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The World Bank

Price Prospects for Major Primary Commodities, 1988-2000

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Volume I

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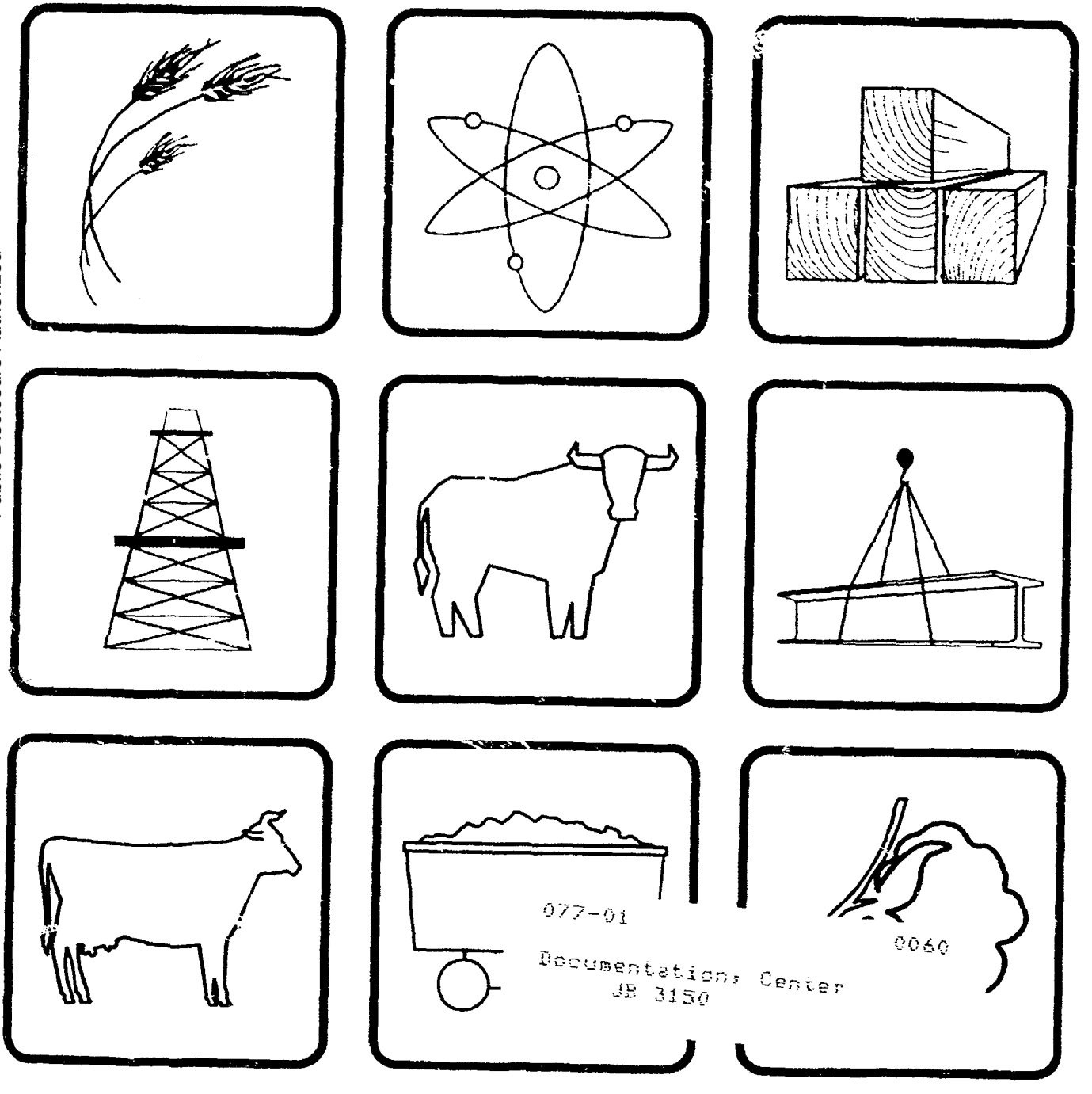
Energy
Metals and Minerals



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Volume I

Summary
Energy
Metals and Minerals

The World Bank
Washington, D.C.

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PREFACE

1. This publication is a two-volume report which reviews the market prospects for the major primary commodities exported by developing countries. In the past this report has been prepared periodically for distribution within the World Bank. However, requests for its distribution outside the World Bank have been manifold, and its publication in this form is in response to these many requests.

2. The forecasts are mainly used in forecasting the balance of payments of countries that borrow from the World Bank and in appraising investment projects that include these commodities as inputs or outputs. Because of the multiple purposes they are intended to serve, the price forecasts are presented in current (nominal) as well as 1985 constant dollar (real) terms. 1/ Up to 1990 the forecasts are in terms of actual prices expected. For 1995 and 2000 the price forecasts are forecasts of the average levels expected during that period.

3. The forecasts are conditional on the various macroeconomic and commodity-specific assumptions used--all of which are subject to uncertainty. The macroeconomic assumptions forming the basis for the price forecasts are set out and discussed in the section that begins on page 11. The primary commodity forecasts are then discussed, commodity by commodity. For each commodity or group of commodities there is a standardized set of tables giving historical and forecast values for production, consumption, exports, imports, and prices; these tables give details in terms of major economic regions as well as for countries which are major participants in these markets. For most of the commodities, the forecasts have been based on simulation runs of global commodity models maintained within the International Commodity Markets Division of the World Bank's International Economics Department. Details of these models can be obtained directly from the Division.

4. The assistance given to the Division in carrying out this exercise is gratefully acknowledged. People in both public and private organizations have been most forthcoming in providing data and in discussing the outlook for the various commodity markets. Their cooperation has added greatly to the usefulness of the report.

1/ Commodity prices have been deflated by the World Bank's Manufacturing Unit Value (MUV) index, and the US GDP deflator. The MUV index is the c.i.f. index of US dollar prices of industrial countries' manufactured exports (SITC 5-8) to the developing countries and may be regarded as a useful deflator to measure changes in the net barter terms of trade of developing countries highly dependent on exports of primary commodities. The US GDP deflator may be a useful deflator to use in circumstances where the US inflation rate is believed to be an appropriate measure of changes in the overall price or cost level.

NOTES AND DEFINITIONS

—Dollars are United States dollars unless otherwise specified.
—All tons refer to metric tons (1,000 kilograms) unless otherwise noted.

Abbreviations and Symbols

TONS	= metric tons	**LB**	= pounds
CUM	= cubic meters	**KG**	= kilograms
MTOE	= millions of tons of oil equivalent		
NA	= not available	**../—/**	= no data
...	= least squares growth rate for the said period is not meaningful due to the shortness of the time period for which data are available, or due to rapid growth from a low base.		

