APPENDIX

Appendix 8

ANNEXURE A-8.1

ENVIRONMENTAL (PROTECTION) THIRD AMENDMENT RULES, 1993

SCHEDULE-VI

General standards for discharge of
Environmental Pollutants - Part A. Effluents
(Marine Coastal area Standards)

Sr. No.	Parameter	Standards for Effluent Disposal to Marine Coastal Areas
1.	Colour and odour	Efforts to remove colour and odour
2.	Suspended solids mg/l Max	a) For process waste water 100 b) For cooling water effluent 10 per cent above total suspended matter of influent
3.	Particle size of suspended solids	a) Floatable solids b) Settleable solids max. 850 microns
4.	Dissolved solids (inorganic) mg/l	---
5.	pH value	5.5 to 9.0
6.	Temperature	Shall not exceed 5°C above the receiving water temperature
7.	Oil and grease mg/l, Max	20
8.	Total residual chlorine, mg/l Max	1.0
9.	Ammonical nitrogen (as N) mg/l, Max.	50
10.	Total Kjeldahl nitrogen (as NH_3) mg/l, Max.	100
11.	Free ammonia (as NH_3) mg/l, Max.	5.0
12.	Biochemical oxygen demand (5 days at 20° C),mg/l, Max.	100
13.	Chemical Oxygen demand, mg/l Max.	250
14.	Arsenic (as As) mg/l, Max.	0.2
15.	Mercury(As Hg) mg/l, Max.	0.01
16.	Lead (as Pb) mg/l, Max.	2.0
17.	Cadmium (as Cd) mg/l, Max	2.0
18.	Hexavalent chromium (as Cr + 6) mg/l, Max.	1.0
19.	Total chromium (as Cr) mg/l, Max.	2.0

20.	Copper (as Cu) mg/l, Max.	3.0
21.	Zinc (as Zn) mg/l, Max.	15
22.	Selenium (as Se) mg/l, Max	0.05
23.	Nickel (as N) mg/l, Max	5.0
24.	Cyanide (as CN) mg/l, Max.	0.2
25.	Flouride (as F) mg/l, Max.	15
26.	Sulphide (as S) mg/l, Max.	5.0
27.	Phenolic compounds (as C_6H_5OH), mg/l Max.	5.0
28.	Radioactive materials a)Alpha emitters uC/ml Max. b) Beta emitters uC/ml Max.	 10^{-2} 10^{-1}
29.	Bio-assay test	90% survival of fish after 96 hours in 100% effluent
30.	Manganese (as Mn)	2 mg/l
31.	Iron (as Fe)	3 mg/l
32.	Vanadium (as V)	0.2 mg/l
33.	Nitrate Nitrogen	20 mg/l

Source : MOE&F

ANNEXURE A-8.1 (a)
Water Quality Standards
(Natural Coastal & beach Water)

Sr. No.	Characteristics	Tolerance limit for bathing, recreation commercial fish culture and salt manufacture.
1	Colour and odour	No noticeable colour or offensive odour
2	Floating material	No visible floating matter or sewage or industrial waste origin
3	Suspended solids	No visible suspended solids of sewage or industrial waste origin
4	pH value	6.5 to 8.5
5	Free ammonia (as N) mg/l, max.	1.2
6	Phenolic compounds (as C6H5OH), mg/l max.	0.1
7	Dissolved oxygen, min.	40 percent saturation value or 3 mg/l whichever is higher.
8	Biochemical oxygen demand (5 days at 20 degree centigrade) mg/lit. max.	5
9	Coliform Bacteria, MPN inder per 100 ml. Max.	1000

ANNEXURE A-8.1(b)
Tolerance Limits of Water Quality of Harbour Region

Parameter	Tolerance Limit
pH	6.5 to 8.5
Temperature	32C
Dissolved Oxygen	< 4-5
Biochemical Oxygen Demand (5 days - 20C)	4
Chemical Oxygen Demand	180
Oil and grease	1
Ammonical Nitrogen	1.2
Cadmium	0.3
Chromium (hexavalent)	0.2
Copper	1.5
Nickel	0.3
Iron	0.3
Lead	0.1
Zinc	1.5
Phenolic Compounds	0.005
Total Coliform MPN/100ml	100

Source : NEERI REPORT

All values except pH are in mg/l.

ANNEXURE A-8.1 (c)
TIDAL WATER QUALITY

Parameters	Limits
(A) Physical Quality	
Temperature	Not higher than ambient temperature by 5 ^{0} C
(B) Chemical Quality	
Arsenic	1.0 mg/l
Chromium (Hexa Cr)	0.05 mg/l
Cyanide (CN)	0.05 mg/l
pH	5.5 to 9.0
CO_2	12 mg/l
Free ammonia (as N)	1.5mg/l
BOD 5 days 20^{0}C	15 mg/l
Biotic Index	6
Dissolved Oxygen	<3mg/l

Source : MPCB

ANNEXURE A-8.2

NATIONAL AMBIENT AIR QUALITY STANDARDS
(As per the Notification dated April 1996 issued by the MOE&F, New Delhi)

Pollutant	Time Weighted Average	CENTRATION IN AMBIENT AIR Industrial Area	Residential, Rural and Other Areas	Sensitive Area
Sulphur Dioxide (SO_2)	nnual Average *	80	60	15
	4 hours **	120	80	30
xides of Nitroge s NO_2	nnual Average *	80	60	15
	4 hours **	120	80	30
Suspended Particulate Matter (SPM)	nnual Average *	360	140	70
	4 hours **	500	200	100
Respirable particulate Matter (RPM) (Size less than 10	nnual Average *	120	60	50
	4 hours **	150	100	75
Lead (Pb)	nnual Average *	1.0	0.75	0.50
	24 hours **	1.5	1.00	0.75
Carbon Monoxide (CO)	8 hours **	5.0	2.0	1.0
	1 hour	10.0	4.0	2.0

Note : * Indicates Annual Arithmetic Mean of Minimum 104 measurements in a year measured twice a week, 24 hourly at uniform intervals

** 24 hourly/8 hourly values should be met 98% of the time in year. However 2% of the time, it may exceed but not on two consecutive days.

Units are in$\mu g/m^3$ except CO in mg/m^3

ANNEXURE A-8.3

STANDARDS FOR NOISE

Area Code	Category of Area	Limits in dB (A)	Leq.
		Day Time	Night Time
(A)	Industrial Area	75	70
(B)	Commercial Area	65	55
(C)	Residential Area	55	45
(D)	Silence Zone	50	40

Note 1 Day time is reckoned in between 6 a.m. and 9 p.m.

Note 2 Night time is reckoned in between 9 p.m. and 6 a.m.

Note 3Silence zone is defined as areas upto 100 meters around such premises as hospitals, educational institutions and courts. The silence zones are to be declared by the Competent Authority.

Use of vehicular horns, loudspeakers and brusting of crackers shall be banned in these zones.

Note 4 Mixed categories of areas should be declared as one of the four above mentioned categories by the Competent Authority and the corresponding standards shall apply.

Source : Environment Protection Rules, 1986.

Noise limits for automobiles

Free field at one metre in dBA at the manufacturing stage.

Sr. No.	Category	Standard dBA
a.	Motor cycle, scooters and three, wheelers	80
b.	Passenger cars	82
c	Passenger/commercial vehicles upto 4 MT	85
d	Passenger/commercial vehicles above 4 MT and upto 12 MT	89
e	Passenger/commercial vehicles exceeding 12 MT	91

ANNEXURE A-8.4

A. AMBIENT PRIMARY AND SECONDARY STANDARDS FOR GASEOUS POLLUTANTS

US- EPA STANDARDS

Sl. No.	Pollutants	Basis	Primary	Secondary	Remarks
1.	Sulphur dioxide	Annual mean (arithmetic) Max. 24 hrs* Max. 3 hrs*	80 365	60 260 1300	* indicates limits not to be exceeded once per month
2.	Nitrogen oxides	Annual mean (arithmetic)	100	100	
3.	Suspended particulate matter	Annual mean (geometric) Max. 24 hrs	75 260	60 150	
4.	Non Methane HC	3 hr. short term average (6-9 AM)	900	(0.24ppm)	

Units are in $\mu g/m^3$ otherwise mentioned

B. OTHER INTERNATIONAL STANDARDS

Si.. No.	Pollutant	Country	Longterm std.		Shortterm std.		Remarks
			Micro gram/ cu.m	averaging time (hrs)	Micro gram/ cu.m	averaging time (hrs)	
1.	Propylene	Bulgaria, USSR East Germany	3000 2000	24 hrs 24 hrs	3000 3000	30min 30min	
2.	Ethylene Oxide	USSR West Germany	30 4000	24 hrs 30 min	300 12000	30 min 30 min	Short terms exposure limit not to be exceeded more than once in any 4 hrs
3.	SO_2	USA	80	1 yr.			Primary standards in USA
4.	Suspended particulate matter	Canada USA	70 60	1 yr. 1 yr.	- 260	- 24 hrs	
5.	Chlorine	USSR West Germany	30 300	24 hrs. 30 min.	100 600	30 min. 30 min.	

