beach site (Recommended site)

The site is located near the estuary of Dar es Salaam Bay. The adjacent area was excavated by a World Bank financed channel project. A tentative ferry ramp exists near the site.

2) Port entrance part of inner port (Site A)

The site, designated in the original request of GOT, is planned to be reclaimed. The site is located at the center of the City where many government offices and hotels exist. Along the coast, many stand-by trawler boats and sunken ships are observed.

3) Kiganboni district (Site B)

The site is situated near the port entrance on the opposite side of Banda Beach. In the vicinity, 73% of fishermen who use Banda Beach reside there and it is easy to obtain land as many vacant and unused land are available.

4) Water basin at the north of commercial port (Site C)

The site has an area of 200m wide and 250m deep water basin and is located between the commercial port and domestic passenger terminal.

Table 2.3.1 shows characteristics of each site.

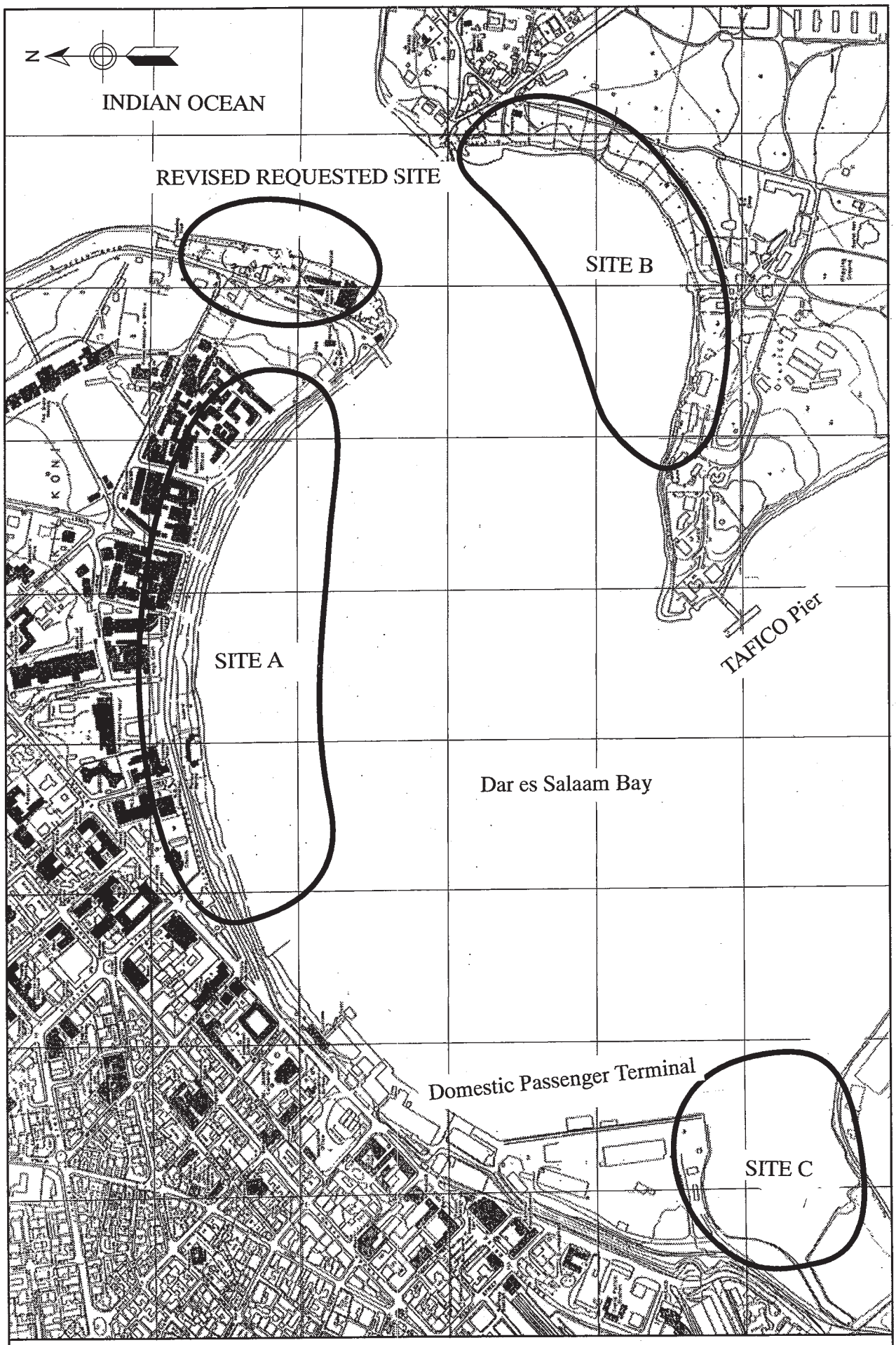


Figure 2.3.1 Location Map of Alternative Project Sites

Table 2.3.1 Characteristics of Each Site

	Recommended Site	Site A	Site B	Site C
Availability of Land	No serious problem in obtaining the land. Reclamation is necessary and the land is near the channel.	As the depth of the beach is rather narrow (40 to 50m) and slope from the adjacent road is sharp, the size of the land should be long feature. The land right can be obtained, but a fish landing wharf can not be installed in front of the site due to the objection raised by THA.	Land is available as vacant and unused land is extended in the nearby coastal area.	It is quite hard to obtain consent of THA, as they have a plan to extend their wharf. A fish landing wharf cannot be installed due to the objection raised by THA.
Sea Traffic Problem	Traffic problem between fishing and commercial boats is slight.	As indicated above, a fish landing wharf cannot be installed, traffic problem does not exist.	Traffic problem between fishing and commercial boats is slight	As indicated above, a fish landing wharf cannot be installed, traffic problem does not exist.
Convenience of Fishermen	As the location of the site is near the present market, fishermen's convenience is unchanged.	As the location of the site is near the present market, fishermen's convenience is unchanged.	As many fishermen (73%) reside near this site, it is convenient for fishermen.	As the site is far from the residence of fishermen, it is inconvenient.
Access by Market Related Traders	It is convenient for market related traders, as the site is located near the center of city.	It is convenient for market related traders, as the site is located near the center of city. But there may be an elevation difference.	It is inconvenient for market related traders, as the access means is only unreliable ferry transport.	It is convenient for market related traders, as the site is located near the center of city.
Effect of Marine Phenomenon	As the site faces the ocean, ocean waves affect directly.	Marine phenomenon is quite calm, as it is situated inside of the bay	As the site faces the ocean, ocean waves affect directly.	Marine phenomenon is quite calm, as it is situated inside of the bay
Project Cost	Most economical	It costs too much to construct facilities in such a place.	Cost of transporting construction equipment and materials is much.	No big difference compared to the recommended site in terms of cost.
Conclusion	Most suitable in terms of accessibility, land property and cost.	There is a problem in the property rights.	Accessibility is not good for market users.	THA won't accept the plan.

The three alternative sites, however, have serious problems as described below:

Site A : Acceptance of THA can not be obtained due to the narrow entrance of port access channel and high expectation of sea traffic accident between the fishing and commercial boats at this point. Thus the fish landing wharf can not be provided at this site.

Site B : Access is difficult for the market traders in this plan as it is located at the opposite side of the city. The Ministry of Public Works is operating their ferry every 30 minutes to connect with the other side of the bay. The ferry boat named "MV Usiwe Kupe" operated up to last year has caused breakdown frequently and has become out of order finally due to grounding in February 1999. Presently a second-hand ferry "MV Ukombozi" is being operated. Once this ferry causes trouble, there is no reliable alternative transportation mode except for road transportation having long detour way around the bay or non-regular small passenger ferry crossing.

Site C : It is impossible to obtain consent of THA, as they have expansion plan of commercial port.

The site, which is a narrow area located between the West Ferry Point Terminal and temporary ferry ramp, is accepted by the government authorities concerned such as President's Office, the Ministry of Natural Resources and Tourism, the Ministry of Lands and Human Settlement, Dar es Salaam City Commission, and Tanzania Harbors Authority. The Study Team has confirmed that the land rights have already been obtained for this site. The land rights for adjacent areas is being arranged by DCC and the Study Team has confirmed it will have been completed by the beginning of the construction work. Moreover, the designated area is a part of the present temporary market and relocation of traders can be minimized at this site.

Hence, considering these conditions, the recommended site is the most appropriate place to construct the new fish market.

Besides the three alternatives, there is another alternative site situated north of Banda Beach. However, it would be inappropriate to construct a new market there for security and scenery reasons, as it is located in front of the State House.