Economic Classifications

Industrial Countries*

North America...includes Canada, United States.

EEC-10...includes Belgium-Luxembourg, Denmark, France, Federal Republic of Germany, Ireland, Italy, Netherlands, Spain, United Kingdom.

Other Western Europe...includes Austria, Finland, Iceland, Liechtenstein, Norway, Sweden, Switzerland.

Asia and Oceania...includes Japan, Australia, New Zealand.

Centrally Planned Economies

USSR

Eastern Europe...includes Albania, Bulgaria, Czechoslovakia, German Democratic Republic, Hungary, Poland, Romania.

Developing Countries

Southern Europe...includes Cyprus, Greece, Israel, Malta, Portugal, Yugoslavia, Turkey.

Africa...includes South Africa.

Latin America and the Caribbean...includes Cuba.

Oceania...excludes Australia and New Zealand.

Asia...excludes Japan; includes China (which includes Taiwan, China, except where specifically noted), Democratic Kampuchea, People's Democratic Republic of Korea, Lao People's Democratic Republic, Mongolia, Viet Nam.

* Also includes American Samoa, Guam, Pacific Islands, Puerto Rico, US Virgin Islands with North America; Bermuda, Channel Islands, Faeroe Islands, Falkland Islands, French Guiana, French Polynesia, Gibraltar, Greenland, Isle of Man, Martinique, New Caledonia, Reunion with EEC-10.

COMMODITY DESCRIPTIONS

ENERGY

Petroleum, average OPEC price (OPEC government sales weighted by OPEC exports)
Thermal Coal, (12,000 BTU/lb, < 1% sulfur, 12% ash), FOB Piers, Hampton Roads, Norfolk

FOOD

Coffee (ICO), indicator price, other mild Arabicas, average New York and Bremen/Hamburg markets, ex-dock for prompt shipment
Cocoa (ICCO), daily average price, New York and London, nearest three future trading months
Tea (London Auction), average price received for all teas
Sugar (World), ISA daily price, FOB and stowed at greater Caribbean ports
Beef (US), imported frozen boneless, 85% visible lean cow meat, FOB port of entry
Bananas (Central and South American), first-class quality tropical pack, FOB US ports
Oranges (Mediterranean Exporters), EEC indicative import price, CIF Paris

CEREALS

Rice (Thai), white, milled, 5% broken, government standard, export price, FOB Bangkok
Wheat (Canadian), No. 1 Western Red Spring (CWRS) 13.5%, basis in store Thunder Bay, domestic; from April 1985, St. Lawrence, export
Maize (US), No. 2, yellow, FOB Gulf ports
Grain Sorghum (US), No. 2, Milo yellow, FOB Gulf ports

FATS AND OILS

Palm Oil (Malaysian), 5% bulk, CIF N.W. Europe
Coconut Oil (Philippines/Indonesian), bulk, CIF Rotterdam
Groundnut Oil (Nigerian/West African), bulk CIF UK, through January 1977; subsequently (any origin), CIF Rotterdam
Soybean Oil (Dutch), crude, FOB ex-mill
Soybeans (US), CIF Rotterdam
Copra (Philippines/Indonesian), bulk, CIF N.W. Europe
Palm Kernels (Nigerian), CIF UK
Groundnut Meal (Indian), 48%, CIF Rotterdam; from 1982, Argentine, 48/50%
Soybean Meal (US), 44% extraction, CIF Rotterdam

NON-FOOD

Cotton (Outlook "A" Index), Middling (1-3/32"), CIF Europe
Jute (Bangladesh), white D, FOB Chittagong/Chalna
Rubber (RSS No. 1), in bales, spot New York
Tobacco (Indian), flue-cured, average export unit value

TIMBER

Logs (Malaysian), Meranti, Sabah SQ Best Quality, sale price charged by importers, Japan
Logs (West African), Sapelli, high quality, loyal and marchand, FOB Cameroon
Sawnwood (Malaysian), Dark Red Meranti, select and better quality, standard density, CIF French ports

METALS AND MINERALS

Copper (LME), cash wirebars through November 1981; from December 1981 through June 1986, high grade cathodes, settlement price; subsequently, grade A
Tin (Malaysian), Straits quality, ex-smelter, Penang, official settlement price
Nickel (Canadian), electrolytic cathodes, Ni 99.9% shipping point; from 1980 (LME) cathodes, minimum 99.8% purity, official morning session weekly average bid/asked price
Aluminum (Representative Free Market Price), ingots, 99.7% purity, transactions price, EEC duty paid
Lead (LME), settlement price, refined lead, purity 99.97%
Zinc (LME), settlement price, good ordinary brand; from Sept. 1984, High Grade Brand
Iron Ore (Brazilian), 65%, CIF North Sea ports
Bauxite, US import reference price based on imports from Jamaica through 1974; from 1975 US import price, CIF US port
Gold (UK), 99.5% fine, London afternoon fixing, average of daily rates
Silver (Handy & Harman), 99.9% grade refined, New York

FERTILIZERS

Phosphate Rock (Moroccan), 72% BPL, FAS Casablanca; from 1981, 70% TPL contract
Urea (any origin), bagged, FOB N.W. Europe
TSP (Triple Superphosphate), bulk, FOB US Gulf
DAP (Diammonium Phosphate), bulk, FOB US Gulf
Potassium Chloride (Muriate of Potash), bulk, FOB Vancouver

SUMMARY

Recent History: 1986-88

1. The net barter terms of trade continued to move against non-fuel primary commodities in 1987, but there was a partial recovery in 1988. The World Bank's non-fuel commodity price index in nominal US dollar terms was virtually unchanged over the three-year period 1985-87. However, during this time the price of manufactured exports to developing countries increased by 30%. The upswing in commodity prices from the latter half of 1987 led to prices in nominal terms in July 1988 reaching levels last seen in the first quarter of 1981--at the beginning of the long downswing. For the first seven months of 1988 non-fuel prices have averaged 19% higher than for 1987. Two features of recent price movements are of major interest--the reasons for the stability of prices at low levels over the 1985-87 period and the recovery in the late 1987 and early 1988.

2. For discussion purposes it is useful to split the non-fuel commodities into three groups, as different explanations are important for each group. Also, price movements in these groups--beverages, grains, and raw materials--have different implications for different groups of developing countries. The beverages are extremely important foreign exchange earners for many of the low-income developing countries. The grains, besides being the staple of most of the people in the developing world, are important imports for the poorest of these countries. The raw materials, both agricultural and minerals/metals (as well as energy), are the main conduit by which fluctuations in the industrial countries are transferred to developing countries. As well, the industrializing countries are rapidly growing consumers of raw materials.