C. INTERNATIONAL BANKING COMMUNITY STANDARDS

Sl. No.	Pollutants	Annual Average $\mu g/m^3$	24 Hrs. Average $\mu g/m^3$
1.	Particulars	100	500
2.	Sulphur Dioxide	100	500
3.	Nitrogen oxides	100	NA

NOISE IMPACTS

D. PART - II

Land Use	Measure	Indoor (dBA)			Outdoor (dBA)		
		Activity Interfer-ence	Hearing loss conside-ration	Borth	Activity Interfer-ence	Hearing loss conside-ration	Borth
Residential	LDn leq(24)	45 -	- 70	45 -	55 -	- -	55 70
Industrial	leq(24)	-	70	70	-	70	70

Note:

1. Ldn - Day and night noise level, weighted average
   Leq(24) - Noise level equivalent for 24 hrs
   L10 - Noise level exceeds the value in 10% of the time

Source : "Environmental Impact Assessment" by Lany W.Canter

Annexure A-8.5 (a)

The concentration of various pollutants have been computed using double Gaussion diffusion expression. Various steps involved are given below.

Step-1 Increase in concentration ($\mu g/m^3$)

$$C_{(x,y,z)} = \frac{Q}{2\pi u \sigma_y \sigma_z} \exp\left\{-\frac{1}{2}\left(\frac{y^2}{\sigma_y^2} + \frac{z^2}{\sigma_z^2}\right)\right\} \text{----------(1)}$$

where,

C = concentration of the pollutants in $\mu g/m^3$ at a point (x,y,z)

Q = emission rate of pollutants from source ($\mu g/m^3$) = emission factors(g/Km) x No. of vehicles/d

u = horizontal wind speed in m/sec at source level

z = height in m

y = distance in horizontal cross wind direction in m

σ_y = lateral diffusion coefficient in m

σ_z = vertical diffusion coefficient in m

Step-2 Assumptions

Following assumption have been made:

- Lateral cross-wind direction distance (y) = 0, only central line concentration have been determined.
- Height of source (z) = 0
- wind speed (U) = 3m/s.

Step-3 Diffusion coefficients

The diffusion coefficient used are presented in annexure A-8.5(a).

Step-4 Predicted Concentrations

Predicted Concentration ($\mu g/m^3$) = Maximum baseline concentration ($\mu g/m^3$) + Increase in concentration ($\mu g/m^3$)

Annexure A–8.5 (b)

Parameters Used to Calculate Pasquill-Gifford *(σ_y)

Pasquill Stability Category	c	d
A	24.167	2.5334
B	18.333	1.8096
C	12.5	1.0857
D	8.33	0.72382
E	6.25	0.54287
F	4.1667	0.36191

$$\sigma_y = 465.11628(x)\tan(TH)$$

and

$$TH = 0.017453293[c - d\ln(x)]$$

where,

Values of c and d are given in the above table,

x is the distance in Kilometers

and σ_y is in meters.

* Source : Users guide for Industrial Source Complex (ISC3) Dispersion Model- Vol-III (U S Environmental Protection Agency)

Annexure A-8.5 (C)

PARAMETERS USED TO CALCULATE PASQUILL-GIFFORD

Pasquill Stability Category	x (km)	a	b
A	< 0.10	122.8	20.9447
	0.10 - 0.15	158.08	1.0542
	0.16 - 0.20	170.22	1.0932
	0.21 - 0.25	179.52	1.1262
	0.26 - 0.30	217.41	1.2644
	0.31 - 0.40	258.89	1.4094
	0.41 - 0.50	346.75	1.7283
	0.51 - 3.11	453.85	2.1166
	> 3.11	**	**
B	< 0.20	90.673	0.93198
	0.21 - 0.40	98.483	0.98332
	> 0.40	109.3	1.0971
C	All	61.141	0.91465
D	< 0.30	34.459	0.86974
	0.31 - 1.00	32.093	0.81066
	1.01 - 3.00	32.093	0.64403
	3.01 - 10.0	33.504	0.60486
	10.01 - 30	36.65	0.56589
	> 30.00	44.053	0.51179
E	< 0.10	24.26	0.8366
	0.10 - 0.30	23.331	0.81956
	0.31 - 1.00	21.628	0.7566
	1.01 - 2.00	21.628	0.63077
	2.01 - 4.00	22.534	0.57154
	4.01 - 10.0	24.703	0.50527
	10.01 - 20	26.97	0.46713
	20.01 - 40	35.42	0.37615
	> 40.00	47.618	0.29592
F	< 0.20	15.209	0.81558
	0.21 - 0.70	14.457	0.78407
	0.71 - 1.00	13.953	0.68465
	1.01 - 2.00	13.953	0.63227
	2.01 - 3.00	14.823	0.54503
	3.01 - 7.00	16.187	0.4649
	7.01 - 15.0	17.836	0.41507
	15.01 - 30	22.651	0.32681
	30.01 - 60	27.074	0.27436
	> 60.00	34.219	0.21716

$$\sigma_z\left(in \cdot meters\right) = ax^b$$

where,
a and b are constants
x is the distance in m.

Source : User Guide for Source Complex (ISC3) Dispersion Model - Vol. III
(US Environmental Protection Agency)

Appendix 9

Micro Forecast

Appendix 9 Micro Forecast

9.1 Import (Excluding Petroleum)

9.1.1 Containerizable Cargo

(1) Agricultural, fishery and forest products

The group of Agricultural, fishery and forest products consists of commodities such as fruits N.O.S, raw rubber, spices-others, wooden products N.O.S, tea and foodstuff N.O.S.

The import volume of agricultural, fishery and forecast products is estimated by its relation with GDP.

$$V = V_O \times (1 + G_T E_L)^{(t-1995)}$$

where; V : Cargo volume

V_O : Volume handled in 1995

G_T : Annual growth rate of GDP towards the target year

(6.2% 1995-2007, 6.5% 2007-2017)

E_L : Elasticity (1.48)

(Annul Growth rate of Cargo / Annual Growth rate of GDP)

t : Target year

The future volume is estimated as shown below.

2007	2017
857,000 tons	2,143,000 tons

(2) Paper and paper products

Paper and paper products is estimated by its relation with GDP.

$$V = V_O \times (1 + G_T E_L)^{(t-1995)}$$

where; V : Cargo volume

V_O : Handled volume in 1995

G_T : Annual growth rate of GDP towards the target year

(6.2% 1995/2007, 6.5% 2007/2017)

E_L : Elasticity (1.80)

t : Target year

The future volume is estimated as shown below.

2007	2017
3,214,000 tons	9,717,000 tons

(3) Light industry products

Light industry products is estimated by its relation with GDP.

$$V = V_O \times (1 + G_T E_L)^{(t-1995)}$$

where; V : Cargo volume

V_O : Handled volume in 1995

G_T : Annual growth rate of GDP towards the target year

(6.2% 1995/2007, 6.5% 2007/2017)

E_L : Elasticity (1.06)

t : Target year

The future volume is estimated as shown below.

2007	2017
7,644,000 tons	14,897,000 tons

9.1.2 Statistically Mixed Cargo in Containerization

(1) Agricultural, fishery and forest products

Agricultural, and fishery and forest products are made up from food grains N.O.S, vegetables and dates, oil and fats, sugar and salt. The volume in the target years is estimated by relation with agricultural sector of GDP.

$$V = V_O \times (1 + G_A)^{(t-1995)}$$

where; V : Volume of cargo

Vo : Volume handled in 1995

G_A : Annual growth rate of agricultural GDP

(4.5% 1995-2007, 4.5% 2007-2017)

t : Target year

The volume in the target years is shown below.

2007	2017
2,003,000tons	3,110,000tons

(2) Wood pulp

Import volume of wood pulp is estimated using a time series analysis. The correlation is expressed by the following equation.

$$V = 3.7030 \times T - 7216.58$$

T : Year

The volume in the target years is as follows.

2007	2017
215,000 tons	252,000 tons

(3) Fertilizer and the its raw materials

The import volume of fertilizer is estimated by relation with the agricultural sector of GDP. The correlation is expressed by the following equation.

$$V = V_O \times (1 + G_A)^{(t - 1995)}$$

where; V : Volume of cargo

Vo : Volume handled in 1995

G_A : Annual growth rate of agricultural GDP towards the target years (4.5% 1995-2007, 4.5% 2007-2017)

t : Target year

The volume in the target years is as shown below.

2007	2017
4,635,000 tons	7,198,000 tons

(4) Iron and steel materials

The volume of iron and steel materials is estimated using a time series analysis. The correlation is expressed by the following equation.

$$V = 81.0969 \times T - 160,154$$

T : Year

The volume in the target years is as shown below.

2007	2017
2,608,000 tons	3,419,000 tons

(5) Scrap and dross

The volume of scrap and dross has varied greatly year by year showing no obvious trend. Therefore, the average volume of the last two years is adopted as the volume in the target years. The volume in the target years is as follows.

2007	2017
178,000 tons	178,000 tons

(6) Motor vehicles and miscellaneous

The volume of motor vehicle and miscellaneous has varied greatly year by year showing no obvious trend. Therefor, the volume of the largest value in the past ten years is adopted as the volume in the target years. The volume in the target years is as follows.

2007	2017
310,000 tons	310,000 tons

9.1.3 Non-Containerizable Cargo

(1) Non-containerizable cargo

The volume of non-containerizable cargo has varied greatly year by year showing no obvious trend. Therefore, the largest value in the past ten years is adopted as the volume in the target years. The volume in the target years is shown below.