(2) Requested Project Scope by GOT and Discussion Results

The contents of project components requested by GOT in July 1998 and the results of discussions between the Study Team and the Tanzanian side are summarized in Table 2.3.2.

Table 2.3.2 Summary of Requested Components and Discussion Results

Requested Project Components	Results of Discussion
Floating Jetty (25m long, 5m wide)	Since the site faces the Indian Ocean, the cost required for the anchoring structure is quite high for this facility. The beach currently used for fish landing can continuously be utilized by small boats in the future. As such this project will not include the floating jetty.
Fish Landing Wharf (50m long)	Fish landing by small boats will be carried out at the northern beach of the site continuously. A fixed type fish landing wharf will be provided for the use by medium boats.
Land Reclamation	As the available inland area is quite limited, the required land shall be created by land reclamation.
Revetments (150m long)	Required revetments will be provided.
Fish Auction Hall (1,000 m^2) Fish Retail Shop (1,200 m^2)	Fish traders operated in the present market will be accommodated.
Ice Making & Storage (5 ton/day)	Sufficient ice blocks are currently provided to each trader by ice plants and this supply system will not be changed in the future, thus the Project will not include ice making plant.
Fish Processing Area (300 m^2)	Fried fish processors operated in the present market will be accommodated.
Vegetable & General Commodities Market (800 sq.m)	Vegetable and general commodities traders will be accommodated.
Cafeteria & Restaurant (35 units)	Among the operated cafeterias at site, minimum number of shops will be taken.
Access Road (250m long and 7m wide)	As the site location is transferred, the project will not be included in the project. But the roads adjacent to the project site will be constructed
Parking Lots (100 cars)	Required number of parking lots will be provided.
Bus Terminal (30 buses)	Bus terminal will be constructed by the project of West Ferry Point and the facility is judged sufficient. Therefore this project will not include a bus terminal facility.
Workshop (100 m^2)	It is considered that the equipment including outboard engine will be repaired by the private shops. This project will not include workshop facility.
Various Equipment	Among the requested equipment, pickup truck and equipment for workshop cannot be provided under the current grant aid system of JICA. However appropriate type and number of equipment will be provided.

2.3.2 Components of the Project

Based on the requests from the Government of Tanzania, facilities and equipment to be provided in this Project are described below.

(1) Fish Landing Wharf

Five hundred and forty-one fishing boats use Banda Beach. Unloading fish catch by small boats is supposed to be carried out at the beach, while medium boats, especially larger ones, are not able to unload at the beach, necessitating transshipment to small fishing boats. Currently, fishermen sometimes wade into the sea to unload catch fish directly.

It takes approximately 1.8 hours on average per boat to unload the fish. As a result, the quality of the fish catch is reduced as the fish are exposed to the sun. Improving the quality of fish catch is one of the important objectives of the Project.

Therefore, a new fish landing wharf will be used by middle size boats. As the site faces the ocean, a floating jetty is not suitable structurally so a fixed type wharf is accordingly appropriate. The front of the wharf will need dredging to have enough depth.

(2) Revetment and Reclamation

The land on ocean side of the Ocean Road narrows to 20 to 40 m width during high tide. According to the discussion with the Tanzanian Government, the new fish market will be constructed between the temporary ferry ramp and the West Ferry Point, with a distance of approximately 150m. In case of reclaiming to the low tide level, the total area of the ground becomes 8,000m^2.

On the south side of the reclaimed land, revetments should be constructed. The temporary ferry ramp is situated on the north of the reclaimed area. It has been revealed during the field survey that the structure of the ferry ramp is not durable to protect high waves. Therefore, it is necessary to secure the reclaimed land by buried type structures.

(3) Auction Hall Complex

1) Auction hall

The existing auction hall is a temporary one due to the construction of the new market. After the implementation of this Project, this facility will be used as a warehouse, etc. for fishermen. In addition, a vital component of the sales and wholesale facility is the installation of tap water and drainage facilities to maintain hygiene management. Therefore, improving the auction and fish

handling area is appropriate.

Ideally, the auction and wholesale facility should be located behind the fish landing beach and wharf. However, since the small fishing boats will be landing their fish on the beach on the north side of the temporary ferry ramp and the medium boats will be landing their fish on the fixed wharf in front of the project site, the auction hall will be located behind the fixed wharf which will have the highest fish landing volume.

In view of the existing business practices, it will be difficult to forcibly conduct all auctions at the new auction and selling area since the small fish catch from small fishing boats will continue to be transacted on the beach.

The market management facility , the ice storage facility, and the fish storage facility will be located in the upper and lower floors of the wholesale market facility.

2) Market management facility

Due to the expanded services of the new market and the collection of facility usage fees, administrative staff members need to be located at the new market. Therefore, a market administrative office will be set up in accordance with the administrative duties and the number of allocated staff members. The facility will contain the fishery section of the DCC which will be in charge of collecting fishery statistics and information, the association offices, and the office of the private maintenance company. These offices will be located on the upper floor of the auction hall where fish and people are anticipated to congregate.

3) Ice storage space

The ice storage facilities of ice retailers at the market are wooden boxes with plastic sheeting which only cool the fish, and it is believed that this method has been one factor that has contributed to the rise in ice prices. Therefore, a large capacity ice storage facility will be installed on the upper floor of the auction hall in order to raise the efficiency of the ice sales.

4) Fish storage area

Fish which were not sold at the day's auction or frozen fish purchased from trawlers are stored temporarily near the existing wholesale area until the next day's auction. These fish are stored in 15 to 20 individual ice boxes. In order to enable these transactions to continue at the new market, space will be allocated in one area of the auction hall.

(4) Fish Retail Market

1) Fresh fish retail area

Handling fresh fish generates bloody wastewater and ideally, it is recommended that fresh fish shops be concentrated in one area to enable the floors to be washed on a daily basis; and, fish should be handled on a sanitary table to maintain its quality. In conjunction with the fish preparation area, the group involved in handling fresh fish should be located next to the auction hall.

2) Fish preparation (scaling) area

The task of preparing the fish involves cleaning and scaling in hot weather, directly on the beach. Deterioration of fish quality due to warm temperatures and sanitation and environmental problems stemming from fish remains and bloody wastewater exist. Therefore, a fish preparation work area will be located adjacent to the auction hall which will have a large impact on improving and maintaining the sanitation of the market.

3) Fried fish processing area

Fried fish which can be preserved for long periods of time is the most common form of processed fish in Tanzania and the most widely distributed fish product. The fried fish processed at the market are sold in the city by small-scale traders.

The existing facilities generally have no roof and the frying process is greatly affected by the weather. The existing facilities which are shacks and are disorderly located throughout the market must be improved for safe maintenance reasons since they utilize high heat and hot oil.

(5) Related Retail Areas

1) Fruits, vegetables, and groceries

The retail of fruits, vegetables, and groceries are an essential service to a segment of the fishery retailers and are vital for maintaining the customers' flow to the market.

2) Cafeterias

Cafeterias are dependent on the fishermen and market related retailers for their survival and they are also an important element of the market. However, their services are mainly focused on retailers and they do not have a direct impact on the customer flow to the market. Therefore, it has been determined that urgent improvements are not needed. In this project, those who will be forced to move to this location are mainly women who will be located in the reclaimed land area. As a result, a minimum amount of improvements to accommodate the women

retailers is considered appropriate.

3) Firewood and charcoal retail area

Fuel related retail activities involves supplying fuel to the fried fish processors and the food stalls. The former uses firewood and the latter uses coal. Fuel retailers are vital to the existence of these retailers and there is a need to secure market space for this activity. Most of the firewood is scrap wood so the fuel retail shops require a spacious backyard to stock the firewood.

(6) Tap Water/Drainage and Environmental Sanitation Facilities

1) Tap water facilities

Tap water supply is the most essential facility for the sanitation maintenance of the market. Concrete floors and retail tables will be installed in the market which will enable easy cleaning and quality management of the fish; and an adequate water supply is needed to accomplish this. However, the cost of the tap water will be borne by the beneficiaries and it will be included in the facility usage fees. Therefore, this cost will directly affect the finances of the retailers and strict maintenance of the tap water facilities must be carried out in order to prevent water wastage. The tap water facilities must be established only at a minimum number of points and a shared washing area should be created in order to strengthen water saving measures.

The fresh fish related facilities will require a large amount of water for washing the floors, etc., and the use of ocean water rather than tap water is planned.

2) Drainage facilities

Drainage facilities will be installed at the new market which will include drainage facilities for rain water, toilet sewage water disposal, general wastewater, bloodly wastewater from fish, and dirty water stemming from washing activities.

(7) Electricity Supply

A power room will be installed near the water tower to furnish electricity for the lighting in the market, the outside lights, water pump, etc.