3. Beverage prices increased sharply in 1986, essentially because of a boom in coffee prices due to drought-related crop losses in Brazil. The unwinding of this boom in 1987 took place at a time when coffee prices were not receiving support from the export quota scheme run under the International Coffee Agreement, and prices fell to extremely low levels. The reimposition of the export quotas led to an increase in prices but these have subsequently been under pressure--mainly from the prospects for a large Brazilian crop and large stocks held in consuming countries. Cocoa prices have fallen to levels not seen in the past 15 years. Again the depressing factor is increasing production. The increases in coffee and cocoa production in recent years in large part derive from the large-scale new plantings made in the late 1970s in response to the price boom experienced at that time. As well, under the pressures for servicing their external debt, many of these producers have depreciated their currencies significantly to increase supply and hence exports of these commodities, which pushes down world prices.

4. Cereal prices, as well as cotton and soybean prices, were driven to very low levels in 1986 and 1987 as a direct result of US farm policy and responses to these policy initiatives, particularly by the EEC. The basic aim of the 1985-90 US farm legislation was to push down world prices and thereby discourage production and exports from its competitors, so that US farm

stocks--which had grown tremendously under the incentives offered by the 1980-85 farm legislation--could be reduced by exports. This policy was successful, and prices of most of these commodities began to rise in the last quarter of 1987 as stocks reached more normal levels. The pressures for the recent prices increases were magnified by the poor Asian monsoon season in 1987, and the US summer drought in the second and third quarters of 1988.

5. Raw material prices were largely constant throughout 1986--the bottom of the downswing since 1981--which appears consistent with the fact that the OECD's industrial production grew at only 1% during that time. However, raw material prices began to move up sharply from the second quarter of 1987, and this upswing continued until June 1988. At this point the metals/minerals subgroup price index was at a record high in nominal terms. Average 1988 prices for agricultural raw materials are 28% higher than in 1986. The primary reason for the upswing has been the unexpectedly strong and sustained growth of industrial economies, particularly in the capital goods sector. The United States, Japan, the United Kingdom, and a few manufactures-exporting developing countries led the expansion. Industrial production growth was also strong in the United States and the United Kingdom. The price increases for the metals and minerals have been sustained because there has been a slow production response. We attribute this to the steady closing down of surplus capacity during the long period of declining prices since 1980. Unlike the fast production response to the increase in copper and aluminum prices in the 1983 mini-boom, this time there was little idle capacity available to bring back on-stream. As a result of the increase in nominal primary commodity prices, the net barter terms of trade of non-fuel commodities for the developing countries should increase by nearly 11% in 1988. This would mean an offset of the terms-of-trade loss experienced in 1987.

Short-Term Price Forecast: 1988-90

6. The price forecasts included in this report are summarized in constant and current dollars in Tables 1 and 2. The price indices maintained by the World Bank are shown in Table 3 (constant dollars) and Table 4 (current dollars). The indices are also calculated for the forecast period. The deflator used by the World Bank to measure international inflation rates, the MUV, is given in Table 5.

7. Non-fuel primary commodity prices in aggregate nominal terms are expected to decline slightly from their 1988 level over the next two years (see column 2, Table 4). Between 1988 and 1990 there is expected to be a decline in metals/minerals prices of about 16%, based on the expectation that the recent growth rates in industrial production will not be maintained (in fact, a considerable slowdown is posited). We also expect an increase in output resulting from the recent price increases as well as from new capacities committed to coming on-stream. Cereal prices are also expected to fall substantially from their recent highs--though most of this decline should take place in the second half of 1989 and in 1990. Offsetting these declines are expected increases in beverage prices, as coffee and cocoa prices increase from the disastrous lows experienced in 1988. However, we are attaching an important qualification to this forecast. The International Coffee Agreement is due for renegotiation, and substantial difficulties lie in the path to a

new agreement. If the export quota scheme is suspended or otherwise becomes inoperative, coffee prices--especially for the tropical robusta varieties--will fall substantially because producers will no longer be jointly constrained to hold the stocks accumulated while the export quota scheme has been in operation. Similar risks face the cocoa market. If the 250,000 tons accumulated by the Buffer Stock Manager, under the International Cocoa Agreement, is released because of lack of support for the operation of the Agreement, cocoa prices will be under further downwards pressure.

8. Nominal prices of the "other foods" are also expected to increase. The most important component of this subgroup is sugar. The international price of sugar in US dollars is expected to increase by 35% over the 1988-90 period (see Table 2). Sugar stocks have been reduced to levels that in the past have seen a triggering of sharp price increases. Sugar production is not expected to outpace consumption over the next few years, and therefore the probability of a production shortfall in a significant producer leading to a price run-up is considered to be high.

9. With the international inflation index forecast to increase by nearly 8% over the 1988-90 period, the non-fuel index in constant US dollar terms declines by 10% (column 2, Table 3). Such a decline would wipe out the terms-of-trade gains in 1988, bringing the constant dollar index back to the record-low level of 1987.

Long-Term Price Forecasts: 1990-2000

10. Non-fuel commodity prices in real terms are expected to make only a modest improvement over the 1990-2000 period--increasing by only 5% (Table 3). The foods group price index is expected to decline even further because of substantial declines in the real prices of the fats and oils and other foods groups. The emergence of the EEC as a significant producer of oilseed products, the rapid increase of productive capacity for palm oil in Malaysia and Indonesia, and expanded soybean plantings in South America will make the vegetable fats and oils market extremely competitive over the long run. The sugar price, the major component of the other foods index, is expected to decline significantly over the 1990-2000 period, though this decline is somewhat misleading as we are expecting a run-up in sugar prices within the next few years. Still, the sugar market has been and will remain under considerable pressure from substitute sweetners--with the extension of high fructose production to developing countries and more extensive use of high potency, noncaloric sweetners in the industrial countries.

11. Beverage prices are expected to decline even further in real terms over the period 1990-95, as continuing production increases from very cost-competitive producers--Brazil, Colombia, and Indonesia in coffee; Brazil, Indonesia, and Malaysia in cocoa--keep up pressure on prices. The sustained period of low prices will eventually dampen plantings, and prices are expected to increase in the 1995-2000 period as the production increases slow. As with all other commodities, beverage prices will remain subject to considerable variability stemming from, e.g., frosts in the Brazilian coffee-growing areas or dry weather affecting West African cocoa producers.