2007	2017
280,000 tons	280,000 ton

9.1.4 Non-Containerizable cargo (Chemical liquid products)

(1) Chemical liquid products

In the case of chemical liquid products, data of import volume which is handled at Pir Pau

Oil Berth, is not mentioned in the Administration Report of MBPT. Therefore, future volume is estimated using relation with GDP based on the data submitted by the Planning and Research Dept. of MBPT. The correlation can be expressed by the following equation.

$$V = V_O \times (1 + G_T E_L)^{(t-1995)}$$

where; V : Cargo volume

V_O : Volume handled in 1995

G_T : Growth rate of GDP towards target year

(6.2% 1995-2007, 6.5% 2007-2017)

E_L : Elasticity (1.05)

(Annul Growth rate of Cargo / Annual Growth rate of GDP)

t : Target year

The resulting volume in the target years is as follows.

2007	2017
200,000 tons	386,000 ton

9.2 Export (Excluding petroleum)

9.2.1 Containerizable Cargo

(1) Agricultural, fishery and forest products

The import volume of agricultural, fishery and forest products in the target years is estimated using the growth rate which is obtained by deducting the population growth rate from the agricultural sector GDP towards the target year.

$$V = V_O \times (1 + G_R)^{(t-1995)}$$

where; V : Volume of cargo

Vo : Volume handled in 1995

G_R : Growth rate of Agricultural, fishery and forest products

{Annul growth rate of GDP (agriculture) − Annul growth rate of Population}

= 4.5 - 1.7 = 2.8%(1995-2007), = 4.5 - 1.3 = 3.2 %(2007-2017)

t : Target year

The future in the target years is as follows.

2007	2017
2,360,000 tons	3,233,000 ton

(2) Light industry products

The volume of light industry in the target years is estimated by using the same growth rate of the cargo from 1986 - 1995.

$$V = V_O \times (1 + G_A)^{(t - 1995)}$$

where; V : Volume of cargo

Vo : Volume handled in 1995

G_A : Annual growth rate of light industry products

(14% 1995-2007, 10% 2007-2017)

t : Target year

The future in the target years is as follows.

2007	2017
14,748,000 tons	38,251,000 ton

9.2.2 Statistically Mixed Cargo in Containerization

(1) Agricultural products

The import volume of agricultural products in the target years is estimated using the annul growth rate which is obtained by deducting the population growth rate from the agricultural sector GDP in the target years.

$$V = V_O \times (1 + G_R)^{(t - 1995)}$$

where; V : Volume of cargo

Vo : Volume handled in 1995

G_R : Growth rate of Agricultural, fishery and forest products

{Annul growth rate of GDP (agriculture) − Annul growth rate of Population}

= 4.5 - 1.7 = 2.8%(1995-2007), = 4.5 - 1.3 = 3.2 %(2007- 2017)

t : Target year

The future volume is estimated as shown below.

2007	2017
1,942,000 tons	2,661,000 ton

(2) Metal and metal products

The volume of metal and metal products has varied greatly year by year and shows no obvious trend. In this forecast, the largest value in the past ten years is adopted as the volume in the target years. The volume in the target years is as follows.

2007	2017
285,000 tons	285,000 tons

9.2.3 Non-Containerizable cargo (Chemical liquid products)

(1) Chemical liquid products

The largest value in the past ten years is adopted as the volume in the target years. The volume in the target years is as follows.

2007	2017
7,000 tons	7,000 tons

9.3 Petroleum

9.3.1 Background

The two refineries, viz. BPC and HPC, are in operations at Trombay at the bottom of the Mumbai harbour, Crude petroleum is supplied partly from the oil wells off-shore Mumbai and partly from the Middle East. The crude petroleum from the off-shore oil wells which is called Bombay High Crude is sent to the refineries at Trombay through sub-marine and land pipelines connected to the refineries, and then is refined or sent further to the Marine Oil Terminal at Jawahar Dweep with four jetties, Nos.1 - 4, placed within the limits of MBP through submarine pipelines and shipped to other refineries on the Indian coast by coastal tankers (See Fig 1.5.1-1).

In 1995/96, 10.0 million tons and 4.6 million tons of crude petroleum were loaded and discharged respectively mainly at the jetties of JD4 and JD1. of the terminal.

The demand of POL (refined petroleum products and lubricant) distributed from Mumbai to its hinterland by land already exceeded the refinement capacity of 12 million tons per annum which is the total of the two refineries at Trombay where operations are almost in full-swing. The starting capacity was 3.5 million tons per annum in 1954 and then expanded to the present capacity. The supply shortage is balanced by imported POL from overseas.

The volume of imported POL has been increasing year by year, amounting to 4.9 million tons in 1995/96, an increase of 61% over the preceding year, whereas 1.6 million tons of POL was shipped by coastal shipping due to inter-regional supply-demand imbalance in terms of POL grades, though the shipped volume showed a downward trend recently in inverse proportion to the increase of imported POL. POL has been discharged/loaded from/onto petroleum tankers mainly at the jetties of JD1 - JD3, and to a lesser extent at the berth Old Pir Pau Pier along with chemical products.

In December of 1996, the New Pir Pau Pier which has a designed water depth of 12m at the pier and is placed within the limits of MBP as well as the JD jetties was opened to handle some specified grades of POL and chemical products in replacement of the old jetty constructed in 1922.

The annual throughput of crude petroleum at MBP fluctuated in the narrow range of 13.9 - 15.8 million tons in the last five years, reflecting full-swing operations of the refineries at Trombay and annual production of Bombay High Crude remaining mostly at a constant level. On the other hand, in the same period, the annual throughput of POL increased from 4.0 to 6.4 million tons indicating a high growth rate of 12.5% per annum in average owing to a sharp increase in import surpassing a gradual decrease in shipment to the other coastal areas.
(See Fig 151-1 in Section 1.5.1)

9.3.2 Crude Oil

(1) Import

The volume of Crude oil has varied greatly year by year showing no obvious trend. In this forecast, the largest value in the past ten years is adopted as the volume in the target years. The volume in the target years is as follows.

2007	2017
8,891,000 tons	8,891,000 ton

(2) Export

The export volume of crude oil has varied greatly year by year and shows no obvious trend. In this forecast, the largest value in the past ten years is adopted as the volume in the target years. The volume in the target years is as follows.

2007	2017
10,000,000 tons	10,000,000 ton

9.3.3 Refined Petroleum Products

(1) Import

Import volume of refined petroleum products is estimated by its relation with GDP. The correlation can be expressed by the following equation.

$$V = 0.00159 \times G + 10,463.248$$

V : Volume (tons)

G : GDP (Rs)

The volume in the target years is estimated as follows.

2007	2017
7,375,000 tons	15,192,000 ton

(2) Export

The export volume of refined petroleum products has varied greatly year by year and shows no obvious trend. In this forecast, the average volume of the past five years is adopted as the volume in the target years. The volume in the target years is as follows.

2007	2017
2,413,000 tons	2,413,000 tons

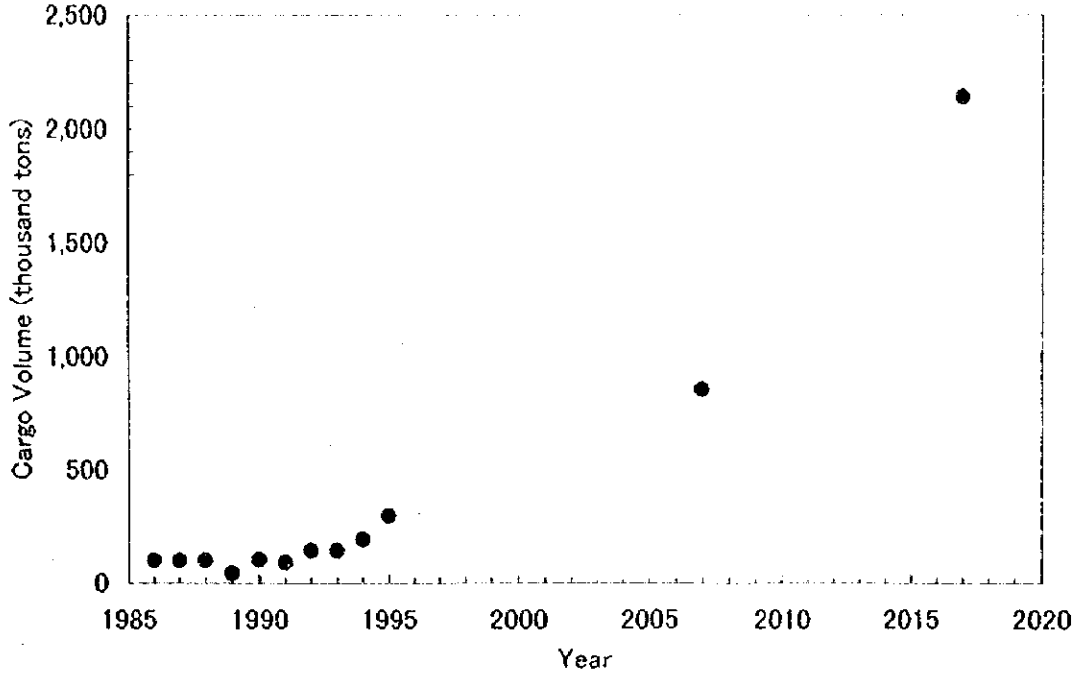

Figure A.9.1 Forecast Volume of Agricultural, Fishery and Forest Products (Import)