(8) Road/Parking Area

1) Road and parking

The project site will be divided between the main fishery related facilities on reclaimed land and the related retail facilities on the inland side and the Ocean Road will run between the two areas.

With the exception of the planned green areas of the market, the area will be

paved where needed. Parking space for the buyers and market-related personnel will be created within the boundaries of the market (30m) on both roads. In addition, parking space will also be created for loading and unloading purposes near the auction/hall building.

2) Bus stop

The West Ferry Point Terminal under construction in the adjacent lot will create parking space for 5 buses and 11 cars and it is anticipated to fulfil the function of a bus terminal for the surrounding area. A bus stop will be created for the bus route going towards West Ferry Point terminal since the market is a midway stop.

(9) Other Related Facilities

1) Public toilets

Presently, the toilet areas utilize the beach areas and pose extremely serious sanitation problems. The fish market in particular, has a large number of women retailers and food stall operators and many users also expressed a high demand for toilets in the interview survey.

2) Garbage area

The current market has installed one garbage collection cart which is collected and transported to the garbage dump by a private company. As there are no major problems with this system, the garbage cart will continue to be used at the new market.

3) Navigation aid

Since the fish landing wharf of the new fish market is situated only about 40m away from the existing channel of Dar es Salaam Port, navigation aids should be installed for safe navigation.

(10) Equipment

1) Fish containers

During the fish landing activities at the existing market, fish are usually transported using straw baskets capable of carrying 20kg of fish and ordinary buckets. During the auction, the fish are spread out on the floor for display and the fish which are sold, are transferred to the bucket of the buyer. Therefore, there is a great need for fish containers in order to improve efficiency and the sanitation standards of the auction.

2) Insulated fish box

The boxes are essential in storing and selling fresh fish. The current market does not have any refrigeration facilities and the insulated fish boxes greatly affect the fish quality. Presently, used Styrofoam boxes are utilised and the effectiveness of the boxes is an issue. Therefore, providing insulated fish boxes will effectively improve the revenue of the retailers.

3) Fish preparation palette

The task of cleaning and removing fish scales is presently carried out directly on the beach and there is a need to use a fish preparation palette for hygiene purposes and to protect the floors in this project.

4) Pushing cart and barrows

Fish boxes and push cars will be used in order to efficiently transport the fish from the boat to the auction building and a policy of increasing the transport volume of one trip is planned. In addition, the use of push carts will become possible since the interior of the market will be paved. Therefore, a two-wheel-drive transport vehicle will be provided by the Project in order to improve the efficiency of transporting the fish from the auction building to the processing plant (75m) and to other areas of the market.

5) Weighing scales

Due to the lack of weighing scales at the existing market, the DCC has had to rely on rough estimations of market statistics. Many of the buyers are distrustful about the practice of selling fish according to a roughly estimated volume. Therefore, it is appropriate that measuring scales that will be jointly used at the auction hall are provided as a means of improving market services for users and to increase the accuracy of market data.

6) Washing tank

Presently, fresh fish retailers and fish prepares use ocean water taken directly from the beach. Scaled fish, in particular, are directly washed in the sea. However, due to the wharf at the new market, this practice can no longer be carried out. As a countermeasure, a jointly-shared tank for washing fish will be installed near the work area in order to conform to the existing practice as much as possible.

Table 2.3.4 summarizes these necessary components.

Table 2.3.4 Outline of Facilities

Facilities	Purpose / Outline	Remarks
1.Fish landing Wharf	Fish landing wharf, stair, apron, fender, mooring, mooring ring, hand rail, carve stone	
2.Revetment & Land Reclamation	Revetment, parapet, apron, land reclamation	
3.Auction Hall Complex	Auction hall, Ice storage, Fish storage, Management office	
4.Fish Retail Market	Fish retailing	
5.Fish preparation Bldg.	Scaling, Taking out of fish gut	
6.Fish Fry Processing Bldg.	Fish Fry Processing	
7.Vegetable / Grocer's Bldg.	Vegetable, Grocer's and Food retailing	Grocer's related to fish retailers necessary
8.Fuel Retail Bldg.	Fire wood and charcoal retailing	Lot size of fire wood and charcoal is different
9.Cafeteria	Meal & food serving	Middle size and small size are required
10.Water Supply & Sanitary Facilities	Water reservoir, Water tower, Seawater intake, Washing Place, Waste water drainage, Soil water drainage, Rain water drainage and Septic tank	3 types of washing place: sink, sink + seawater well, sink for kitchen,
11.Power Supply Facilities	Power supply, Telephone and Announce equipment	
12.Road & Parking	Road, Parking and Bus stop	
13.Other Related Facilities	Public Toilet (2), Garbage yard (2), Street light, Watchmen box, Planting and etc.	

2.4 Basic Design Concept

2.4.1 Design Standards and Criteria

(1) Design Standard

Design standards for the waterfront facilities do not exist in Tanzania. The applied design standards are listed below.

- Design Standards for Fishing Port Facilities, 1990: Japan Fishing Port Association
- Technical Standards for Port and Harbor Facilities in Japan: The Overseas Coastal Area Development Institute of Japan.
- Manual for Asphalt Pavement: Japan Road Association
- Manual for Concrete Pavement: Japan Road Association

Regarding design standard for architectural facilities, the British Standard is adopted in Tanzania. Seismic and wind forces will be determined from the Japanese Standard

basically with consideration of the local information.

(2) Design Criteria

1) Estimated fish demand

The fish handling volume of the Banda Beach market is anticipated to increase in view of the surplus volume of natural resources at present and a high population growth rate surpassing 3.5 %. However, due to the market's extremely close proximity to the sea lanes of the commercial port, an increase in the number of fishing boats utilizing the Banda beach is highly problematic and there is a need to restrict the fish landing activities of the area. DCC has been planning to improve other fish landing site/market sites to meet a rise in fish demand and is currently implementing construction work to expand the existing Musasani market in anticipation of increased fish production and expanded fish marketing activities in future. Hence the scope of the facilities plan of this project is calculated based on the current number of shops and fish handling volume and it did not include the element of prospective increased demand into consideration.

2) The operation of the market

Based on the findings of the field study, the major activities of the market were organized as follows.

1. Type of activities	:Wholesale/retail of fishery products, fish processing, retail of fruits/vegetables and grocery, food and other service related business for market users
2. Market operating hours	:Opening time 06:00, closing time 18:00 (will follow the existing operating hours)
3. Number of market users	:1,000 buyers (during the peak hours of 07:00 to 10:00), and 1,000 market retailers
4. Handling volume per day	:30 tons (15% is large fish)
5. Ratio of distribution via wholesale (auction)	:100%
6. Average purchase volume of one retailer	:53kg for fresh fish retailer, 23kg for buyers (fried fish processors)
7. Fish landing conditions during peak hours	:16 boats/07:00 (average data for January 1999)
8. Size of the auction	:More than 100 people in four locations, 10 to 15 people in five locations (peak hours); transacted volume at one time 20kg

(3) Characteristic of Fishing Boats

Table 2.4.1 Utilization of Fishing Boat

Item	Criteria	Remarks
①Design Fishing Boat		
Weight	3 GT	Middle class
Length	8~12 m	Surveyed by DCC
Draft	1.5 m	Surveyed by DCC
②Acting Force by Boat		
Berthing velocity	0.5 m/sec	
Mooring Tractive force	9.8 kN/piece	

(4) Allowable Stress

Table 2.4.2 Allowable Stress

Materials	Allowable stress
Civil Engineering Portion	
Reinforced concrete Type 1	
(strength)	2.06 KN/cm^2 (210 kgf/cm^2)
(compressive stress)	0.68 KN/cm^2 (70 kgf/cm^2)
(shearing stress)	0.04 KN/cm^2 (4.5 kgf/cm^2)
Reinforced concrete Type 2	
(strength)	2.35 KN/cm^2 (240 kgf/cm^2)
(compressive stress)	0.78 KN/cm^2 (80 kgf/cm^2)
(shearing stress)	0.04 KN/cm^2 (4.5 kgf/cm^2)
Reinforced concrete Type 3	
(strength)	2.65 KN/cm^2 (270 kgf/cm^2)
(compressive stress)	0.88 KN/cm^2 (90 kgf/cm^2)
(shearing stress)	0.04 KN/cm^2 (4.5 kgf/cm^2)
Steel sheet pile SY30	
(tensile stress)	17 KN/cm^2 (1,800 kgf/cm^2)
(shearing stress)	9.8 KN/cm^2 (1,000 kgf/cm^2)
Steel pipe pile SKY41	
(tensile stress)	13 KN/cm^2 (1,400 kgf/cm^2)
(shearing stress)	7.8 KN/cm^2 (800 kgf/cm^2)
Architectural Portion	
Structural concrete	210 kg/cm^2 (20.6N/mm^2)
Plain concrete	150 kg/cm^2 (14.7N/mm^2)
Pile	180 kg/cm^2 (17.7N/mm^2)
Reinforcing Bars	

JIS SD 295A	3,000 kg/cm^2 (295N/mm^2)
JIS SD 345	3,500 kg/cm^2 (345N/mm^2)
BS 4449	4,180 kg/cm^2 (410N/mm^2)

Source: Technical Standards for Port and Harbor Facilities in Japan

2.4.2 Natural Conditions

(1) Geology

Three offshore and two onshore borings were carried out during the field survey as shown in Figure 2.4.1. Based on the results of the soil investigations, soil layers are assumed in designing a fish landing wharf, revetments, fishery related buildings. The soil characteristics at the Project site seem complicated and there seems to be a soil layer containing a coral lime stone on the surface. N-values at the Project area vary, depending on the places. Weak soil layers with N-values of 5 or less have been found at DL-10m. In determining design structures, such soil conditions should be carefully considered.