12. Real prices of raw material commodities--agricultural and metals/minerals--should trend up fairly strongly in the 1990-2000 period. This uptrend derives in part from the low levels of prices forecast for 1990, based on the assumed slowdown in OECD industrial production over the next two years. A much faster increase in raw material prices could be seen in the 1990s if the real interest rate were to fall to near long-term levels coincident with reasonably strong economic growth. These circumstances would stimulate a resurgence in investment activity, which has been considerably dampened over the past decade or so. Investment activities are raw material-intensive and an upswing in investment would lead to a sustained run-up in raw material prices. In the absence of these improved circumstances, raw material demand will continue to feel the strong competition from synthetic substitutes.

Petroleum Price Forecasts: 1988-2000

13. The oil price scenario which we believe most likely foresees a somewhat more cohesive OPEC, following the cessation of the Iran-Iraq war, and a period of low prices stimulating crude oil demand while depressing exploration and development of oil reserves. Under this scenario, OPEC's production control would be sufficient to ensure that crude oil prices would not increase quickly--remaining below $11/barrel in 1985 dollars for the period 1988-90. As well as fostering a pickup in demand, such price levels would also slow the development of alternative energies and energy-saving technologies. With increasing demand and assuming a slowdown in the growth of non-OPEC supplies in the 1990s, there should be an upward trend in prices--rising to $12/barrel by 1995 and $15/barrel by the year 2000 (in 1985 dollars).

14. The cohesiveness of OPEC will remain tenuous. Other factors critical to the future performance of this market include the rate of progress of technological developments affecting energy use efficiency, conservation, and development of alternative fuels, as well as the growth in non-OPEC supplies. These factors all pose downside potential to our price forecasts. On the other hand, the potential for disruption of oil supplies remains high. These considerations point to a large degree of uncertainty about the forecast and likely considerable variability in actual prices.

TABLE 1: COMMODITY PRICES AND PRICE PROJECTIONS IN NOMINAL DOLLARS /A

		ACTUAL									SHORT RUN			LONG RUN	
COMMODITY	UNIT	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1995	2000
ENERGY															
PETROLEUM	$/BBL	3.6	29.2	32.7	30.0	27.9	27.8	26.7	11.5	13.3	9.9	10.4	10.9	12.2	15.4
COAL	$/MT	0	41	54	50	44	49	47	37	38	26	24	25	27	29
FOOD															
COFFEE	¢/KG	346	330	288	298	288	321	321	363	193	213	211	211	204	205
COCOA	¢/KG	188	290	198	168	211	242	225	175	153	114	100	105	104	115
TEA	¢/KG	302	214	192	187	231	349	198	163	131	124	134	145	150	160
SUGAR	$/MT	223	606	357	179	185	196	98	113	115	240	268	300	224	254
BEEF	¢/KG	359	265	258	251	242	250	215	177	184	177	172	167	188	200
BANANAS	$/MT	435	383	383	362	426	374	378	323	290	303	281	280	310	290
ORANGES	$/MT	462	374	388	372	371	356	388	333	352	291	289	297	310	300
RICE	$/MT	386	416	461	283	275	255	216	178	177	215	198	183	173	166
WHEAT	$/MT	175	183	187	161	168	167	173	136	103	125	125	103	108	113
MAIZE	$/MT	161	120	125	108	135	137	112	74	58	77	73	65	68	73
GRAIN SORGHUM	$/MT	143	124	121	105	128	120	103	70	56	71	68	60	62	68
FATS AND OILS															
PALM OIL	$/MT	716	598	544	430	498	736	501	217	264	330	295	294	327	296
COCONUT OIL	$/MT	1,089	646	543	449	725	1,157	580	251	340	412	400	414	425	374
GROUNDNUT OIL	$/MT	1,042	824	995	966	708	1,027	905	481	385	389	417	430	529	456
SOYBEAN OIL	$/MT	845	572	483	433	523	732	572	289	257	340	325	316	470	371
SOYBEANS	$/MT	322	284	275	237	280	285	224	176	166	225	209	186	198	148
COPRA	$/MT	619	434	362	304	493	718	586	166	238	282	286	296	305	266
PALM KERNELS	$/MT	462	331	303	256	363	534	291	120	138	180	193	199	206	179
GROUNDNUT MEAL	$/MT	281	230	227	183	199	189	143	139	125	138	153	147	129	104
SOYBEAN MEAL	$/MT	283	251	241	211	236	199	157	156	156	200	188	167	147	112
NON-FOOD															
COTTON	¢/KG	174	196	176	154	184	180	132	89	127	99	99	111	123	116
JUTE	$/MT	754	295	263	276	300	536	583	228	248	263	301	211	243	236
RUBBER	¢/KG	127	156	119	97	123	111	92	80	86	103	85	77	115	108
TOBACCO	$/MT	2,717	2,205	2,241	2,331	2,229	2,011	1,950	1,762	1,471	1,459	1,431	1,475	1,492	1,439
TIMBER															
LOGS (MERANTI)	$/CM	102	187	148	151	144	169	136	128	170	163	165	166	177	185
LOGS (SAPELLI)	$/CM	118	241	203	170	160	177	174	187	199	192	194	196	202	208
SAWNWOOD	$/CM	256	350	300	292	302	310	276	226	213	206	205	204	202	203
METALS AND MINERALS															
COPPER	$/MT	3,887	2,092	1,681	1,432	1,581	1,392	1,417	1,161	1,371	1,720	1,251	1,087	1,354	1,280
TIN	¢/KG	984	1,576	1,341	1,252	1,294	1,259	1,154	521	515	490	535	610	663	750
NICKEL	$/MT	7,830	6,249	5,677	4,678	4,640	4,802	4,899	3,280	3,749	9,075	5,529	3,981	4,020	3,989
ALUMINUM	$/MT	1,486	1,659	1,276	1,026	1,485	1,385	1,110	1,066	1,237	1,706	1,404	1,186	1,299	1,280
LEAD	$/MT	836	869	693	528	422	448	391	343	459	448	395	356	439	419
ZINC	$/MT	812	730	807	720	759	932	783	637	615	782	652	590	630	794
IRON ORE	$/MT	41.8	25.6	23.2	25.0	23.8	23.4	22.7	18.6	16.9	17.2	18.5	18.2	15.5	17.0
BAUXITE	$/MT	33.0	30.7	33.8	39.1	37.1	37.4	35.7	28.5	22.7	19.9	18.7	19.8	22.1	21.2
GOLD	$/TOZ	99	583	438	363	420	364	318	311	344	313	288	250	232	229
SILVER	$/TOZ	4.9	19.8	10.0	7.7	11.4	8.2	6.1	4.6	5.4	4.7	4.8	4.5	4.3	4.3
FERTILIZERS															
PHOSPHATE ROCK	$/MT	30	45	47	41	37	39	34	29	24	26	26	28	32	34
UREA	$/MT	133	213	206	154	134	173	136	90	90	105	120	152	141	132
TSP	$/MT	117	173	154	134	134	133	121	102	106	112	109	122	138	146
DAP	$/MT	149	213	186	177	182	191	169	130	134	139	152	177	188	194
POTASSIUM CHLOR /B	$/MT	87	111	107	79	75	85	84	58	53	62	64	69	72	75

N.A. = NOT AVAILABLE.