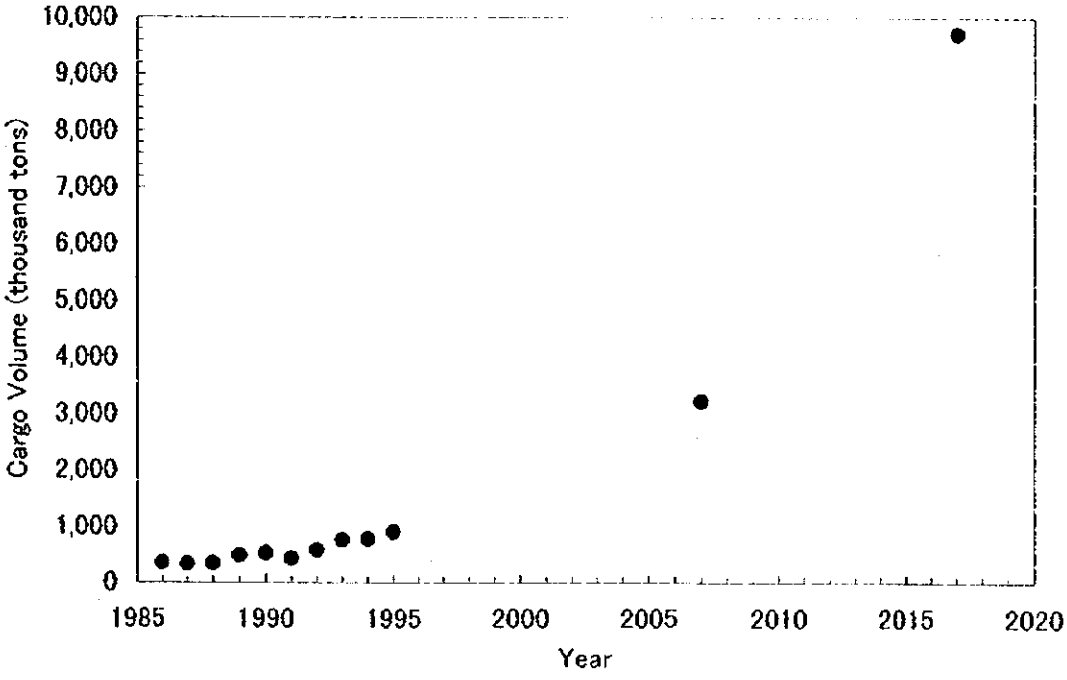

Figure A.9.2 Forecast Volume of Paper and Paper Products (Import)

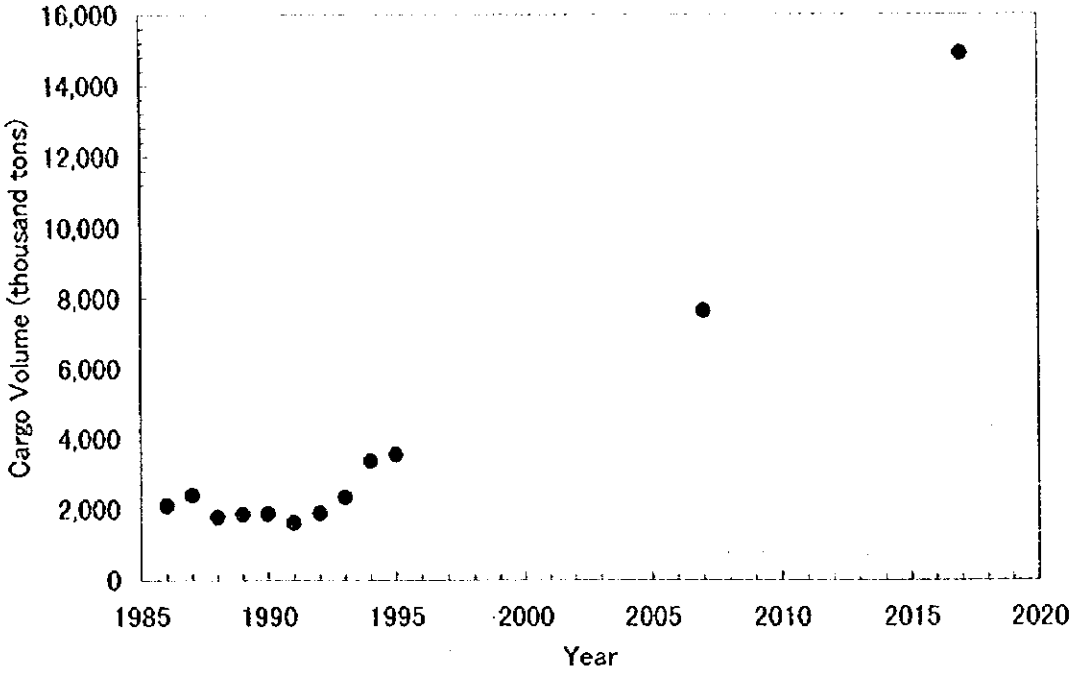

Figure A.9.3 Forecast Volume of Light Industry Products (Import)

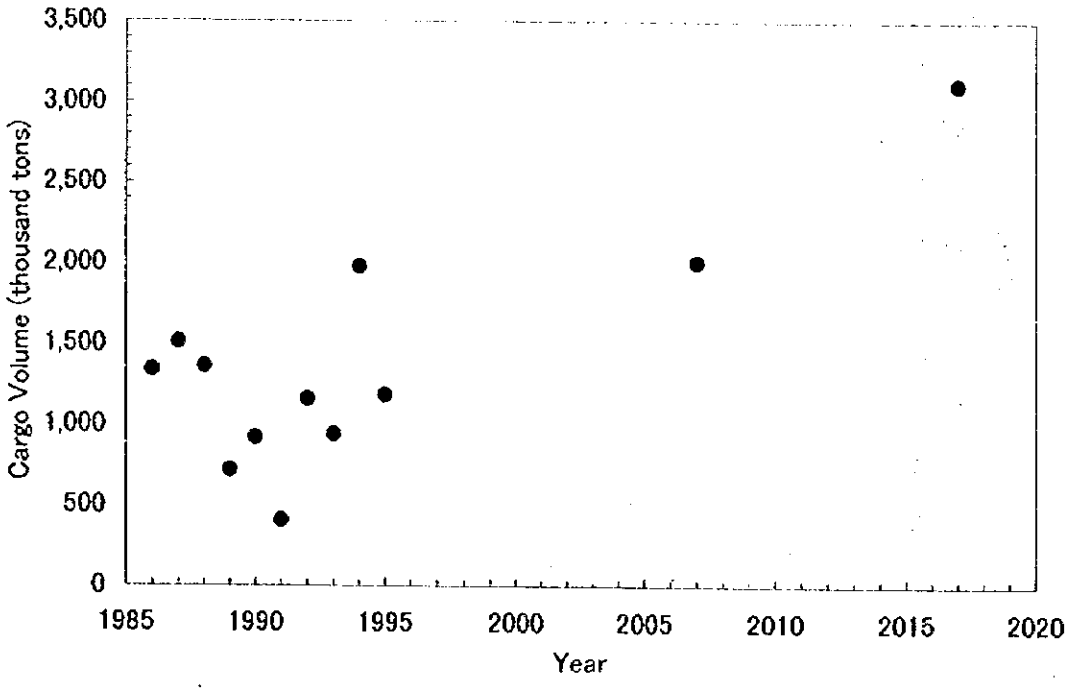

Figure A.9.4 Forecast Volume of Agricultural, Fishery and Forest Products (Import)

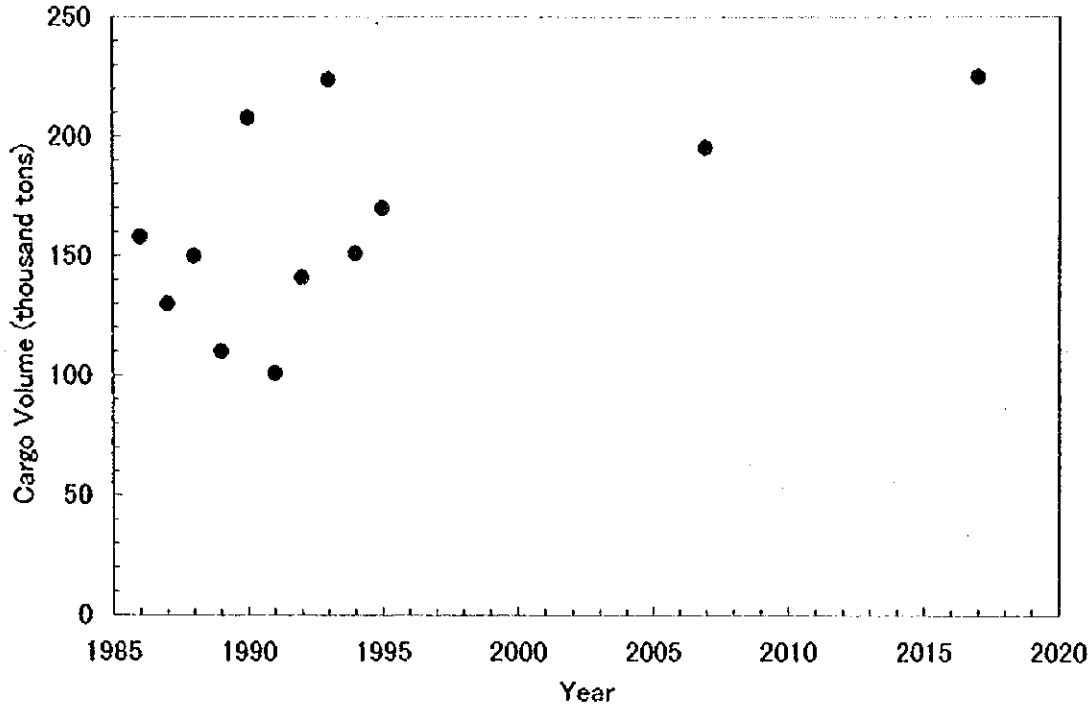

Figure A.9.5 Forecast Volume of Wood Pulp (Import)