(2) Climate

1) Temperature

Temperatures in Dar es Salaam are summarized in Table 2.4.3.

Table 2.4.3 Mean Temperatures in Dar es Salaam

Month	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug	Sep.	Oct.	Nov.	Dec.
Mean Temp. (°C)	27.5	27.6	27.4	26.5	25.5	24.1	23.6	23.7	24.3	25.2	26.3	27.3

Source: Meteorological Agency

2) Precipitation

Table 2.4.4 shows the precipitation in Dar es Salaam from 1996 to 1998.

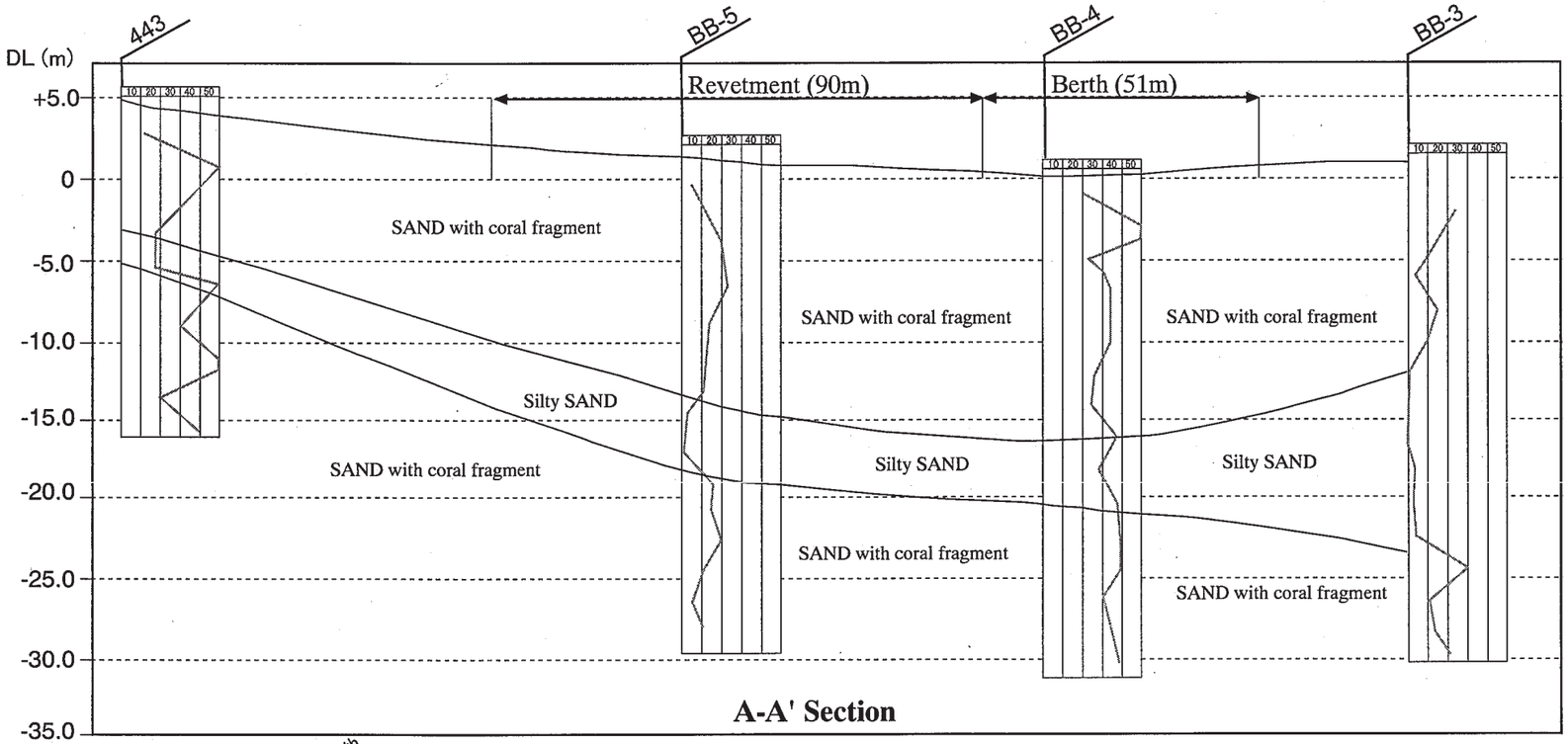
Table 2.4.4 Monthly Precipitation in Dar es Salaam (1996-1998)

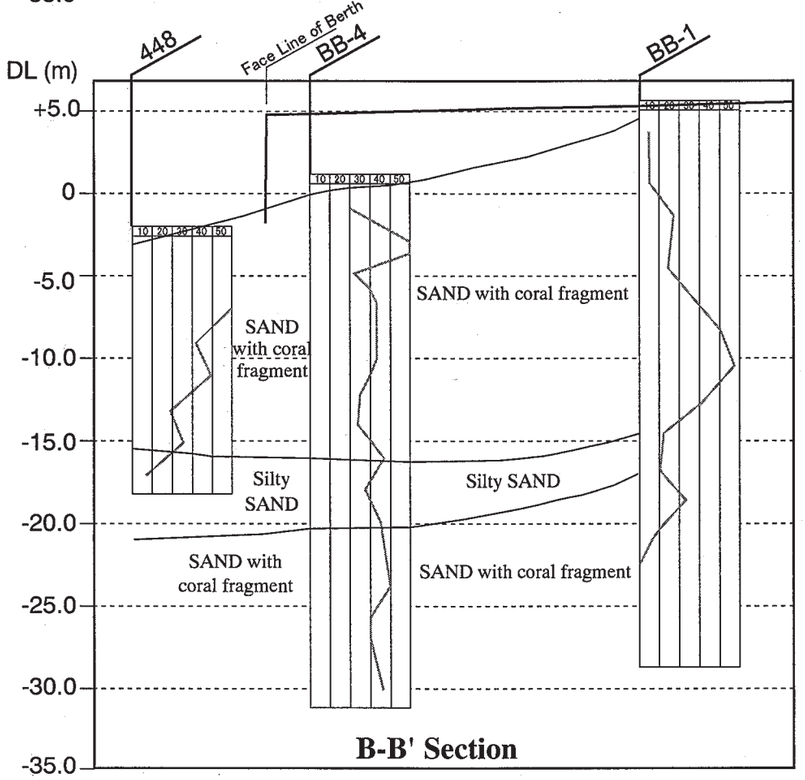
Unit : mm

Year	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Total
1996	37.2	120.5	197.9	111.2	313.4	9.0	18.4	0.0	16.2	71.6	0.0	3.3	898.7
1997	0.0	0.0	272.9	198.6	108.4	162.2	6.6	5.0	13.5	243.7	159.1	71.4	1241.4
1998	0.0	51.4	25.9	185.3	60.8	0.0	5.7	0.4	19.0	17.3	78.4	0.0	444.2

Source: Meteorological Agency

Precipitation data are summarized in Table 2.4.5 for reference to establish a construction planning.