/A COMPUTED FROM UNROUNDED DATA AND DEFLATED BY MUV (1985=100).
/B POTASSIUM CHLORIDE, ALSO KNOWN AS MURIATE OF POTASH.

SOURCE: WORLD BANK.

OCTOBER 17, 1988

TABLE 2: COMMODITY PRICES AND PRICE PROJECTIONS IN CURRENT DOLLARS /A

COMMODITY	UNIT	ACTUAL 1970	1980	1981	1982	1983	1984	1985	1986	1987	SHORT RUN 1988	1989	1990	LONG RUN 1995	2000
ENERGY															
PETROLEUM	$/BBL	1.3	30.5	34.3	31.0	28.1	27.5	26.7	13.8	17.2	14.0	15.5	16.6	22.0	35.0
COAL	$/MT	0	43	57	52	45	49	47	44	36	37	36	38	50	67
FOOD															
COFFEE	¢/KG	115	344	282	309	290	318	321	429	251	300	315	320	389	465
COCOA	¢/KG	68	260	208	174	212	240	225	207	198	160	150	160	188	260
TEA	¢/KG	110	223	202	193	233	346	198	193	171	175	200	220	271	363
SUGAR	$/MT	81	632	374	186	187	115	90	133	149	337	401	455	406	575
BEEF	¢/KG	130	276	248	258	244	227	215	209	238	249	257	254	342	453
BANANAS	$/MT	165	379	401	374	429	370	378	382	378	427	420	425	561	657
ORANGES	$/MT	168	391	405	385	373	352	388	394	458	410	432	450	561	680
RICE	$/MT	144	434	483	293	277	252	216	211	230	303	297	250	313	377
WHEAT	$/MT	63	191	196	167	170	165	173	161	134	176	187	157	192	256
MAIZE	$/MT	58	125	131	109	136	136	112	88	76	108	110	98	123	166
GRAIN SORGHUM	$/MT	52	129	126	109	129	119	103	83	73	100	102	91	112	155
FATS AND OILS															
PALM OIL	$/MT	260	584	571	445	501	729	501	257	343	464	441	446	592	671
COCONUT OIL	$/MT	397	674	570	464	730	1,155	590	297	442	580	598	628	769	847
GROUNDNUT OIL	$/MT	379	859	1,043	585	711	1,017	905	569	500	547	624	655	957	1,034
SOYBEAN OIL	$/MT	307	597	507	447	327	724	572	342	334	478	486	480	850	840
SOYBEANS	$/MT	117	296	288	245	282	282	224	208	216	316	313	282	358	336
COPRA	$/MT	225	453	379	314	496	710	586	197	309	397	427	449	552	603
PALM KERNELS	$/MT	168	345	317	265	365	528	291	142	181	253	288	302	373	406
GROUNDNUT MEAL	$/MT	102	240	238	189	200	187	143	165	162	194	229	223	233	235
SOYBEAN MEAL	$/MT	103	262	253	219	238	197	157	185	203	282	281	253	266	254
NON-FOOD															
COTTON	¢/KG	63	205	185	160	185	179	132	106	165	140	148	168	223	263
JUTE	$/MT	274	308	276	286	302	531	583	270	323	370	450	320	440	535
RUBBER	¢/KG	46	162	125	100	124	110	92	95	112	144	127	118	208	239
TOBACCO	$/MT	988	2,300	2,350	2,410	2,245	1,990	1,950	2,085	1,912	2,053	2,139	2,238	2,700	3,260
TIMBER															
LOGS (MERANTI)	$/CM	37	195	156	156	145	167	136	151	221	230	247	252	320	419
LOGS (SAPELLI)	$/CM	43	252	213	176	161	176	174	222	258	271	290	297	366	471
SAWNWOOD	$/CM	93	365	314	302	304	307	276	267	276	290	306	309	366	460
METALS AND MINERALS															
COPPER	$/MT	1,413	2,182	1,742	1,480	1,592	1,377	1,417	1,374	1,783	2,420	1,870	1,650	2,450	2,900
TIN	¢/KG	359	1,644	1,406	1,295	1,303	1,246	1,154	616	669	690	900	925	1,200	1,700
NICKEL	$/MT	2,846	6,519	5,953	4,838	4,673	4,752	4,899	3,881	4,872	12,770	8,267	6,041	7,275	9,039
ALUMINUM	$/MT	540	1,730	1,338	1,061	1,695	1,371	1,110	1,261	1,608	2,400	2,100	1,800	2,350	2,900
LEAD	$/MT	304	906	727	546	425	443	391	406	597	630	980	540	795	950
ZINC	$/MT	295	761	846	745	764	922	783	754	799	1,100	975	895	1,140	1,800
IRON ORE	$/MT	15.2	26.7	24.3	25.9	24.0	23.2	22.7	22.0	22.0	24.2	27.7	27.6	28.1	38.5
BAUXITE	$/MT	12.0	32.0	35.4	40.4	37.4	37.0	35.7	33.7	29.5	28.0	28.0	30.0	40.0	48.0
GOLD	$/TOZ	36	608	460	376	423	360	318	368	446	440	430	380	420	520
SILVER	$/TOZ	1.8	20.6	10.5	7.9	11.4	8.1	6.1	5.5	7.0	6.6	7.2	6.9	7.8	9.7
FERTILIZERS															
PHOSPHATE ROCK	$/MT	11	47	50	42	37	38	34	34	31	36	39	43	58	77
UREA	$/MT	48	222	216	159	135	171	136	107	117	148	180	230	255	300
TSP	$/MT	43	180	161	138	135	131	121	121	138	157	163	185	250	330
DAP	$/MT	54	222	195	183	184	189	169	154	174	196	228	269	340	440
POTASSIUM CHLOR /B	$/MT	32	116	112	82	75	84	84	69	69	87	95	105	130	170

N.A. = NOT AVAILABLE.

/A DATA HAVE BEEN ROUNDED.
/B POTASSIUM CHLORIDE, ALSO KNOWN AS MURIATE OF POTASH.

SOURCE: WORLD BANK.

