

Chapter 27 Master Plan of Ports for 2020

27.1 Required port facilities and equipment for major ports in Hanoi segment

27.1.1 Required length and depth of berth for major ports

Expected cargo throughput of ports/Berths in the Hanoi segment in 2020 is 17.2 million tons and 67 thousand TEUs (see **Table 27.1.1**).

Cargoes at Berths shall be handle at the existing and transferred sites by improving only in terms of handling efficiency without extension of infrastructures.

In order to handle increasing cargoes at major ports of Hanoi, Khuyen Luong, New North and New East, 3.0km of berth (additional length: 2.3km) will be required in 2020 assuming the average yearly throughput capacity to be 4,800 tons/m for bulk cargo, 2,400 tons/m for non-bulk cargo and 1,500 TEUs/m for container at these major ports (see **Table 27.1.2**, **Table 27.1.3** and **Figure 27.1.1**).

It should be noted that in case of a detached pier type berth, if less trucks are allocated timely to the berth than required, cargo handling efficiency will suffer since vessels will be forced to wait and equipment will remain idle. Therefore it is recommended that a standard type berth (those connected to land area) shall be adopted when constructing a new berth.

Required water depth of berth is 2.5m below the 95% water level for vessels/barge trains deployed in the RRD and 3.6m for Sea-cum-river vessels.

Table 27.1.1 Cargo Throughput of Ports/Berths in Hanoi Segment (2020)

Port	Cargo Throughput (1000tons)						Total	Container (1000TEUs)
	Construction Material	Cement	Fertilizer	Coal	Paddy/Rice	Others		
Hanoi Port	220	415		114	307	183	1,238	
Khuyen Luong Port	1,958	415	182	212	307	183	3,257	
New North Port	2,797	311		79		62	3,250	
New East Port	839	934		238		185	2,197	67
Chem Berths	2,128	315				93	2,536	
Sub-total	7,942	2,391	182	643	614	706	12,478	67
Other Berths	3,088	1,017		218		428	4,751	
Total	11,030	3,408	182	861	614	1,135	17,229	67

Source) JICA Study Team

Table 27.1.2 Converted Berth Length of Hanoi & Khuyen Luong Ports

Port	Berth	Dimension of Berth					Converted Berth Length (m)	Note
		Length (m)	Type		Crown Elevation			
			Description	Capacity Ratio	(m)	Capacity Ratio		
Hanoi	B2	20	Detached Pier	50%	+8.5	90%	9	
	B3	50	Detached Pier	70%	+11.5	100%	35	
	B4	18	Detached Pier	50%	+8.5	90%	8	
	N0.1	55	Detached Pier	70%	+11.5	100%	39	
	No.2, 3	40	Detached Pier	70%	+11.5	100%	28	
		40	Detached Pier	70%	+11.5	100%	28	
		62	Detached Pier	70%	+11.5	100%	43	
	T4	12	Detached Pier	50%	+8.0	87%	5	
	No.4,5,6	40	Detached Pier	70%	+11.5	100%	28	
		40	Detached Pier	70%	+11.5	100%	28	
		40	Detached Pier	70%	+11.5	100%	28	
		47	Detached Pier	70%	+11.5	100%	33	
	No.7	50	Standard	100%	+9.0	93%	46	
	T8	14	Detached Pier	50%	+8.5	90%	6	
No.8	40	Standard	100%	+9.5	95%	38		
Total	568					403		
Khuyen Luong	No.1	22	Standard	100%	+7.5	88%	19	
	No.2	84	Standard	100%	+10.15	98%	82	
	No.3	30	Detached Pier	50%	<+10.0	98%	15	Planned
	No.4	30	Detached Pier	50%	<+10.0	98%	15	Planned
	Total	166					131	

- Note)
1. Converted berth length is equivalent, in terms of throughput capacity, to berth length of standard type berth with high crown elevation.
 2. Capacity ratio of crown elevation +11.5m at HN Port is set to 100%.
 3. Berth No.3 and No.4 of Khuyen Luong Port will be completed before 2010.