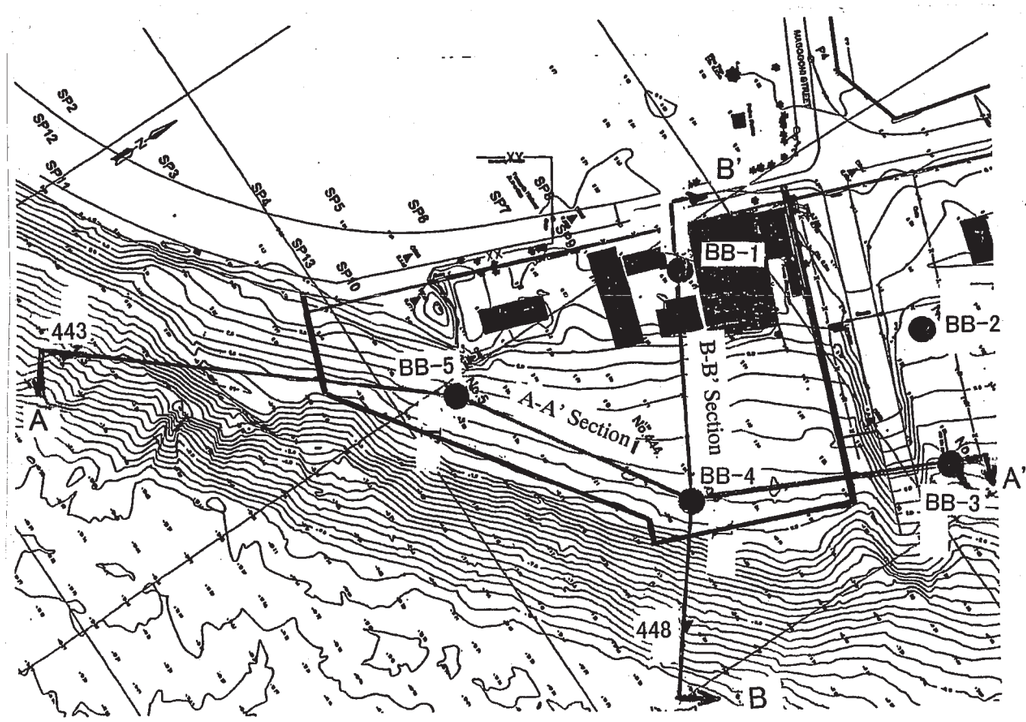


Figure 2.4.1 Locations of Boreholes and Assumed Soil Layers

Table 2.4.5 Number of Rainy Days in Dar es Salaam

	More than 10mm/day	20mm/day	30mm/day	40mm/day
1996	29 days	19days	10 days	5 days
1997	37days	18 days	16 days	10 days
1998	11 days	5 days	4 days	4 days

Source: Analysis by the JICA Study Team

3) Wind

Wind records from 1990 to 1996 in Dar es Salaam are shown in Table 2.4.6.

Table 2.4.6 Wind Records (1990-1996)

1Knot=0.5144m/s

Speed	Direction																	Total
(knots)	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	Calm	
1 to 3	1	1	1	2	3	2	2	3	8	3	1	1	1	0	0	0		28
4 to 6	3	7	7	8	12	8	6	13	25	14	7	5	3	1	1	2		119
7 to 10	8	14	14	14	15	8	7	14	21	6	4	2	1	1	0	1		132
11 to 16	3	8	6	7	5	4	3	5	5	1	1	0	0	0	0	1		49
17 to 21	1	1				1	1	1										5
Over 22																		
Total	16	31	29	30	34	23	18	35	60	24	12	9	5	2	1	4	31	365

Source: Meteorological Agency

The maximum wind velocity is set to be 30m/s, referring to previous design data on buildings in Dar es Salaam.

(3) Wave

1) Deepwater wave

Since there are no wave records at Dar es Salaam Port, Global Wave Statistics published by British Maritime Technology is utilized in determining the design wave height at the fish market. Global Wave Statistics comprises worldwide significant wave data categorized by wave height, direction, and period. The data of deepwater waves at the No.59 area have been used as summarized in Table 2.4.7.

Table 2.4.7 Distribution of Deepwater Waves at No.59 Area

Height(m)	NW	N	NE	E	SE	S	SW	W	Total
7-8					3				3
6-7			3	2	7	4	1		17
5-6		1	8	5	20	23	9		66
4-5	1	5	32	23	62	93	37	2	254
3-4	7	30	141	90	208	328	122	7	933
2-3	32	126	502	318	611	930	322	24	2,865
1-2	106	344	1,200	861	1,323	1,662	545	70	6,112
0-1	156	269	770	956	1,018	818	274	91	4,351
Total	303	776	2,655	2,254	3,251	3,857	1,311	193	14,600

Source: Global Wave Statistics published by British Maritime Technology

In order to forecast a possible significant wave height with return period, Gumbel and Weibull distribution models are applied and an ideal formula is adopted. Based on the formula, deepwater wave heights offshore of Dar es Salaam with return period are calculated as shown in Table 2.4.8. The period of the waves is 8 seconds.

Table 2.4.8 Deepwater Wave Heights

Possibility(year)	5	10	20	30	40	50
Wave Height(m)	6.8	7.1	7.5	7.7	7.8	7.9

Source: Analysis by Study Team

2) Shallow water wave

The fish market faces northeast so waves from the northeast attack directly. However, since reefs surround the shoreline of Dar es Salaam, the offshore waves break at the reefs and the wave height becomes low accordingly.

The following describes how deepwater waves are changing. Tide elevation DL+3.7m is applied in determining a design wave height since its condition would cause the highest wave.

a. Effect of Nyakatombe Island

Nyakatombe Island exists offshore of Dar es Salaam Bay and is surrounded by reefs. Waves from the northeast are affected by the island and the height of the waves in front of the reef decreases accordingly before entering Ras Chokir (A-point).

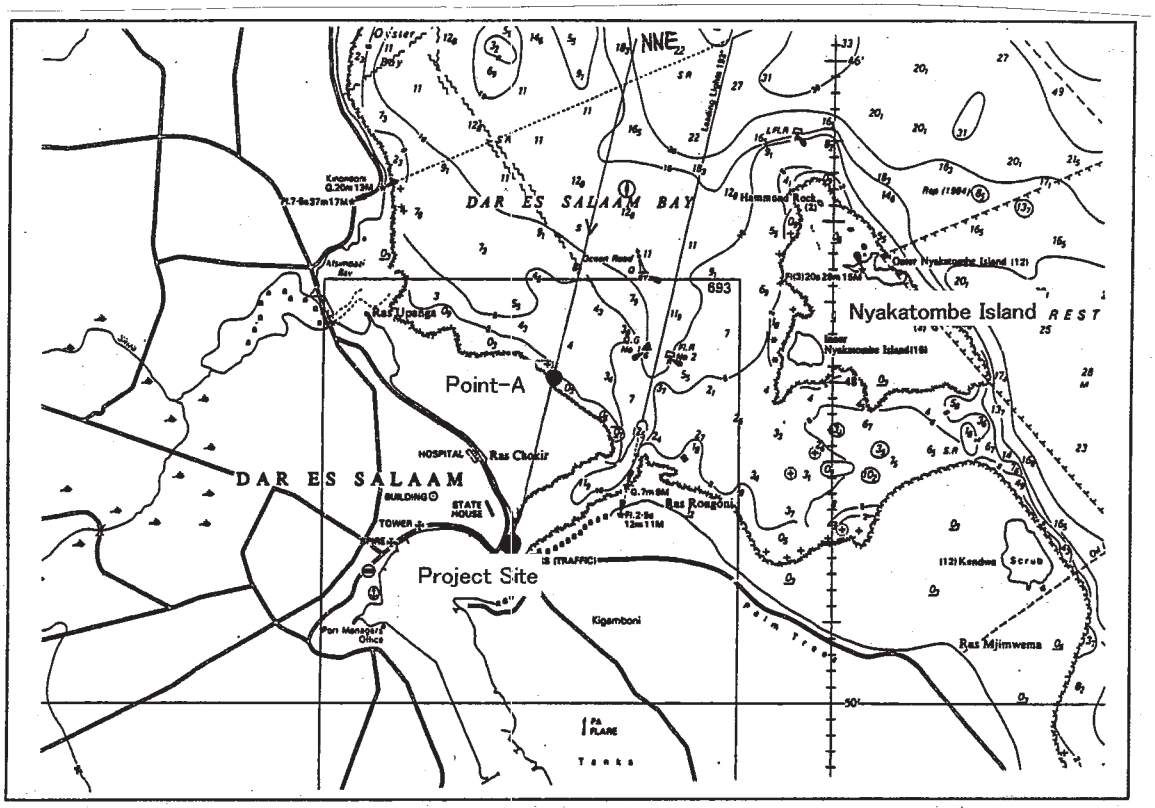


Figure 2.4.2 Offshore Area of Dar es Salaam

b. Wave height over reef

The Takayama's formula is applied in calculating a wave height over the reef. The formula considers a wave height increase at the reef edge. The wave height over the reef decreases due to the friction with the reef.

c. Result of wave height analysis at fish market

In determining a significant wave height at the shallow area, the most critical wave direction is north-northeast. Table 2.4.9 shows the wave heights at Point-A and the fish market with return period. A significant wave height at the fish market with a 50-year return period is 1.65m.