OCTOBER 17, 1988

TABLE 3: WEIGHTED INDEX OF COMMODITY PRICES (CONSTANT US DOLLARS)
(1979-81=100)

	PETROLEUM	33 COMMODITIES (EXCLUDING ENERGY)	AGRICULTURE							TIMBER	METALS & MINERALS
			TOTAL	FOOD					NON-FOOD		
(WEIGHTS- % SHARE) /A		(100.0)	(67.7)	TOTAL (53.2)	BEVERAGES (22.3)	CEREALS (9.4)	FATS & OILS (9.3)	OTHER (12.3)	(14.4)	(5.2)	(27.1)
1948	30.0	112.4	123.6	119.2	86.2	153.7	188.4	100.7	139.8	43.0	97.9
1949	25.8	112.8	120.9	118.9	99.5	162.2	147.1	99.6	128.6	47.3	105.1
1950	26.2	149.3	167.4	151.2	146.2	176.7	176.6	121.6	227.0	56.6	122.1
1951	22.7	155.8	171.7	145.2	140.3	165.4	182.1	110.9	269.5	71.9	132.4
1952	21.7	137.1	139.6	129.0	127.7	156.5	146.3	97.4	178.6	51.4	147.6
1953	23.6	131.6	135.7	134.0	134.0	161.3	150.5	100.4	142.2	48.3	137.4
1954	25.5	144.3	154.3	157.2	194.3	153.2	142.8	103.6	143.6	67.9	134.5
1955	25.0	140.4	141.7	133.3	151.5	132.9	130.3	102.8	172.8	53.4	154.1
1956	24.2	137.6	137.3	133.3	153.4	129.8	129.0	102.7	152.3	49.6	135.2
1957	23.6	127.9	130.9	127.1	137.3	121.0	127.2	113.1	144.7	46.8	136.3
1958	22.0	117.2	119.3	116.1	123.0	120.6	117.7	99.1	131.0	43.9	126.1
1959	19.8	117.1	119.3	110.5	109.7	116.3	127.3	94.9	151.9	52.4	123.9
1960	18.2	115.3	116.3	105.5	104.2	108.5	118.5	95.7	156.2	56.4	124.1
1961	17.9	108.7	108.0	101.8	97.1	114.6	117.9	88.5	131.0	57.4	120.3
1962	16.4	106.1	106.1	100.3	90.7	124.2	113.1	89.9	127.6	61.7	114.6
1963	16.7	110.1	112.2	109.9	91.4	126.6	121.7	122.0	120.8	61.4	114.4
1964	15.3	117.1	114.0	112.1	103.2	124.0	123.3	110.8	120.9	51.6	137.4
1965	15.1	118.9	109.0	106.7	98.2	120.4	134.5	91.0	117.4	59.1	155.3
1966	14.7	119.2	106.8	104.5	92.7	131.3	126.2	89.1	115.2	60.1	161.5
1967	14.5	110.5	104.4	103.4	89.3	136.8	119.5	91.5	108.2	63.5	134.7
1968	14.6	112.1	104.8	102.5	89.1	134.4	115.4	92.8	113.2	65.7	139.1
1969	13.9	112.5	103.7	100.6	87.8	126.5	108.3	98.3	115.2	60.1	144.7
1970	13.1	111.2	102.5	102.9	96.0	108.9	120.6	97.1	101.4	59.8	142.8
1971	16.2	97.8	93.2	92.3	79.3	99.8	114.4	93.3	96.4	57.9	117.0
1972	16.6	93.9	92.1	92.3	80.0	96.5	103.5	103.0	91.1	52.5	106.4
1973	20.4	124.0	123.9	123.7	87.9	170.2	184.9	107.1	124.3	79.2	133.0
1974	69.3	134.4	134.7	140.3	83.1	202.4	171.6	172.9	114.0	77.9	144.8
1975	60.7	100.9	99.8	102.7	71.0	142.4	103.6	129.2	89.2	52.8	113.1
1976	64.3	111.9	115.5	117.3	134.0	114.8	109.5	94.7	110.7	70.0	110.2
1977	64.0	122.9	134.1	142.6	205.6	96.1	123.7	78.0	102.5	74.1	104.4
1978	56.0	101.5	107.9	110.9	132.3	100.1	112.3	79.1	96.8	67.7	92.1
1979	71.3	104.8	105.5	106.4	121.0	92.2	113.5	85.6	101.9	104.3	103.1
1980	106.7	104.9	104.4	103.9	99.1	100.5	95.9	121.2	106.4	109.5	105.2
1981	119.3	90.8	90.7	90.3	81.9	106.6	91.9	92.0	91.9	86.6	92.1
1982	109.5	82.4	81.1	80.9	84.8	78.7	75.8	79.1	82.1	88.0	84.4
1983	101.8	89.2	89.4	88.0	88.1	87.4	91.9	85.4	94.6	84.2	89.5
1984	101.4	92.2	94.2	95.4	103.7	85.0	110.0	77.3	89.7	98.6	85.9
1985	97.4	80.9	81.2	83.0	94.6	73.6	76.3	74.2	74.6	79.5	80.5
1986	41.6	69.0	71.1	74.4	97.7	54.4	49.7	66.0	58.7	74.6	62.7
1987	48.3	62.7	58.7	56.9	58.4	46.7	52.7	65.2	65.2	99.5	65.7
1988	36.3	69.5	63.5	63.2	59.7	58.5	66.5	70.6	64.8	95.5	79.5
1989	37.8	64.4	60.8	61.1	58.8	55.5	59.9	70.7	59.5	96.5	67.3
1990	39.9	62.5	60.0	60.2	59.8	47.3	58.8	71.8	59.4	97.0	62.3
1995	44.4	66.0	62.3	59.4	58.4	49.4	59.4	68.6	73.2	103.3	67.9
2000	56.4	65.5	60.5	58.4	60.0	51.0	48.8	68.2	68.5	108.0	69.8

/A COMPUTED FROM UNROUNDED DATA AND DEFLATED BY MANUFACTURING UNIT VALUE (MUV) INDEX.

NOTE: THE COMMODITIES INCLUDED IN EACH GROUP ARE: BEVERAGES--COFFEE, COCOA, TEA; CEREALS--MAIZE, RICE, WHEAT, GRAIN SORGHUM; FATS AND OILS--PALM OIL, COCONUT OIL, GROUNDNUT OIL, SOYBEANS, COPRA GROUNDNUT MEAL, SOYBEAN MEAL; OTHER FOODS--SUGAR, BEEF, BANANAS, ORANGES; NON-FOODS--COTTON, JUTE, RUBBER, TOBACCO; TIMBER--LOGS; METALS AND MINERALS--COPPER, TIN, NICKEL, BAUXITE, ALUMINUM, IRON ORE, LEAD, ZINC, PHOSPHATE ROCK.

SOURCE: WORLD BANK.