Source) JICA Study Team estimation

Table 27.1.3 Required Length of Cargo Berth in 2020

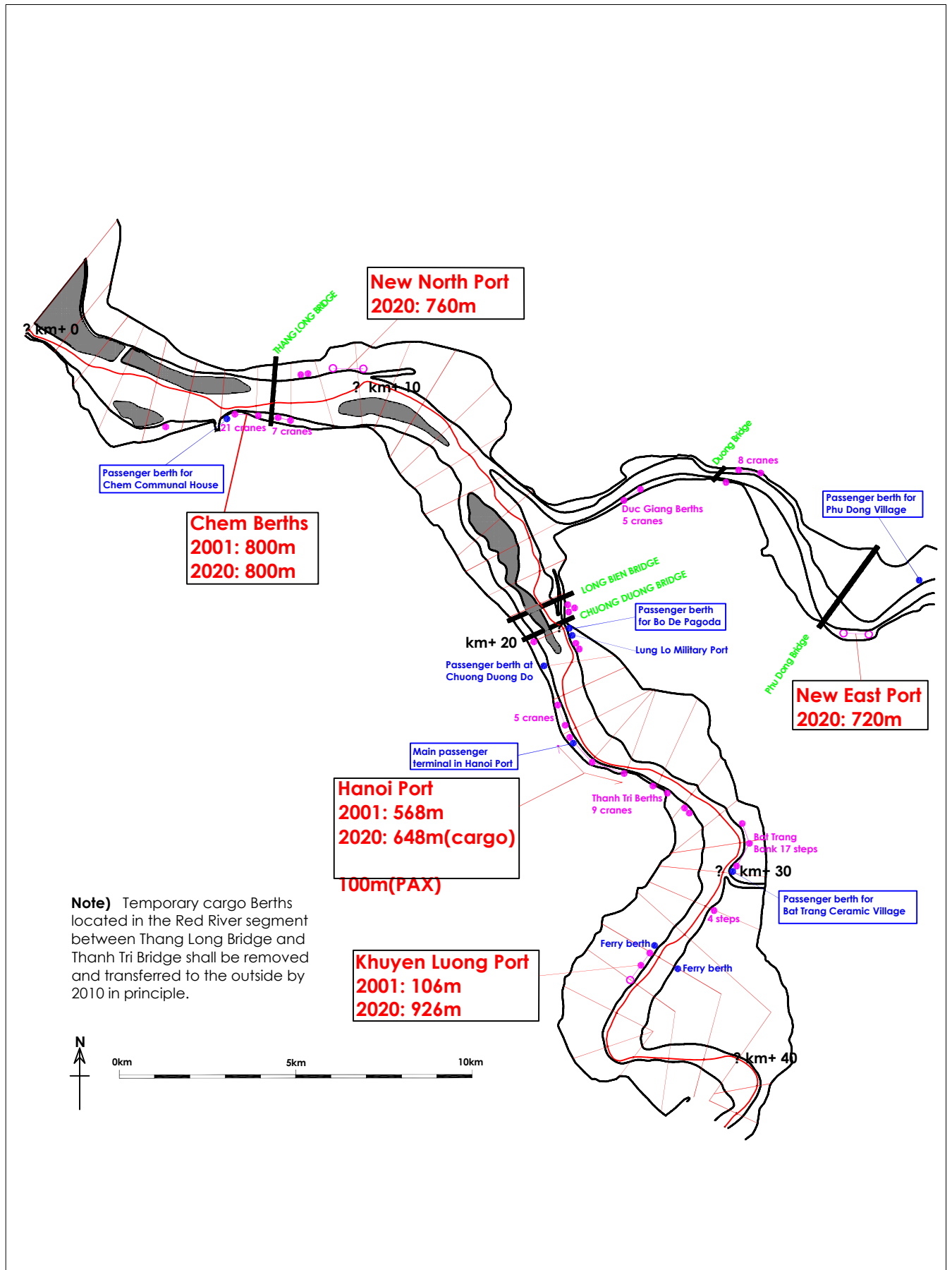
Port	Required Length of Berth (m)										
	Construction Material	Cement	Fertilizer	Coal	Paddy/Rice	Others	Container	Total	Existing (Converted)	Additional	Additional Planned
Hanoi Port	46	173		24	128	76		446	403	44	80
Khuyen Luong Port	408	173	76	44	128	76		905	131	774	760
New North Port	583	130		17		26		755		755	760
New East Port	175	389		50		77	45	735		735	720
Total	1,211	865	76	134	256	255	45	2,842	534	2,308	2,320