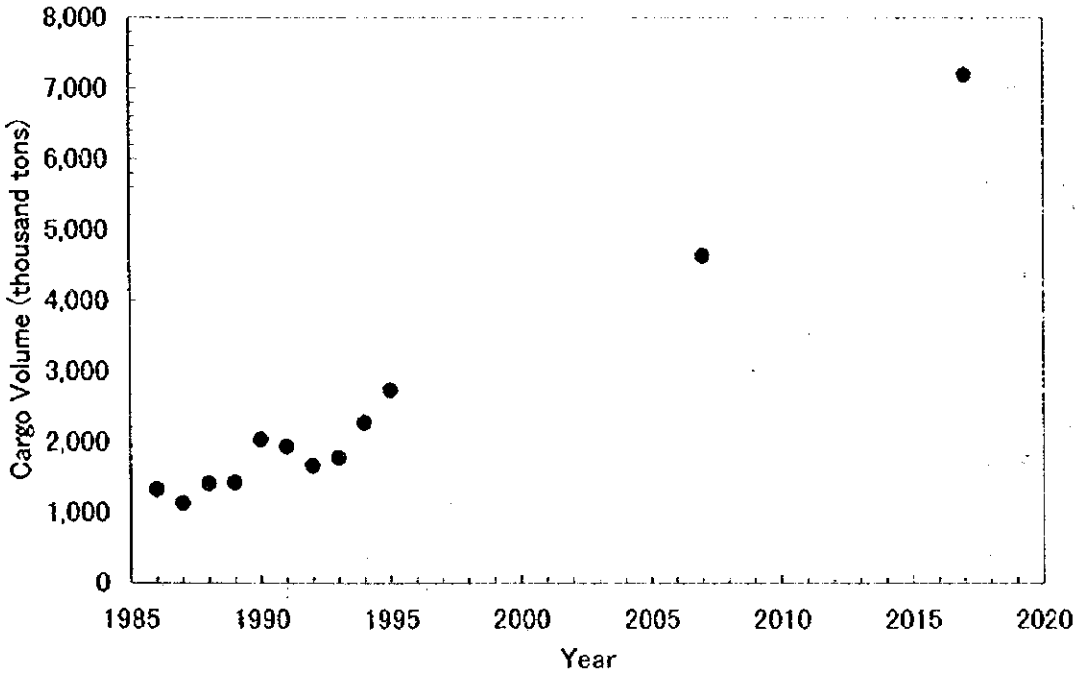

Figure A.9.6 Forecast Volume of Fertilizer and its Raw Materials (Import)

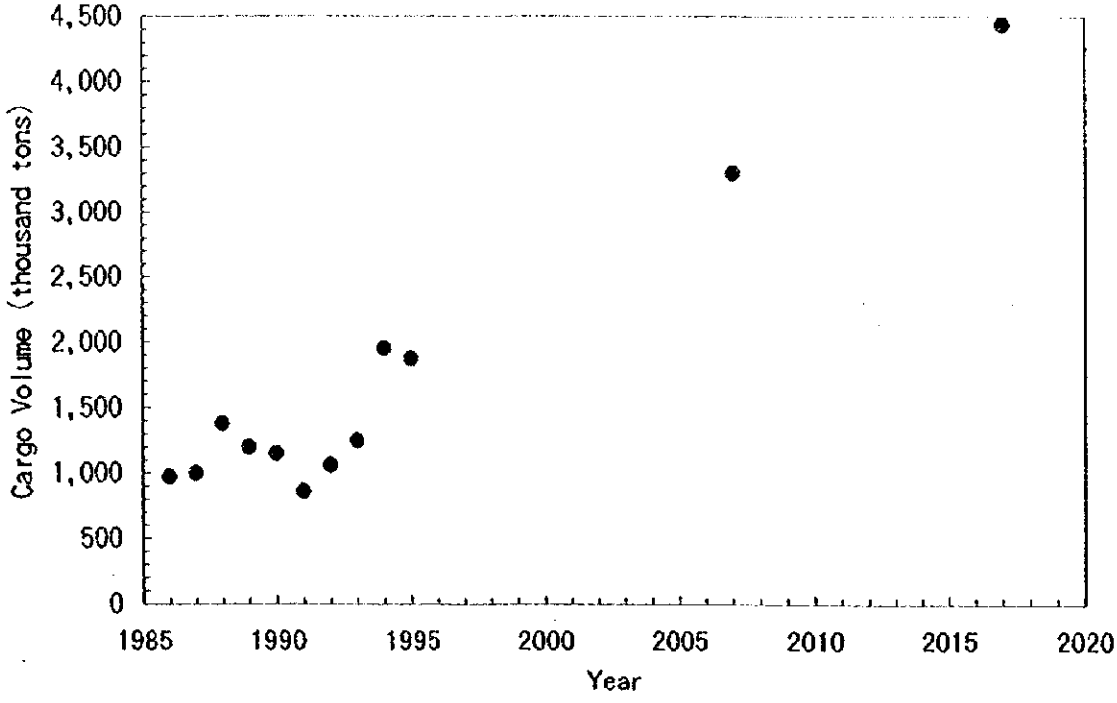

Figure A.9.7 Forecast Volume of Iron and Steel Materials (Import)

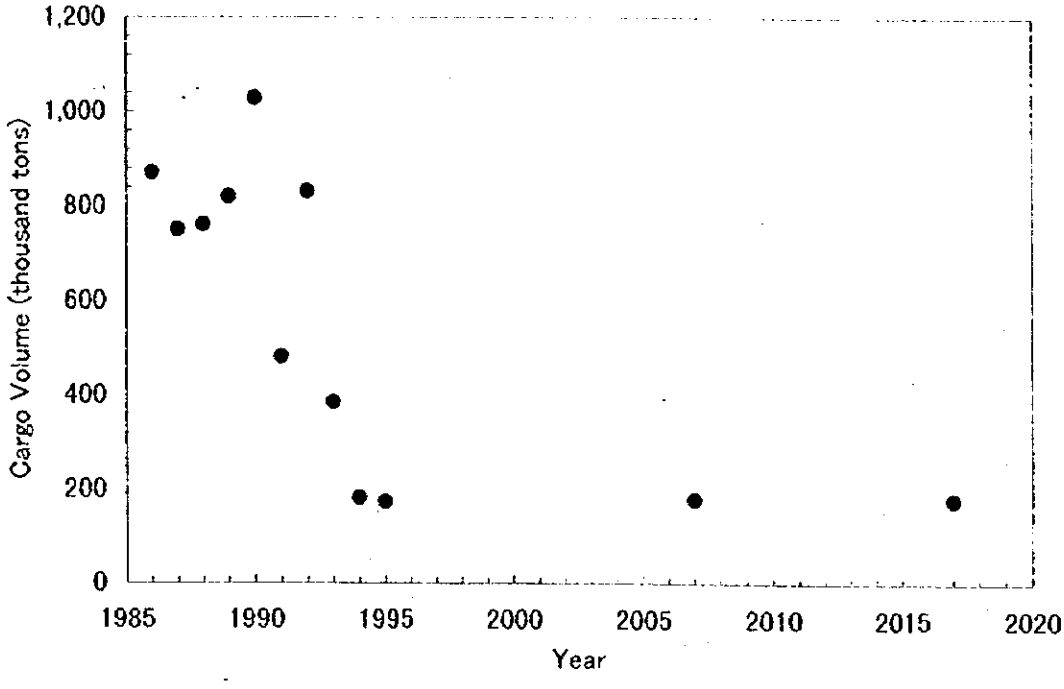

Figure A.9.8 Forecast Volume of Scrap and Dross (Import)

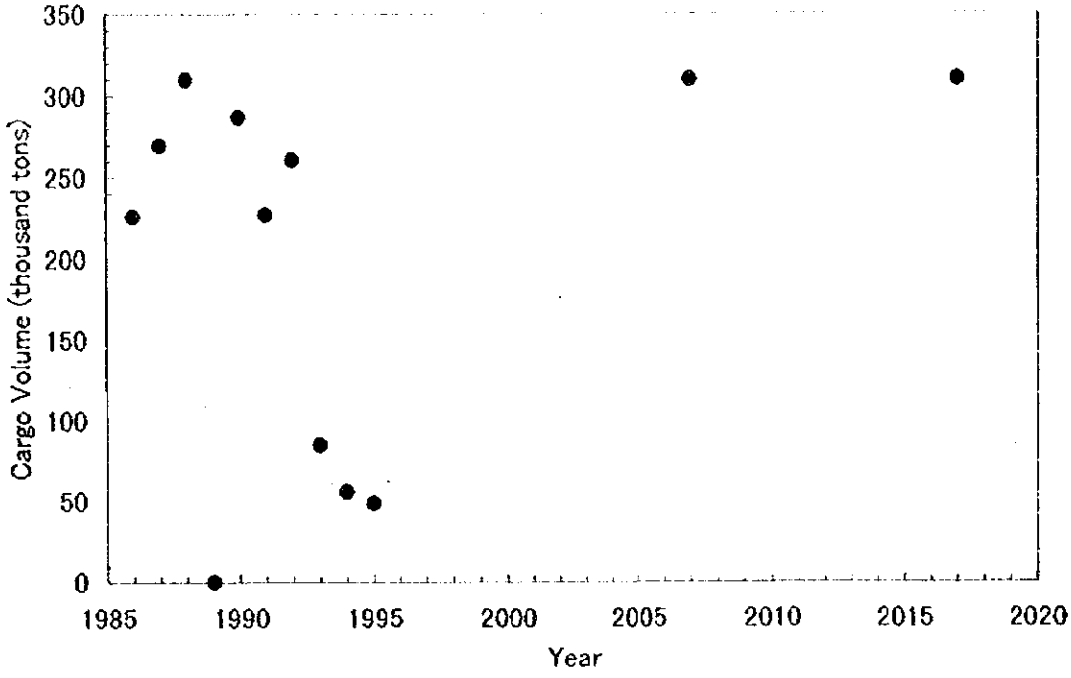

Figure A.9.9 Forecast Volume of Motor Vehicles and Miscellaneous (Import)