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TABLE 4: WEIGHTED INDEX OF COMMODITY PRICES (CURRENT US DOLLARS)
(1979-81=100)

(WEIGHTS-$ SHARE) /A	PETROLEUM	33 COMMODITIES (EXCLUDING ENERGY) (100.0)	AGRICULTURE TOTAL (67.7)	AGRICULTURE FOOD TOTAL (53.2)	AGRICULTURE FOOD BEVERAGES (22.3)	AGRICULTURE FOOD CEREALS (9.4)	AGRICULTURE FOOD FATS & OILS (9.3)	AGRICULTURE FOOD OTHER (12.3)	AGRICULTURE NON-FOOD (14.4)	TIMBER (5.2)	METALS & MINERALS (27.1)
1948	8.3	31.0	34.1	32.9	23.8	42.4	52.0	27.8	38.6	11.9	27.0
1949	6.8	29.9	32.0	31.5	26.4	43.0	39.0	26.4	34.1	12.5	27.8
1950	6.1	34.8	39.0	35.2	34.1	41.2	41.1	28.3	52.9	13.2	28.4
1951	6.1	41.9	46.2	39.1	37.7	44.5	49.0	29.8	72.5	19.3	35.6
1952	6.1	38.7	39.4	36.4	36.0	44.1	41.3	27.5	50.4	14.5	41.6
1953	6.5	36.1	37.2	36.7	36.7	44.2	41.2	27.5	39.0	13.2	37.7
1954	6.8	38.7	41.4	42.1	52.1	41.1	38.3	27.8	38.5	18.2	36.0
1955	6.8	38.3	38.7	36.4	41.3	36.3	35.6	28.1	47.2	14.6	42.1
1956	6.8	38.9	38.9	37.7	43.4	36.7	36.5	29.1	43.1	14.0	43.9
1957	6.8	37.0	37.8	36.7	39.7	35.0	36.8	32.7	41.8	13.5	39.4
1958	6.5	34.5	35.1	34.1	36.2	35.4	34.6	29.1	38.5	12.9	37.1
1959	5.8	33.9	34.6	32.0	31.8	33.7	36.9	27.5	44.1	15.2	35.9
1960	5.4	34.1	34.4	31.2	30.9	32.1	35.1	28.3	46.2	16.7	36.7
1961	5.4	32.7	32.5	30.6	29.2	34.5	35.5	26.6	39.4	17.3	36.2
1962	5.0	32.6	32.6	30.8	27.8	38.1	34.7	27.6	39.2	18.9	35.2
1963	5.0	33.2	33.8	33.1	27.5	38.1	36.6	36.7	36.3	18.5	34.4
1964	4.7	35.8	34.9	34.3	31.6	37.9	37.7	33.9	37.0	15.8	42.0
1965	4.7	36.8	33.7	33.0	30.3	37.2	41.6	28.1	36.3	18.2	48.0
1966	4.7	38.0	34.1	33.4	29.6	41.9	40.3	28.4	36.8	19.2	51.5
1967	4.7	35.7	33.7	33.4	28.8	44.2	38.6	29.6	35.0	20.5	43.5
1968	4.7	35.9	33.5	32.8	28.5	43.0	36.9	29.7	36.2	21.0	44.5
1969	4.7	37.9	35.0	33.9	29.6	42.6	36.5	33.1	38.8	20.3	48.8
1970	4.7	39.8	36.7	36.8	34.4	39.0	43.2	34.8	36.3	21.4	51.1
1971	6.1	37.0	35.2	34.9	30.0	37.7	43.2	35.3	36.5	21.9	44.2
1972	6.8	38.7	37.9	38.0	33.0	39.7	42.7	42.4	37.5	21.6	43.8
1973	9.7	59.2	59.1	59.0	41.9	81.2	88.2	51.1	59.3	37.8	63.5
1974	40.3	78.1	78.2	81.5	48.3	117.6	99.7	100.5	66.2	45.3	84.1
1975	39.2	65.2	64.5	66.3	45.8	92.0	67.0	83.5	57.6	34.1	73.1
1976	42.1	73.3	75.9	76.8	87.7	75.2	71.7	62.0	72.5	45.8	72.2
1977	46.0	88.4	96.4	102.6	147.8	69.1	88.9	56.1	73.7	53.3	75.0
1978	46.4	84.0	89.3	91.8	109.5	82.8	93.0	65.5	80.2	56.1	76.2
1979	66.9	98.3	98.9	99.8	113.5	86.5	106.4	80.3	95.6	97.9	96.7
1980	109.7	107.8	107.3	106.8	101.8	103.3	98.5	124.6	109.4	112.6	108.1
1981	123.4	93.9	93.7	93.4	84.7	110.2	95.0	95.1	95.0	89.6	95.2
1982	111.5	84.0	82.7	82.5	86.5	80.3	77.4	80.7	83.7	89.8	86.1
1983	101.1	88.6	88.8	87.4	87.5	86.8	91.3	84.8	94.0	83.6	88.9
1984	98.9	90.0	91.9	93.1	101.2	82.9	107.3	75.4	87.5	96.3	83.9
1985	96.0	79.8	80.1	81.8	93.3	72.6	75.2	73.1	73.6	78.4	79.4
1986	48.6	80.5	82.9	86.8	114.0	63.4	58.0	77.1	68.5	87.1	73.2
1987	61.9	80.4	75.2	72.9	74.9	59.9	67.5	83.6	83.6	127.5	84.1
1988	50.4	96.4	88.1	87.6	82.8	81.1	92.2	97.9	89.8	132.4	110.5
1989	55.8	94.9	89.6	90.1	86.6	81.8	88.3	104.1	87.7	142.2	99.2
1990	59.7	93.6	89.8	90.0	89.4	70.7	87.9	107.4	88.9	145.1	93.1
1995	79.1	117.7	111.1	105.9	104.3	88.1	105.9	122.4	130.5	184.2	121.1
2000	125.9	146.4	135.2	130.4	134.1	113.9	109.1	152.3	152.9	241.2	156.0

/A COMPUTED FROM UNROUNDED DATA.

NOTE: THE COMMODITIES INCLUDED IN EACH GROUP ARE: BEVERAGES--COFFEE, COCOA, TEA; CEREALS--MAIZE, RICE, WHEAT, GRAIN SORGHUM; FATS AND OILS--PALM OIL, COCONUT OIL, GROUNDNUT OIL, SOYBEANS, COPRA, GROUNDNUT MEAL, SOYBEAN MEAL; OTHER FOODS--SUGAR, BEEF, BANANAS, ORANGES; NON-FOODS--COTTON, JUTE, RUBBER, TOBACCO; TIMBER--LOGS; METALS AND MINERALS--COPPER, TIN, NICKEL, BAUXITE, ALUMINUM, IRON ORE, LEAD, ZINC, PHOSPHATE ROCK.