Note) 1. Throughput capacity

Bulk (ton/m/y)	Non-bulk (ton/m/y)	Container (TEU/m/y)
4,800	2,400	1,500

2. Additional planned berth lengths are set as a multiple of 40m.

Source) JICA Study Team



Note) Kilometrage goes downstream along the talweg of January 2002.
Source) JICA Study Team

Figure 27.1.1 Location of Ports/Berths (2020)

27.1.2 Required handling equipment for major ports

In order to realize the above-mentioned average yearly throughput capacity at major ports (4,800 tons/m for bulk cargo, 2,400 tons/m for non-bulk cargo and 1,500 TEUs/m for container), various cargo handling equipment will be required. For bulk cargoes, quayside mobile crane, grab bucket, shovel loader, bulldozer and dump truck will be used and for non-bulk cargoes, quayside mobile crane, forklift, truck and pallet will be needed. Quayside mobile cranes can be utilized both for bulk cargo and non-bulk cargo through changing grab attachment of a crane. For containers, quayside mobile crane (heavy type), forklift (heavy type), tractor and trailer will be used.

In the four major ports in the Hanoi Segment, fifty five (55) 8tons (r=20m) type quayside mobile cranes, twenty nine (29) grab buckets, eighty seven (87) 3tons type forklifts, twenty (20) shovel loaders, nine (9) bulldozers, fifty four (54) dump trucks and fifty eight (58) trucks will be required. In addition, in New East Port two (2) 30tons (r=20m) type quayside mobile cranes, four (4) 37tons type forklifts and six (6) tractors and trailers will be required for handling containers. (see **Table 27.1.4**)

Table 27.1.4 Required Handling Equipment for Major Ports (2020)

Port	Throughput (1000 tons)			Berth Length (m)			Required Handling Equipment										
							Quayside Mobile Crane		Grab Bucket	Forklift		Shovel Loader	Bulldozer	Dump Truck	Truck	Tractor + Trailer	Pallet
	Bulk	Non-bulk	Container (1000TEU)	Bulk	Non-bulk	Container	30tons (r=20m)	8tons (r=20m)	3cu.m 3.1x1.75	37tons	3tons	2 cu.m	5tons	10tons	7tons	container	wooden 1.2x1.8
Hanoi Port	333	905		69	377			9	2		23	1	1	3	15		2,700
Khuyen Luong Port	2,170	1,087		452	453			18	10		27	7	3	18	18		3,300
New North Port	2,877	373		599	155			15	12		9	9	3	24	6		1,100
New East Port	1,078	1,119	67	225	466	45	2	13	5	4	28	3	2	9	19	6	3,400
Total	6,458	3,484	67	1,345	1,452	45	2	55	29	4	87	20	9	54	58	6	10,500

Note) Required No. of units

Quay-side mobile crane:	0.8	units @ 40m for Bulk & Non-bulk
Quay-side mobile crane (heavy):	1.0	unit @ 40m for Container
Grab bucket:	1.0	unit @ Quay-side crane for Bulk
Forklift:	3.0	units @ Quay-side crane for Non-bulk
Forklift (heavy):	2.0	units @ Quay-side crane for Container
Shovel loader:	3.0	units @ 1 million tons of Bulk
Bulldozer:	1.0	unit @ 1 million tons of Bulk
Dump truck:	2.0	units @ Quay-side crane for Bulk
Truck	2.0	units @ Quay-side crane for Non-bulk
Tractor & Trailer:	3.0	units @ Quay-side mobile crane for Container
Pallet:	3,000	units @ 1 million tons of Non-bulk

Source) JICA Study Team

27.1.3 Required land space for major ports

In a major port, space for storage yard (construction material and coal), warehouse, road, utility and reserve area is required. And in a port handling containers, ICD (inland container/clearance depot) consisting of CY (container

yard), CFS (container freight station) and DC (distribution center) is also needed. Total area required for major ports in 2020 will be 49ha (Hanoi Port: 7ha, Khuyen Luong Port: 14ha, New North Port: 11ha and New East Port: 18ha (including 6.7ha for ICD) (see **Table 27.1.5**).