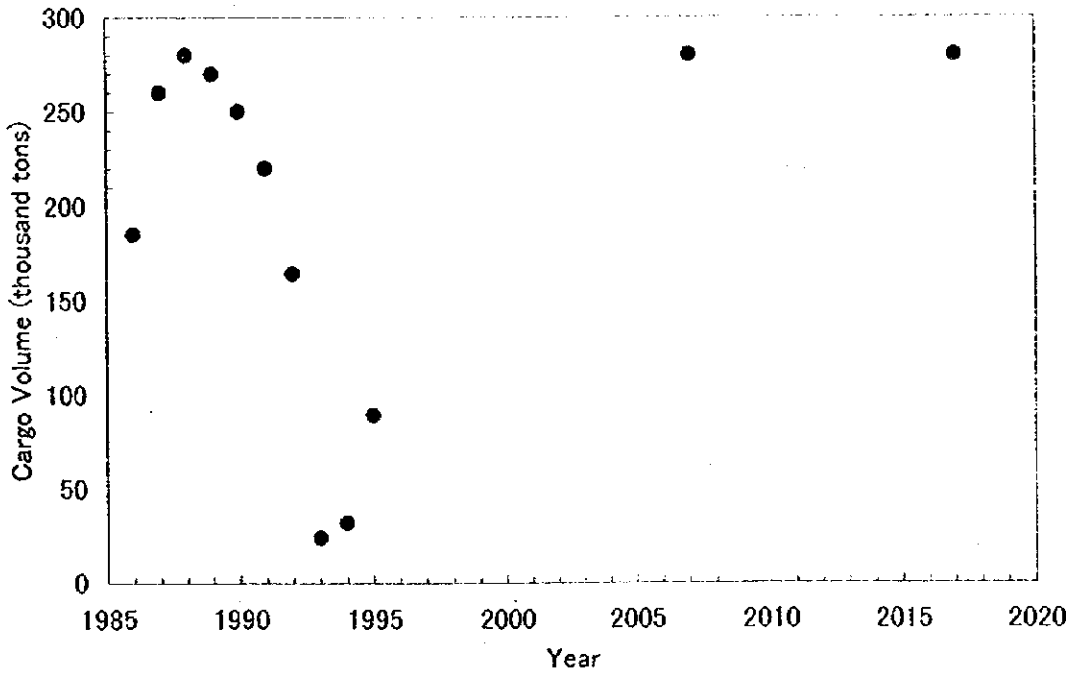

Figure A.9.10 Forecast Volume of Non-Containerizable Cargo (Import)

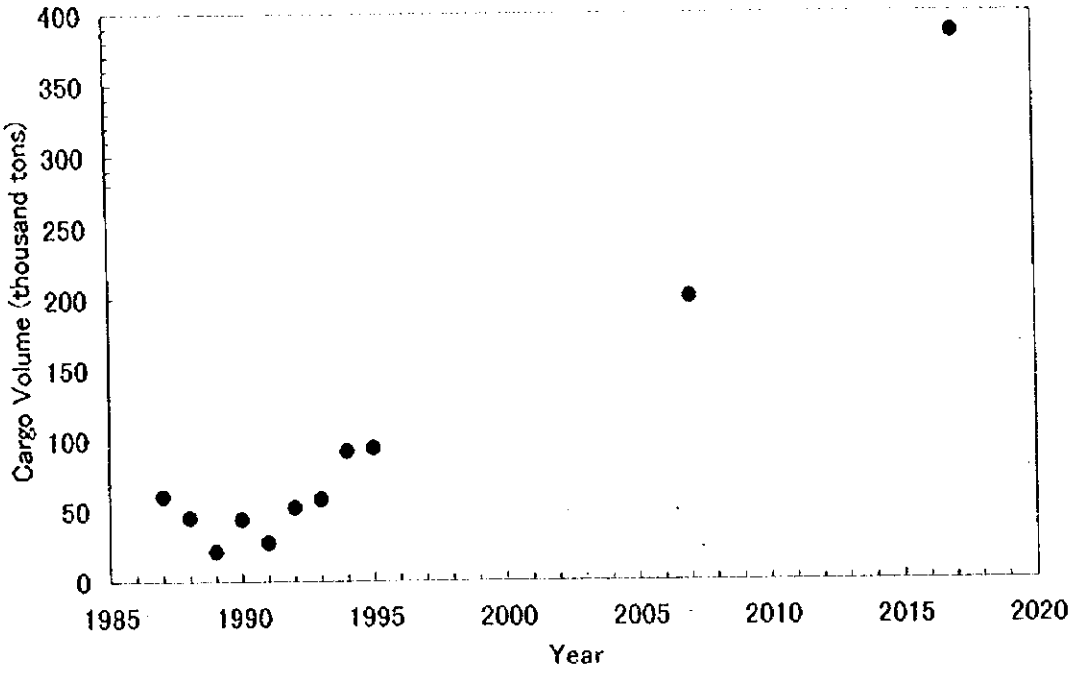

Figure A.9.11 Forecast Volume of Chemical Liquid Products (Import)

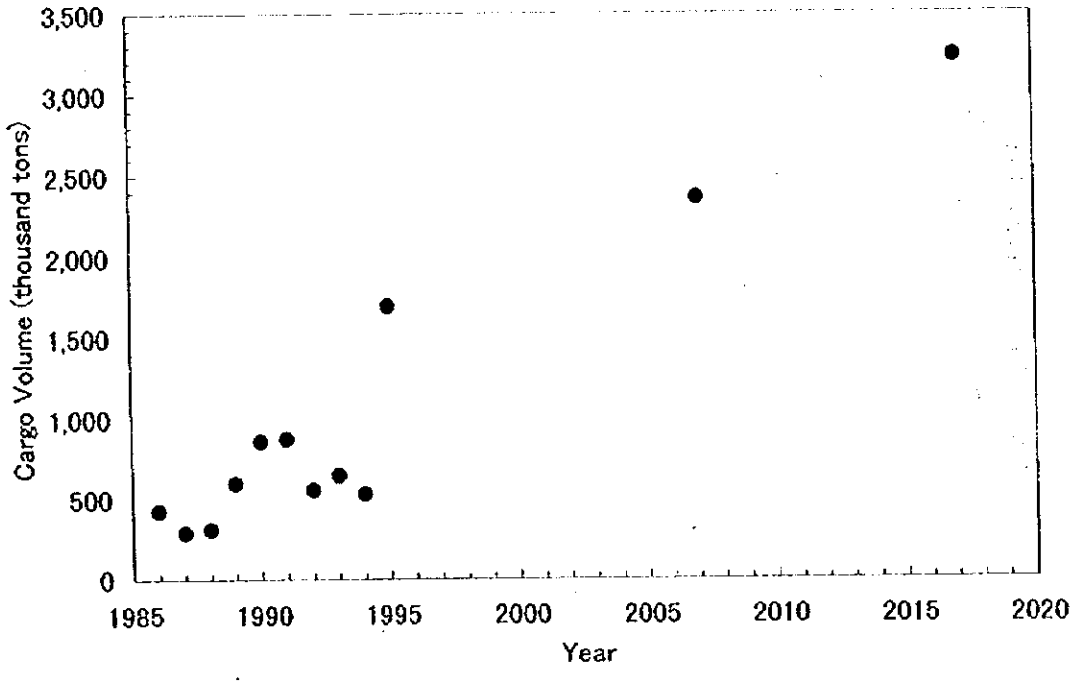

Figure A.9.12 Forecast Volume of Agricultural, Fishery and Forest Products (Export)