Table 2.4.9 Wave Height($H_{1/3}$) at Point A and Fish Market (unit:m)

	Return Period					
	5 Years	10 Years	20 Years	30 Years	40 Years	50 Years
Point A	5.3	5.5	5.9	6.0	6.1	6.2
Fish Market	1.62	1.62	1.63	1.63	1.63	1.65

Source: Analysis by Study Team

(4) Tide

Tidal records at Dar es Salaam Port can be applied at the fish market. The various tidal elevations are shown as follows.

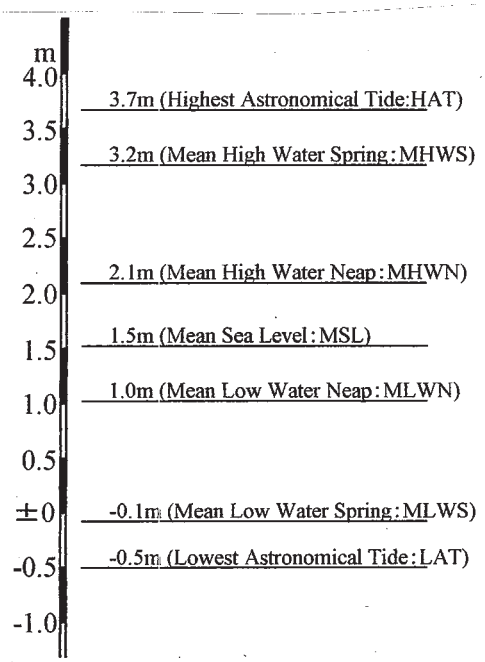


Figure 2.4.3 Tide Levels

(5) Current

The tidal difference at Dar es Salaam Bay reaches 3.3 meters on average during the spring tide. According to Chart No.693 of the British Navy, the maximum current speed is 3 knots. Since the estuary of Dar es Salaam Bay was widened by a World Bank financed channel project, the current speed has been assumed to be slow. According to the result of the current speed observation during the field survey, the speed reached 0.55 m/sec during the spring tide and 0.37m/sec at the neap tide.

Table 2.4.10 Result of Current Observation

Observation Date	Maximum Speed		Minimum Speed	
	Speed(m/s)	Direction	Speed(m/s)	Direction
July 28 (Spring)	0.47	N	0.09	SW
July 29 (Spring)	0.36	SW	0.05	NE
July 30 (Spring)	0.55	N	0.05	SW
Aug. 4 (Neap)	0.36	E	0.05	NE
Aug. 5 (Neap)	0.32	SE	0.09	W
Aug. 6 (Neap)	0.37	W	0.14	S

Source: Result of Field Survey

(6) Littoral Drift

The following has been considered in investigating whether or not littoral drift will occur and how it will affect the structures.

Compared with aerial photos in 1975 and 1992, the shoreline in front of the State House has been shifted 70m offshore as shown in Photo-1. Sand drifts in this area.

On the other hand, the foundation of a building near the fish market was eroded from attacking waves. According to a hearing conducted at the site, it happened after the dredging work of the existing channel. The waves were able to attack directly after the beach was demolished. Therefore, since this scouring phenomenon is expected to continue in the future, some protection is necessary.

In order to grasp the existing oceanographic conditions that would cause the littoral drift, the following has been investigated.

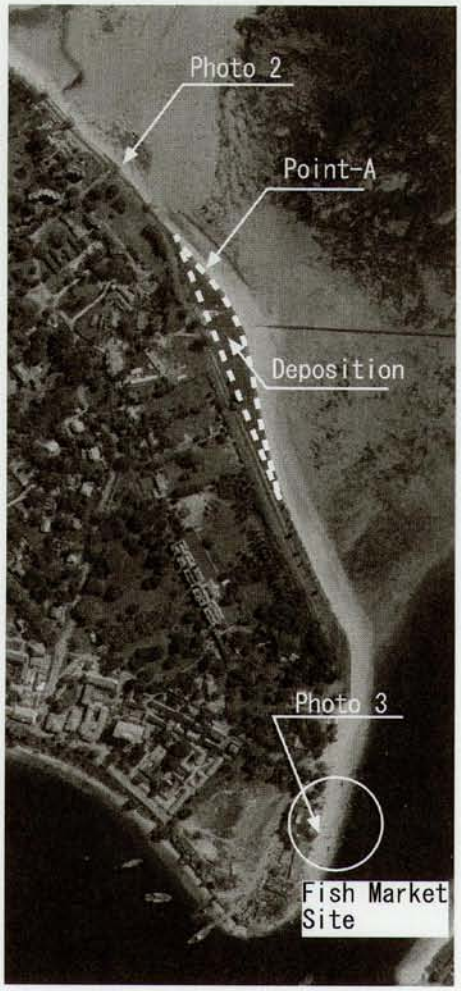
The sand movement has two kinds, surface sediment and total sediment movements. Based on the hydrologic formulas, the critical water depth for surface sediment movement is calculated as follows.

Waves	:	1.65m (50-year return period)
Seabed material	:	Mean particle size 0.15mm
Tide elevation	:	DL+3.7m (HAT)

The critical water depth for sand movement is calculated at 9.5m under these conditions. Therefore, the critical water depth is adjusted to DL-5.8m.

Taking into full account these factors that affect the littoral drift, structures of the berth and revetment should be designed carefully to protect from the littoral drift. It is revealed that seabed sediments more shallow than DL-6.0m may be affected by the littoral drift.

Aerial Photo in 1975



Aerial Photo in 1992

Photo 1: Point-A,
Shoreline was moved.

Photo 2: Revetment near Point-A
Sand inside was scoured.

Photo 3: Old Ice Plant
The foundation was scoured by waves.

(7) Water Quality

Water quality tests were carried out during the field survey at two spots near the fish market with to grasp existing water qualities. Table 2.4.11 shows water qualities measured during the spring and neap tides.

According to the standards of NEMC, these values are under the environmental limit.

Table 2.4.11 Water Qualities

	Temp.	Ph	COD (mg/L)	BOD (mg/L)	SS (mg/L)	DO (mg/L)
Spot 1 (Spring)	22.4	8.20	11.89	0.16	7.0	0.53
Spot 1 (Neap)	23.1	8.00	11.80	0.09	9.0	0.53
Spot 2 (Spring)	22.5	8.16	11.91	0.14	8.0	0.49
Spot 2 (Neap)	23.3	7.98	11.31	0.04	10.0	0.31

Source: Result of Field Survey

(8) Seabed material

Three seabed materials were taken during the field survey near the fish market. The mean particle sizes are 0.35mm, 0.83mm and 0.15mm. The distribution curve indicates that the seabed is composed of less than 5 % silty soil.

Live corals have not been found at the Project area.

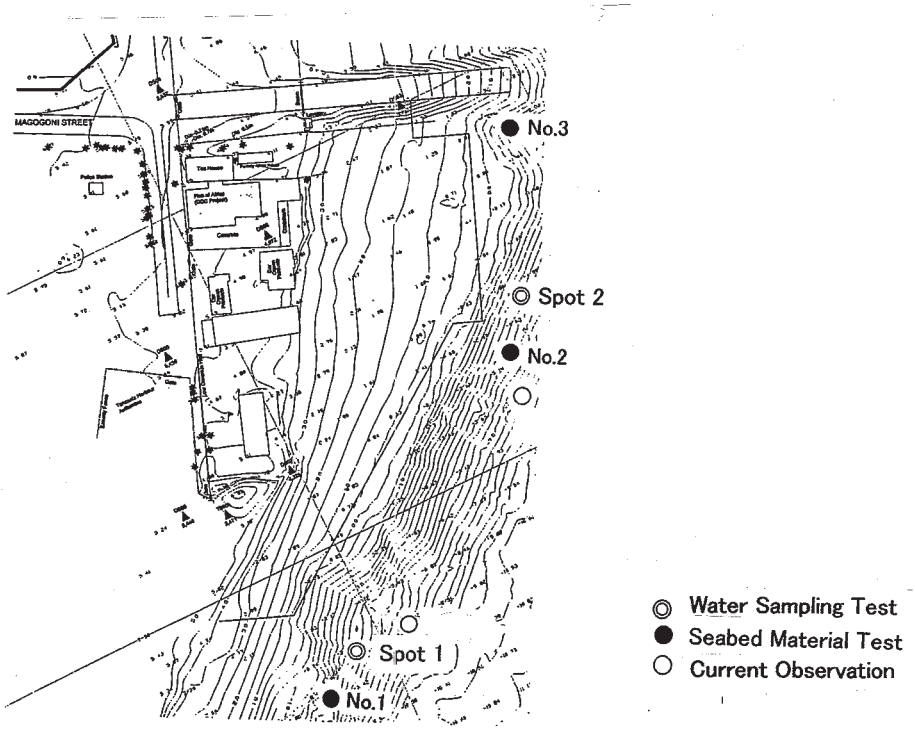


Figure 2.4.4 Spots of Water Quality, Seabed Material Tests, and Current Observations

(8) Earthquake

Few earthquakes occur in Dar es Salaam. According to the National Earthquake Information Center (NEIC), earthquakes bigger than magnitude 5 since 1975 within a 400km-radius from Dar es Salaam are tabulated in Table 2.4.12.