Table 27.1.5 Required Land Space for Major Ports (2020)

Port	Throughput (1000 tons)				Berth Length (m)				Required Land Space							
	Construction Material	Coal	Non-bulk	Container (1000 TEU)	Construction Material	Coal	Non-bulk	Container	Storage Yard		Warehouse	ICD (CY) (CFS) (DC)	Road	Utility	Reserve	Total
									Construction Material	Coal						
Hanoi Port	220	114	905		46	24	377		3,181	2,961	15,739		20,091	13,394	11,603	66,970
Khuyen Luong Port	1,958	212	1,087		408	44	453		28,379	5,529	18,901		40,723	27,148	15,062	135,742
New North Port	2,797	79	373		583	17	155		40,542	2,073	6,487		33,965	22,643	7,505	113,216
New East Port	839	238	1,119	67	175	50	466	45	12,163	6,220	19,462	67,000	33,095	22,064	17,315	177,318
Total	5,814	643	3,484	67	1,211	134	1,452	45	84,265	16,783	60,590	67,000	127,874	85,249	51,485	493,246

Note) Calculating formula: $A = (N / D) \times p \times u \times t / (w \times e)$ for Storage yard and Warehouse

A: Required area (sq.m)			
N: Annual cargo-wise throughput (tons/year)			
D: Annual available working days (days)	345	345	345
p: Peaking factor to daily average	1.5	1.5	1.5
u: Area use ratio	0.6	0.6	0.6
t: Dwelling time (days)	10.0	10.0	10.0
w: Cargo weight per space (tons/sq.m)	3.6	2.0	3.0
e: Area efficient ratio	0.5	0.5	0.5

Note) ICD area: 1,000 sq.m per 1000TEU port throughput

Note) Total area: 150 m Depth at least is required as a distance between waterfront and the backward port limit in addition to ICD .

Note) Road space: 30% of total area

Note) Utility space: 20% of total area. Utility space consist of office, workshop, park, restaurant, shop, rest spot, etc.

Source) JICA Study Team

27.1.4 Required number of access road lanes for major ports

Access roads between major ports and dyke road or Ring Road No.3 will have to be constructed. The number of access road lanes is decided based on the traffic volume, that is, the maximum hourly traffic. Two lanes will be required for all major ports in 2020 (see **Table 27.1.6**).

Table 27.1.6 Required number of access road lanes for major ports (2020)

Port	Throughput (1000 tons)			Maximum Hourly Traffic of Access Road							No. of Access Road Lanes
				Throughput Related Traffic				Other Traffic		Total	
	Bulk	Non-bulk	Container (1000 TEU)	Bulk	Non-bulk	Container	Total	(Mixed Ratio)	Traffic		
Hanoi Port	333	905		40	137		177	30%	53	230	2
Khuyen Luong Port	2,170	1,087		262	164		426	20%	85	511	2
New North Port	2,877	373		347	56		404	10%	40	444	2
New East Port	1,078	1,119	67	130	169	30	329	30%	99	428	2
Total	6,458	3,484	67	780	526	30	1,336		277	1,614	

Note) Calculating formula: $T = (N / D / 24) \times pd \times ph / (w \times l)$

T:				Maximum hourly traffic of access road
N:				Annual cargo-wise throughput (tons/year, TEU/year)
D:	345	345	345	Annual available working days (days)
pd:	1.8	1.8	1.8	Peaking factor to daily average
ph:	2.5	2.5	2.5	Peaking factor to hourly average
w:	9.0	6.0	1.5	Unit load per truck (ton, TEU)
l:	0.5	0.6	0.8	Ratio of loaded truck

Note) Design standard traffic volume for double lanes is 650 vehicles/hour.