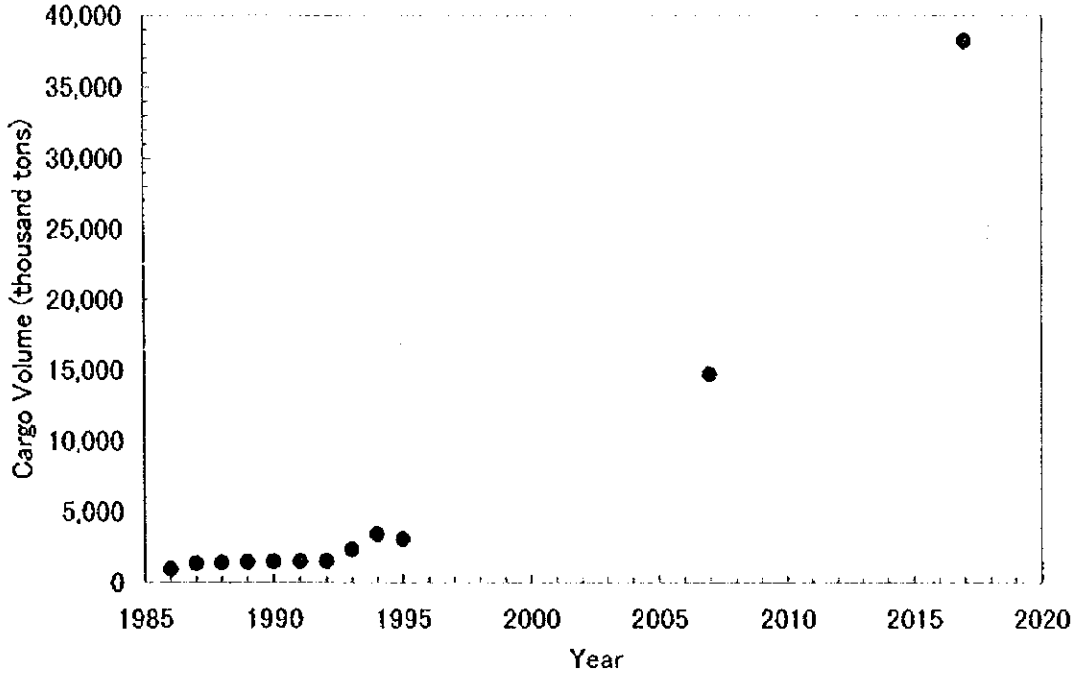

Figure A.9.13 Forecast Volume of Light Industry Products (Export)

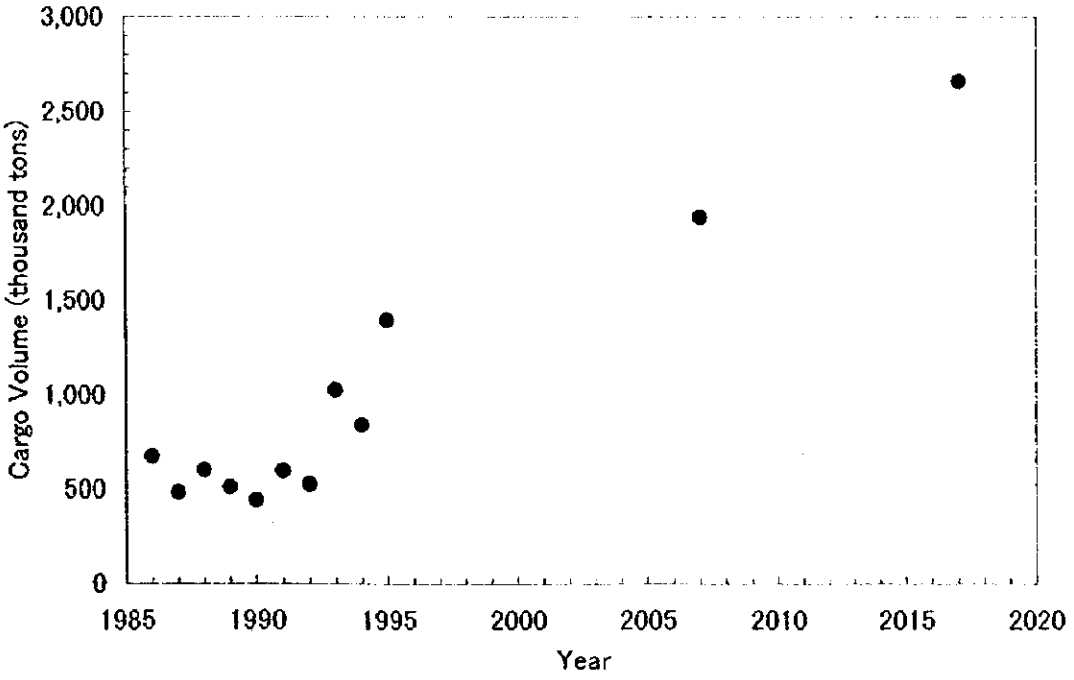

Figure A.9.14 Forecast Volume of Agricultural Products (Export)

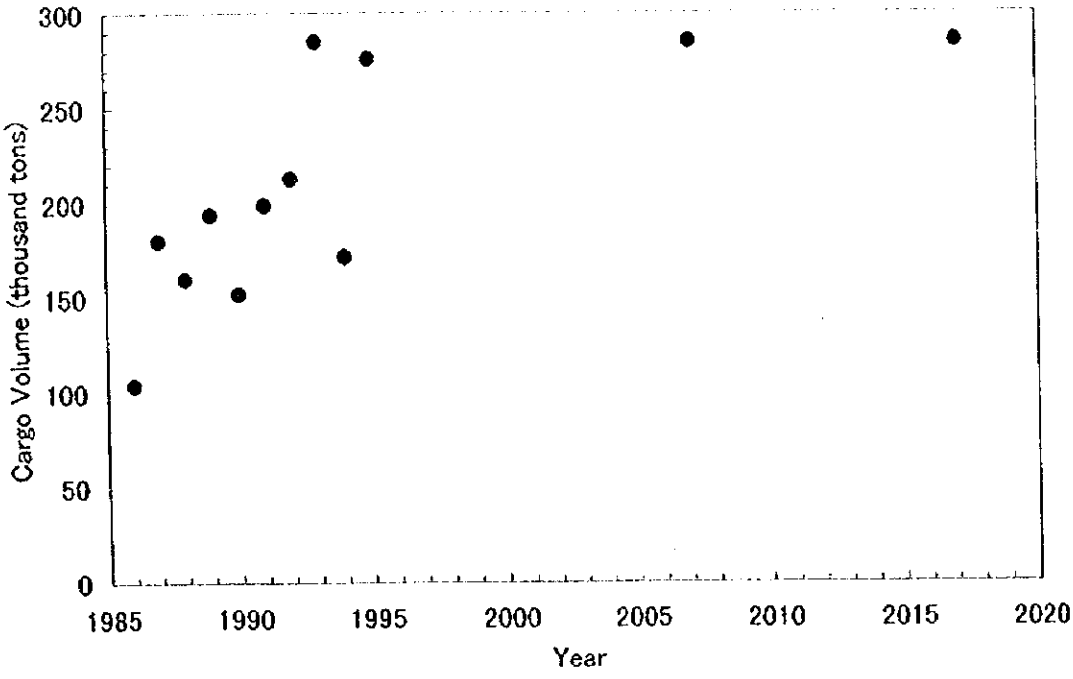

Figure A.9.15 Forecast Volume of Metal and Metal Products (Export)

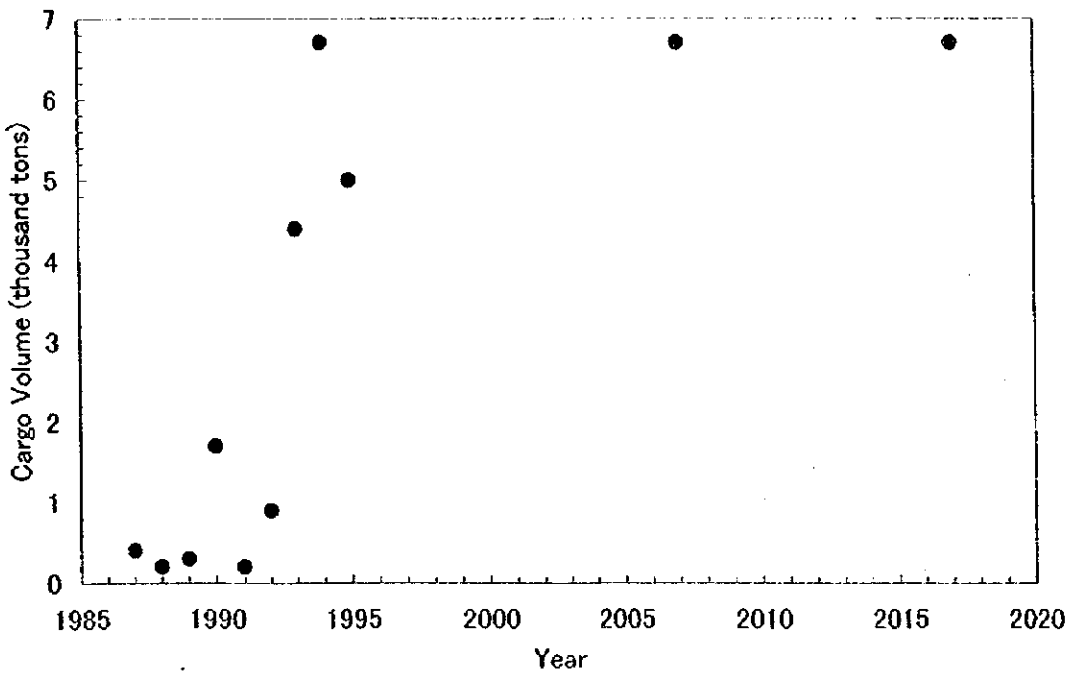

Figure A.9.16 Forecast Volume of Chemical Liquid Products (Export)