The seismic coefficient is calculated using a formula defined in the Japan Road Manual.

Table 2.4.12 Earthquake Records around DAR and Seismic Coefficient

Date	Latitude	Longitude	Distance to Epicenter	Magnitude	Horizontal (gal)	Seismic Coefficient
1977/01/04	7.43S	38.52E	109km	5.20	24.20	0.03
1983/05/09	4.21S	37.78E	333km	5.30	8.08	0.01
1986/04/28	8.67S	38.95E	207km	5.00	10.93	0.01
1990/03/13	3.99S	39.92E	319km	5.30	8.48	0.01
1995/12/08	4.47S	38.79E	264km	5.00	8.41	0.01

Source: National Earthquake Information Center (NEIC)

The design seismic coefficient is calculated as follows.

Design seismic coefficient = (actual seismic coefficient) x (soil condition factor) x (importance factor)

Where,

Actual seismic coefficient: 0.03

Soil condition factor : 1.2 is applied since the thickness of a sand layer is more than 25m and a weak soil layer exists

Importance factor : 1.0 is applied.

Therefore,

Design seismic coefficient=0.03 x 1.2 x 1.0 =0.04

The design seismic coefficient is rounded to 0.05.

2.5 Facilities Layout Plan

2.5.1 Fish Circulation Plan

The main facilities of the Project are:

1) Fish landing facilities
2) Auction hall complex
3) Fish retail market
4) Fish preparation
5) Fish processor
6) Related retail market
7) Foods shops and cafeterias

Figure 2.5.1 shows flow of fish and commodities in the market.

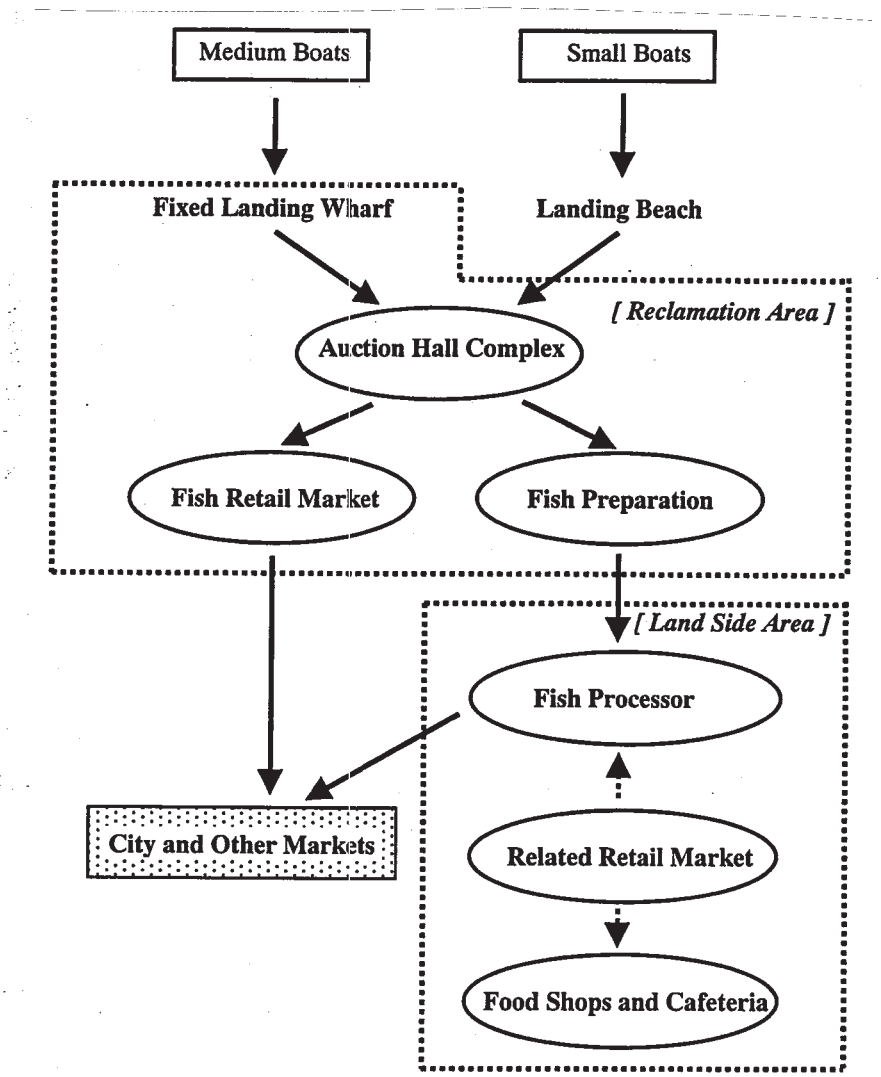


Figure 2.5.1 General Flow of Fish and Commodity in Fish Market

Among these facilities, it is recommended to place facilities 1) to 4) closely to each other considering the following reasons:

- The movement of fish in the market should be as short as possible to minimize damage. To this end, fish landing wharf for medium boats should be constructed near auction hall.
- The facilities where fish is handled in the market shall be centralized in one place, since it is recommended to keep those facilities causing smell away from the State House as much as possible.
- In order to maintain good sanitary conditions of the fish market, the floor of the facilities 2) to 4) should be washed frequently. It is recommended to use sea water for that purpose, as the cost of tapped water from the city is relatively expensive. Therefore the facilities 2) to 4) should be placed in close location.
- In order to meet the environmental requirement, discharged waste water shall be treated in the market. Wastewater will be discharged mainly from facilities 2) to 4) and wastewater shall be led to the treatment facility in the shortest way.
- Facilities 2) and 3) require ice for storing of fish. For smooth and efficient supply of ice, it is necessary to arrange these facilities in close proximity.

Considering these reasons, it is essential to locate facilities 1) to 4) near the shore. Similarly the movement of commodities and personnel such as markets retail traders and visiting consumers among the other market facilities is expected to a certain degree. It is advisable to arrange all facilities in the same location from a viewpoint of commodity and personnel movement, but these should be laid out separately in two locations for to the following reasons:

- In this project, the possible area for seaside reclamation is quite limited.
- The land area adjacent to the site, which is currently used by the market traders and shops, has very limited vacant areas. In order to minimize the relocation of a considerable number of those traders, only limited area will be used by this Project.
- Some traders and shops currently operated in the area cannot be accommodated by this Project. It is necessary for DCC to secure land for those people and the inland area is the best location for the future expansion of market activity.

As such, the facilities mainly handling fish, 1) to 4), will be placed in the seaside reclamation area and other related facilities will be in the inland area.

Detailed layout plan of each facility are discussed in the proceeding section.

2.5.2 Facilities Layout Plan

In order to facilitate the flow of the fish and to enable easy drainage and sanitation

maintenance, the major facilities related to fresh fish handling will be located on the ocean side. The fish processing, vegetable and fruits, and other related facilities will be located on the inland side of the site. The following factors were considered in determining the location of each facility:

(1) Auction Hall Complex

The auction hall which also functions as a handling facility will be constructed behind the fish landing wharf in order to minimize the facility's distance to the wharf. In addition, in order to enable easy transport of the fish, the facilities will be located adjacent to the parking space and main road. Ice and fish storage facilities will be installed since the market will be responsible for packing the fish in ice and storing the leftover fish for the next day's auction. Other factors which were taken into consideration are as follows:

- In order to maintain the freshness of the landed fish, the facilities will be located away from direct sunlight as much as possible.
- The auction hall is congested with fishermen and retailers. Therefore, an adequate amount of space around the facilities was allocated in order to accommodate the auctioneers and retailers waiting for the fish landings and the auctions through the day.
- Presently, the fish catch is not transported by truck, but in anticipation of truck transport services in future, space that will enable the truck to park at the side of the facilities for easy loading will be created.