Source) JICA Study Team

27.1.5 Required elevation of port facilities for major ports

Crown elevation of berths in major ports shall be set at a level slightly higher than Warning Water Level III (+11.5m at Hanoi Station). Ground elevation of roads, storage yards and warehouses shall be set at a level higher than that of berths in order to avoid traffic blockade and/or degradation of commodity value due to flooding. Proposed elevation for each facility is shown in **Table 27.1.7** and **Figure 27.1.2**.

Table 27.1.7 Required Elevation of New Port Facilities

Port	Water Level when WWL-III at Hanoi Station	berth	Road	Storage Yard (CY)	Warehouse (CFS-DC)
		0.5m higher than the Water Level	1.0m higher than the Water Level	1.0m higher than the Water Level	2.0m higher than the Water Level
Hanoi Port	+11.0m	+11.5m	+12.0m	+12.0m	+13.0m
Khuyen Luong Port	+10.6m	+11.1m	+11.6m	+11.6m	+12.6m
New North Port	+11.8m	+12.3m	+12.8m	+12.8m	+13.8m
New East Port	+10.5m	+11.0m	+11.5m	+11.5m	+12.5m

Note) WWL-III at Hanoi Station is +11.5m.

Note) Water levels at Hanoi, Khuyen Luong and New North Ports when WWL-III at Hanoi Station are set based on the water level survey data on the 8th August 2002 conducted by TEDI-port.

Note) Water level at New East Port when WWL-III at Hanoi Station is set based on the H5% water levels of Hanoi Station and New East Port calculated by interpolating method using the data at Thuong Cat and Ben Ho Stations.

Source) JICA Study Team

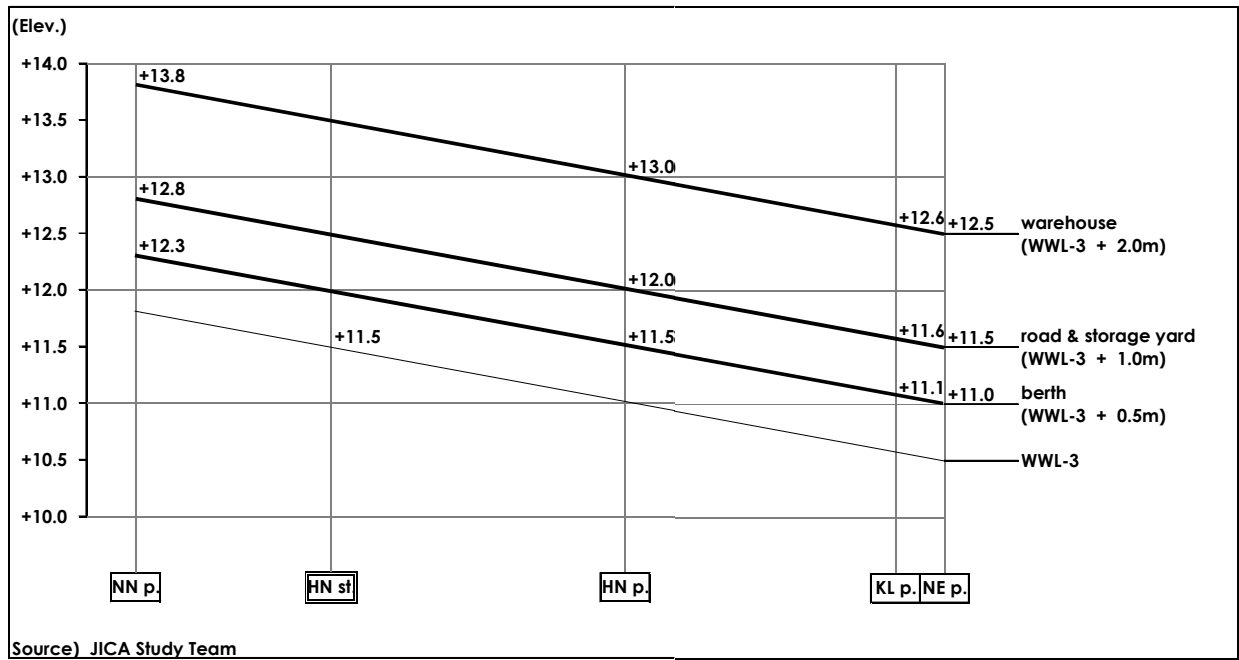


Figure 27.1.2 Proposed Elevation of Port Facilities

27.2 Hanoi Port

Development direction of Hanoi Port is proposed as follows:

- Hanoi Port shall handle non-bulk and bulk cargoes as well as cargoes of SRV, and serve mainly for Citadel districts. Bulk cargo handling, however, shall be decreased taking into account environmental preservation.
- Length of newly planned berths shall be 80m for cargo vessels and 100m for passenger boats.
- Out-dated handling equipment shall be replaced.
- Road of low elevation shall be improved.