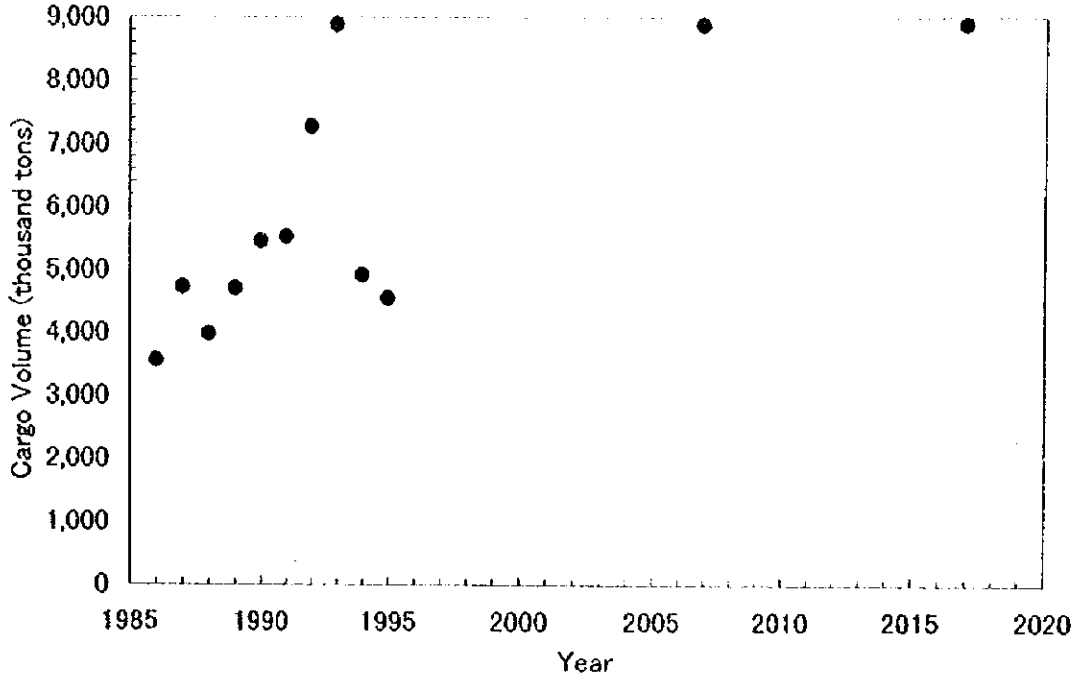

Figure A.9.17 Forecast Volume of Crude Oil (Import)

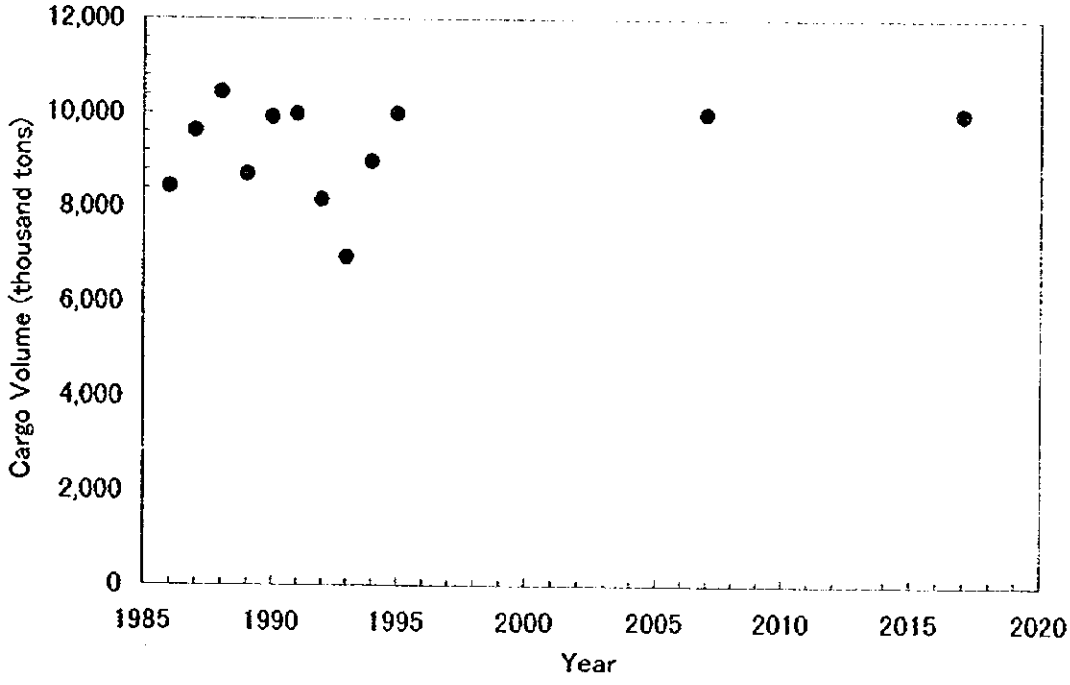

Figure A.9.18 Forecast Volume of Crude Oil (Export)

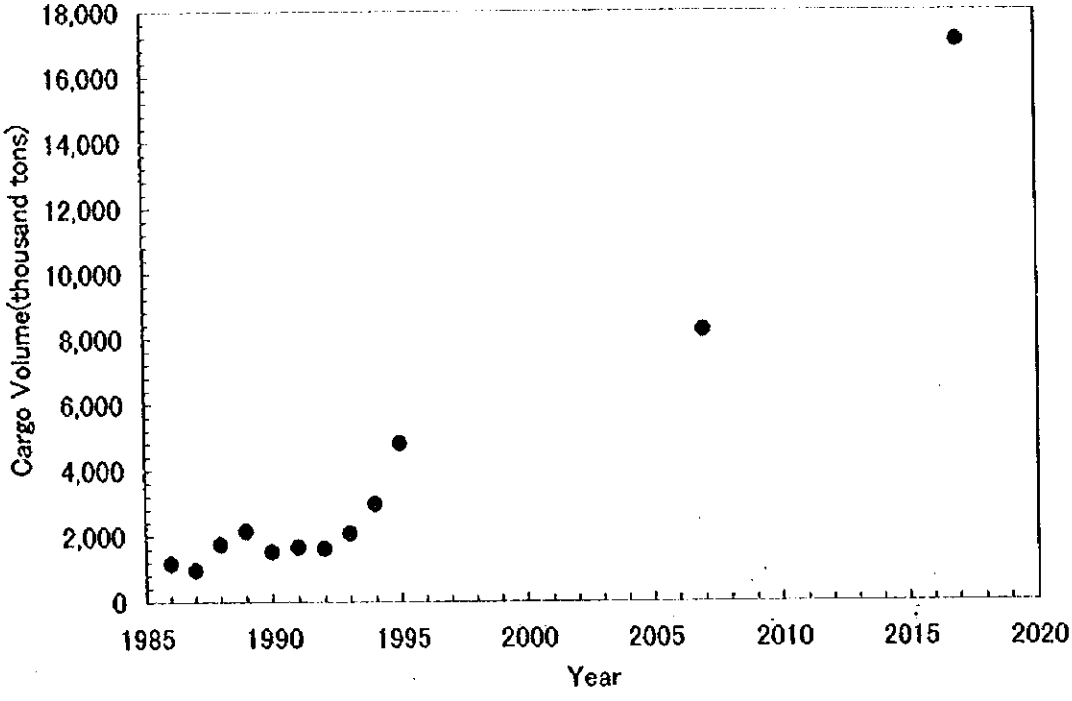

Figure A.9.19 Forecast Volume of Refined Petroleum Products (POL) (Import)

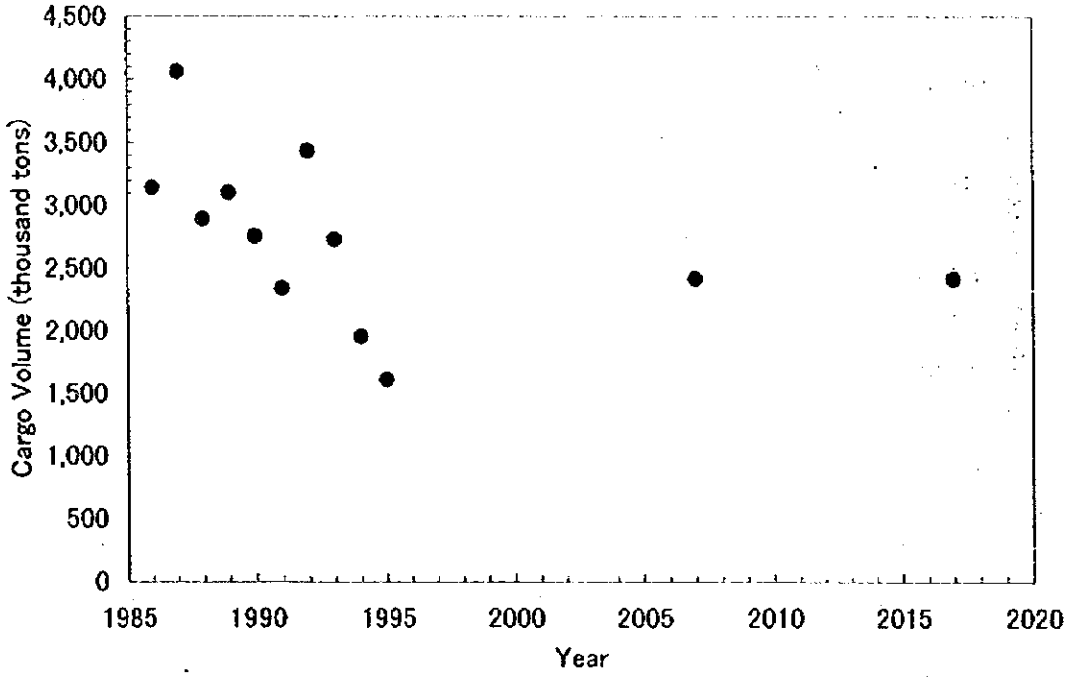

Figure A.9.20 Forecast Volume of Refined Petroleum Products (POL) (Export)