(2) Fish Preparation /Fish Retail Building

Both facilities will be located adjacent to the auction hall complex since the retailers prepare and sell the fish purchased at the continuously held auctions. In addition, these two facilities will be placed in the same section since they generate waste water and fish remains, elements that deteriorate the environment, in order to enable the combined disposal of waste water.

(3) Fried Fish Processing Building

In order to secure an efficient fish flow of auction→fish preparation→processing, to enable easy transport of the fish, and in view of the stench and other environmental factors, the fried fish processing section will be located in the western end of the market. In addition, the fuel retailers of firewood, charcoal and food oil and other related businesses will be located nearby. The location of the fuel shops will have easy access to the market road in order to minimize the distance of transporting the unloaded firewood and charcoal to the shop.

(4) Related Retail Market

The vegetable/fruit and sundry shops will be located next to the parking area since the goods are delivered to the market by motor vehicle. In addition, they will be located next to an extended lot in order to enable expansion in future. The cafeteria will be located on the south side of the reclaimed land, due to its strong affiliation with the fishermen.

(5) Parking and Road

The parking area will be located within the area of the right of way since its use is restricted by the road planning law.

A green area for retailers and other market related personnel will be located as a waiting or rest area. Plants will be planted along the road and on the side adjacent to the president house to improve the surrounding environment. The existing trees will remain untouched as much as possible.

The facilities layout plan with circulation of fish is shown in Figure 2.5.2.

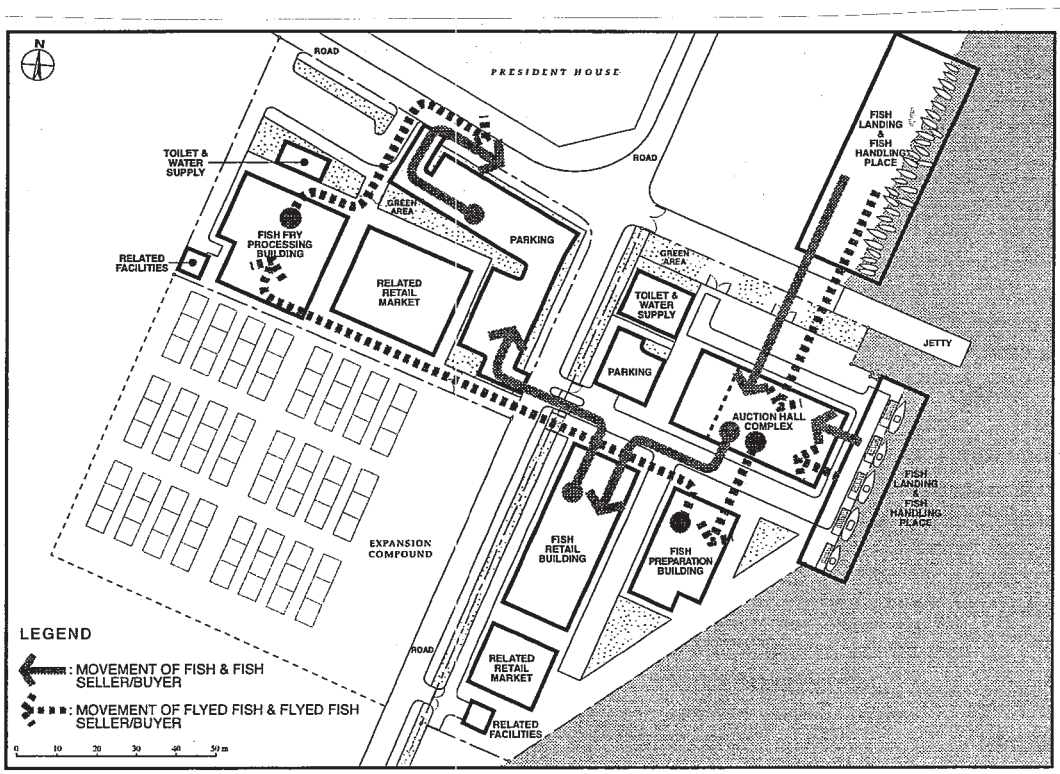
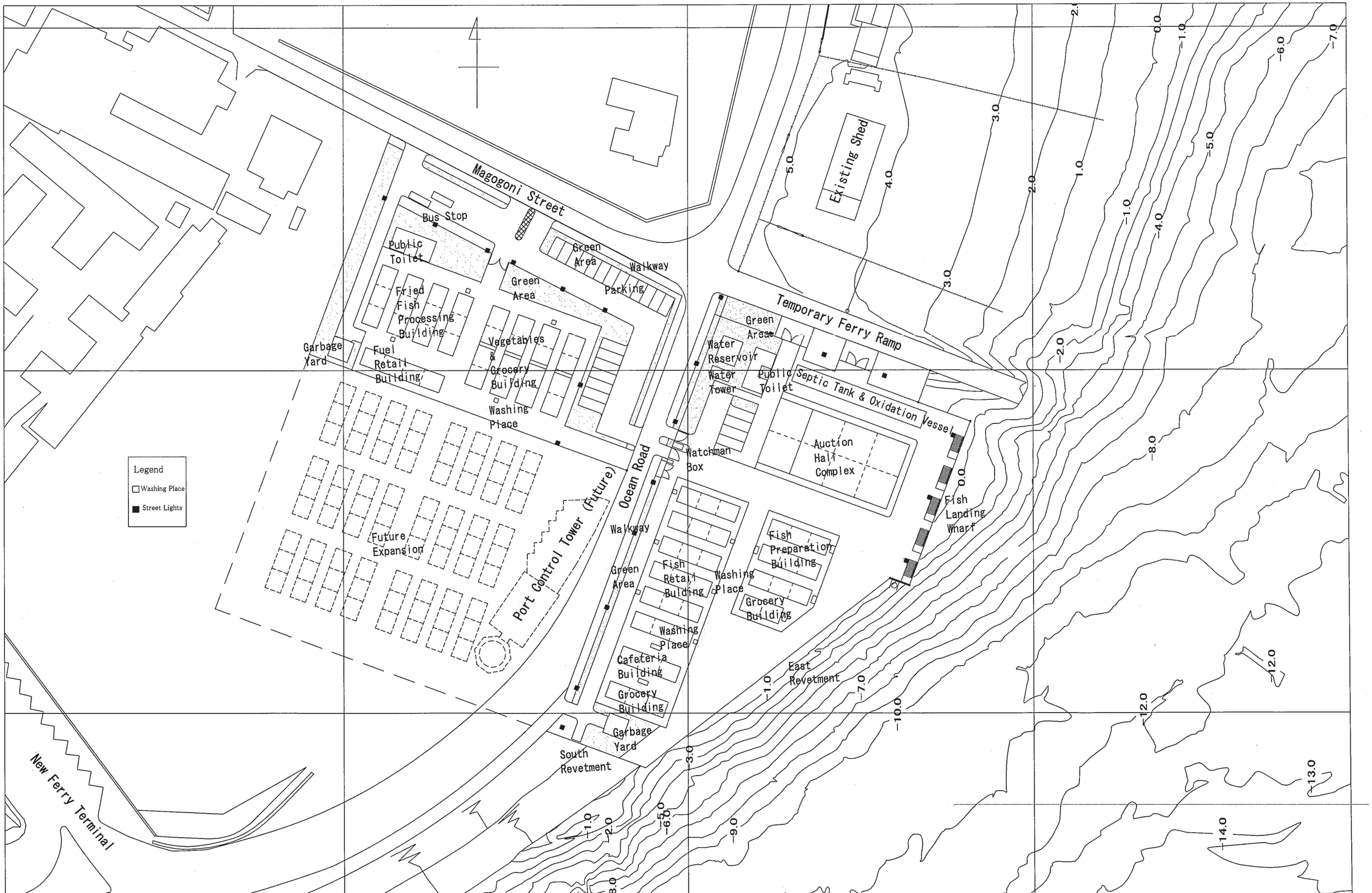


Figure 2.5.2 Facilities Layout Plan with Circulation of Fish

Based on the basic facilities layout plan with circulation of fish, the optimum layout has been determined as shown in Figure 2.5.3.



UNITED REPUBLIC OF TANZANIA BASIC DESIGN STUDY ON THE PROJECT FOR CONSTRUCTION OF DAR ES SALAAM FISH MARKET	JAPAN INTERNATIONAL COOPERATION AGENCY NIPPON KOEI CO.,LTD. SYSTEM SCIENCE CONSULTANTS INC.	DWG.TITLE **Figure 2.5.3 Facilities Layout Plan**	SCALE 1:1000	DWG.NO. 2 - 38