Master plan of Hanoi Port is shown in **Table 27.2.1** and **Figure 27.2.1**.

Table 27.2.1 Master Plan of Hanoi Port (2020)

Item	Description
Port Owner/Investor	MOT (small-scale investment: port operator)
Port Operator	Hanoi Port under NOWATRANCO
Facing IW Corridor	Corridor 1 (Quang Ninh - Hai Phong - Hanoi - Viet Tri) Corridor 4 (Sea - Hanoi)
Hinterland	Citadel districts
Design Capacity	1.2 million tons (Bulk: 0.3, Non-bulk: 0.5, SRV: 0.4)
Length of Waterfront	1.8km (Additional bank protection upstream of T4: 900m)
Berth Property	Existing: 568m for cargo (partial repair work is needed at berths No.4-6) Newly planned: 80m@-3.6m (+11.5m) for SRV 100m@-2.0m (+12.0m) for passenger
Land Area	Total: 7ha (Storage yard: 0.6ha, Warehouse: 1.6ha for port related use and 1.1ha for other use) (Newly planned warehouse: 1.4ha)
Handling Equipment	Quayside mobile crane: 9 units (8tons) Grab bucket: 2 units (3cu.m), Forklift: 23 units (3tons) Shovel loader: 1 unit (2cu.m), Bulldozer: 1 unit (5tons) Dump Truck: 3 units (10tons), Truck: 15 units (7tons) Pallet: 2,700 units (1.2mx1.8m)
Passenger Terminal	1 unit (see Section 27.6)
Access Road	2 lanes to be linked to Dyke road (for Ring Road No.2) Planned: Elevation improvement to +12.0m (L=2.6km)

Source) JICA Study Team

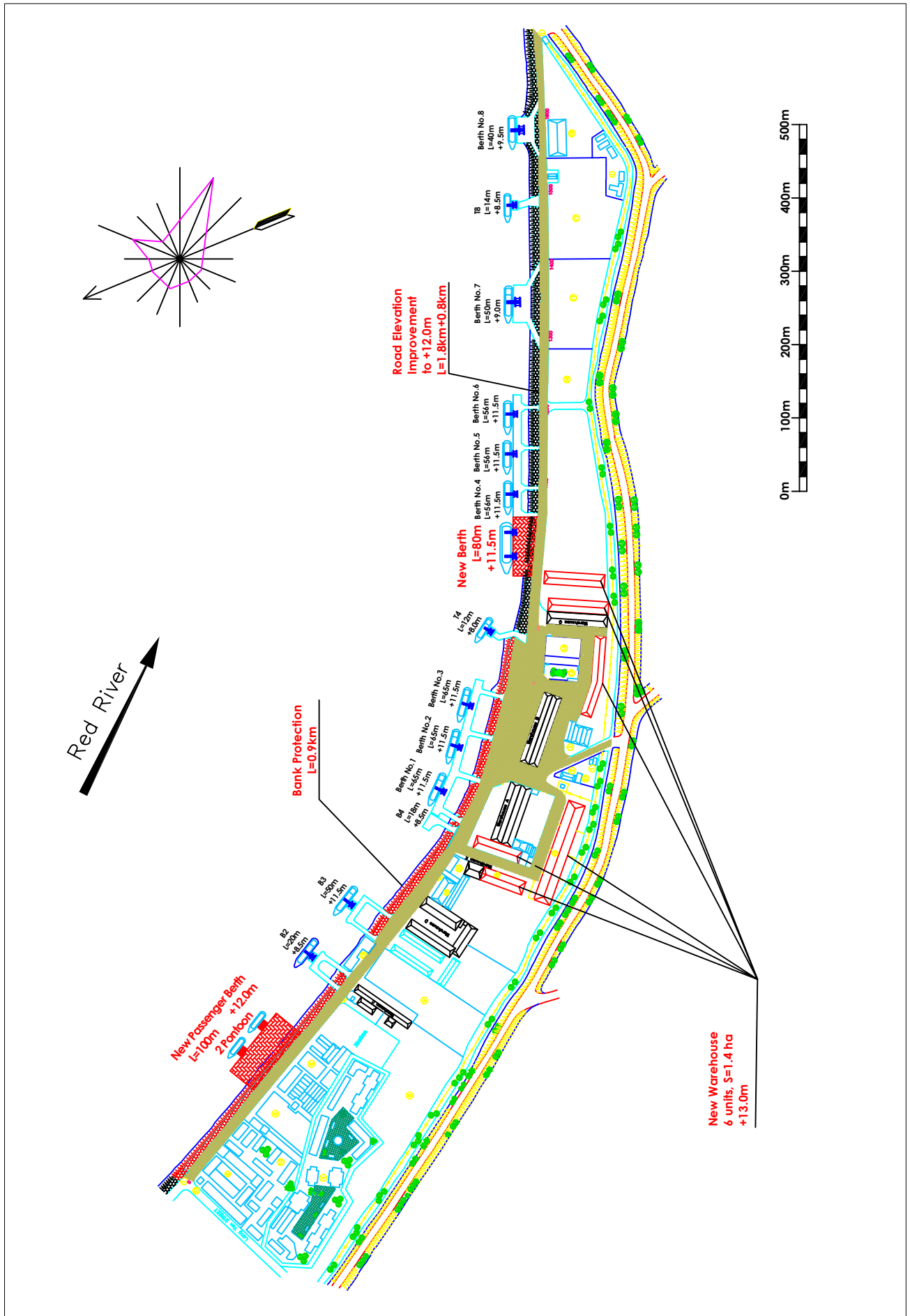


Figure 27.2.1 Master Plan of Hanoi Port (2020)

27.3 Khuyen Luong Port

Development direction of Khuyen Luong Port is proposed as follows:

- Khuyen Luong Port shall handle bulk and non-bulk cargoes as well as cargoes of SRV, and serve mainly for districts located at the right bank of Red River as well as a part of Ha Tai Province making full use of its excellent location in terms of road network.
- Length of newly planned berths shall be 760m.
- Extension area for port facilities shall be allocated at downstream side of existing facilities.

Master plan of Khuyen Luong Port is shown in **Table 27.3.1** and **Figure 27.3.1**.

Table 27.3.1 Master Plan of Khuyen Luong Port (2020)

Item	Description
Port Owner/Investor	MOT (small-scale investment: port operator)
Port Operator	Khuyen Luong Port, Vietnam Sea & River Transport Corporation under VINALINES
Facing IW Corridor	Corridor 1 (Quang Ninh - Hai Phong - Hanoi - Viet Tri) Corridor 4 (Sea - Hanoi)
Hinterland	Primary: Thanh Tri District Secondary: Citadel districts and Ha Tay Province SRV: whole city and Ha Tay Province
Design Capacity	3.3 million tons (Bulk: 2.2, Non-bulk: 0.5, SRV: 0.6)
Length of Waterfront	1.4km
Berth Property	Existing: 106m +60m (be completed before 2010) (2 mooring buoys be completed before 2010) Newly planned: 760m (+11.1m) @ -2.5m (-3.6m for SRV)
Land Area	14ha (Storage yard: 3.4ha, Warehouse: 1.9ha) (Newly planned Storage yard: 3.0ha, Warehouse:1.5ha)
Handling Equipment	Quay-side mobile crane: 18 units (8tons) Grab bucket: 10 units (3cu.m), Forklift: 27 units (3tons) Shovel loader: 7 units (2cu.m), Bulldozer: 3 units (5tons) Dump Truck: 18 units (10tons), Truck 18units (7tons) Pallet: 3,300 units (1.2mx1.8m)
Access Road	2 lanes to be linked to Dyke road (for Ring Road No.3) Planned: Access road improvement (L=2.7km)

Source) JICA Study Team

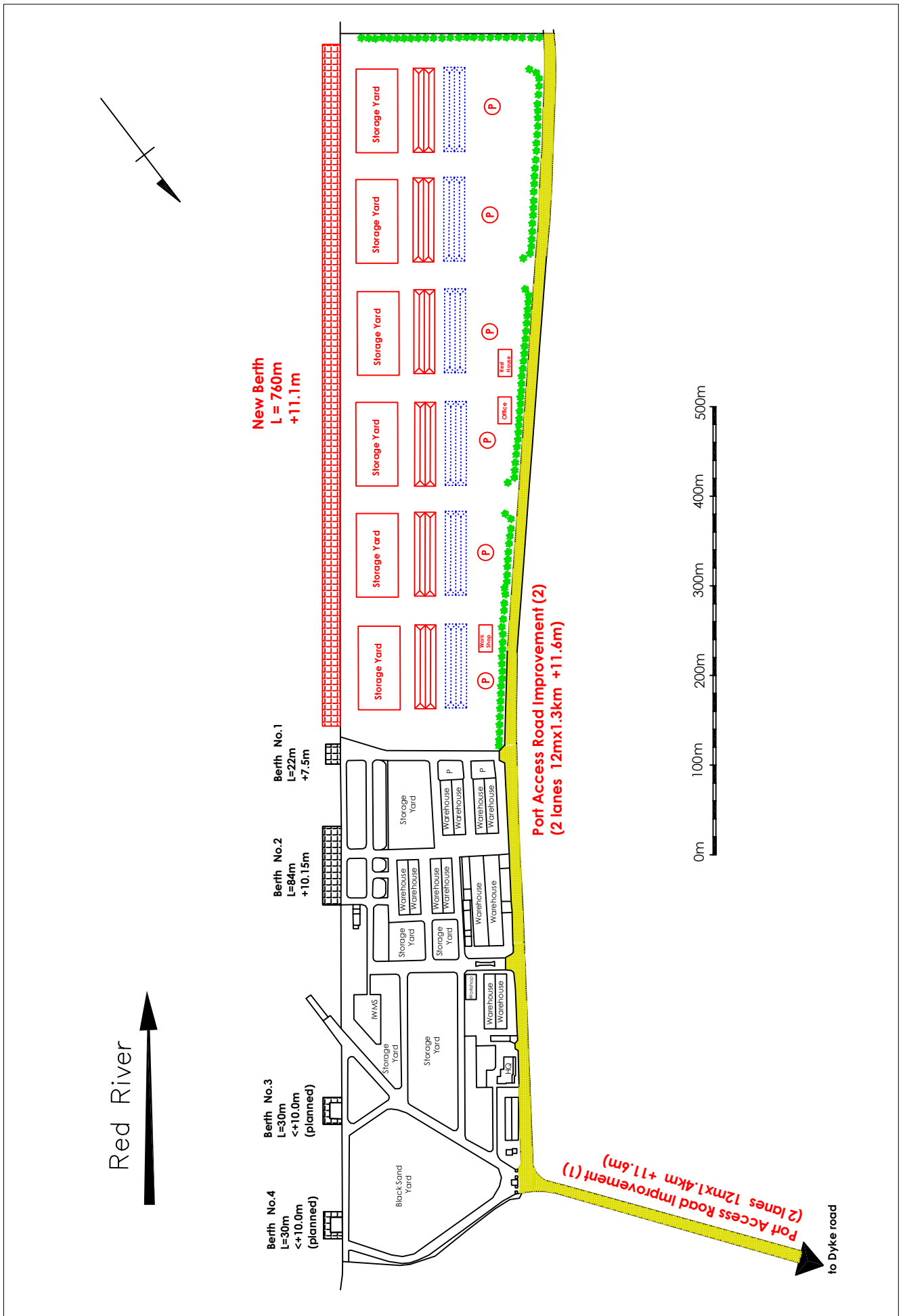


Figure 27.3.1 Master Plan of Khuyen Luong Port (2020)