SOURCE: WORLD BANK.

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TABLE 5: MANUFACTURING UNIT VALUE (MUV) INDEX, 1948-2000 /A

YEAR	(1980=100)	(1985=100)	(% CHANGE) /B
1948	26.8	27.9	
1949	25.7	26.8	-3.9
1950	22.6	23.6	-11.9
1951	26.1	27.2	15.3
1952	27.3	28.5	4.8
1953	26.6	27.7	-2.8
1954	26.0	27.1	-2.2
1955	26.5	27.6	1.9
1956	27.4	28.6	3.6
1957	28.0	29.2	2.1
1958	28.5	29.7	1.7
1959	28.1	29.3	-1.4
1960	28.7	29.9	2.1
1961	29.2	30.4	1.7
1962	29.7	31.0	2.0
1963	29.2	30.4	-1.9
1964	29.8	31.1	2.3
1965	30.0	31.3	0.6
1966	31.1	32.4	3.5
1967	31.4	32.7	0.9
1968	31.2	32.5	-0.6
1969	32.8	34.2	5.2
1970	34.8	36.3	6.1
1971	36.7	38.3	5.5
1972	40.0	41.7	8.9
1973	46.4	48.4	16.1
1974	56.5	58.9	21.7
1975	62.8	65.5	11.2
1976	63.7	66.4	1.4
1977	70.0	73.0	9.9
1978	80.5	83.9	14.9
1979	91.2	95.1	13.4
1980	100.0	104.3	9.7
1981	100.5	104.8	0.5
1982	99.1	103.3	-1.4
1983	96.6	100.7	-2.5
1984	94.9	99.0	-1.7
1985	95.9	100.0	1.1
1986	113.4	118.3	18.3
1987	124.6	130.0	9.8
1988	134.9	140.7	8.3
1989	143.4	149.5	6.3
1990	145.5	151.7	1.5
1995	173.5	181.0	3.6
2000	217.3	226.6	4.6

/A UNIT VALUE INDEX OF MANUFACTURED EXPORTS (SITC 5-8) FROM FIVE INDUSTRIAL MARKET ECONOMIES TO DEVELOPING COUNTRIES ON A CIF BASIS. FOR HISTORY, THE SOURCE IS THE UN, MONTHLY BULLETIN OF STATISTICS. COMPUTED FROM UNROUNDED DATA.

/B FIGURES REFER TO ARITHMETIC RATES OF CHANGE OVER THE PREVIOUS YEAR; EXCEPT IN 1995 AND 2000 WHERE THEY REPRESENT AVERAGE RATES OF GROWTH PER ANNUM OVER THE PREVIOUS FIVE YEARS, COMPUTED USING YEAR-END INDEX LEVELS.

SOURCE: WORLD BANK.

SEPTEMBER 29, 1988

COMMODITY MARKETS IN 1986-88

Non-Fuel Commodities

1. The downtrend in non-fuel primary commodity prices that characterized most of the 1980-86 period was reversed from mid-1987. The World Bank's current dollar index (1979-81=100) of non-fuel primary commodity prices increased from a record low of 74.4 for the first quarter of 1987 to 97.5 in the second quarter of 1988--an increase of 31% (see Table 1).

2. After reaching a mini-peak in the first quarter of 1984, primary commodity prices declined steadily through early 1986 as the growth of industrial economies slowed. The behavior of primary commodity prices in 1986 and in the first half of 1987 proved to be a major disappointment to most primary producers. Despite moderate economic growth during this period, most primary commodity prices in nominal terms--with the main exception of beverages--fell to record-low levels in recent history. In terms of annual averages, the non-fuel commodity price index in current dollar terms remained approximately constant (at about 80) in all three years--1985, 1986, and 1987 (see Table 1). However, had beverage prices not increased sharply in 1986, the lowest point for the index would have occurred in 1986. In constant 1985 dollar terms, 1/ the 1987 index was the lowest ever recorded for the series (See Figure 2). Referring back to Figure 1, it can be seen that the price index in SDR terms showed a pattern of changes during 1980-88 similar to the constant dollar index, reflecting the fact that the deflator index has been heavily influenced by exchange rate changes.

3. Among the commodity groups, fats and oils prices experienced the sharpest declines between 1984 and 1986, with a 45.9% drop. They were followed by cereals prices, with a 23.5% decline. The prices of industrial raw material commodities--metals and minerals and non-food agricultural commodities--hit record lows in 1986, down by 13.1% and 22.3%, respectively, from their 1984 levels. Beverage prices remained at relatively high levels throughout the 1984-86 period.

4. It was also the raw materials commodities that benefited the most from the recent price upsurge. Compared to the first quarter of 1987, the metals and minerals price index (which started to move upward from mid-1987) was 58% higher by the second quarter of 1988. Non-food agricultural commodity prices began to increase from the fourth quarter of 1986 and gained 40% between the third quarter of 1986 and the third quarter of 1987. The index subsequently declined somewhat when cotton prices eased substantially to more than offset increases in rubber prices. Cereals and fats and oils prices started to pick up only from late-1987 but made impressive gains, by 39.6% and 42.4%, respectively, between the 1987 first quarter and the 1988 second quarter.

1/ Deflated by the Manufacturing Unit Value (MUV) Index for US dollar prices of manufactured exports from industrial to developing countries.

TABLE 1 : COMMODITY PRICE DATA

	UNIT	ANNUAL AVERAGES 1986	ANNUAL AVERAGES 1987	QUARTERLY AVERAGES 1987 JAN-MAR	QUARTERLY AVERAGES 1987 OCT-DEC	QUARTERLY AVERAGES 1988 APR-JUN	MONTHLY AVERAGE 1988 JUN	PERCENT CHANGE (%) 1987/1985 JAN-DEC	PERCENT CHANGE (%) APR-JUN 1988/ OCT-DEC 1985
ENERGY									
CRUDE OIL:									
*SPOT	$/BBL	13.46	17.23	16.89	16.73	15.07	14.63	-35.44	-43.97
COAL									
*AUSTRALIAN	$/MT	31.13	27.50	29.25	23.00	34.00	36.00	-18.52	0.74
*U.S.	$/MT	43.92	36.17	36.50	35.50	37.00	37.50	-22.43	-20.43
BEVERAGES									
COCOA	¢/KG	206.96	199.42	197.78	191.26	166.02	162.41	-11.54	-29.22
COFFEE	¢/KG	429.26	250.50	255.85	273.92	307.87	317.18	-22.47	-15.04
TEA	¢/KG	192.80	170.75	188.32	194.75	173.73	166.21	-13.90	0.83
CEREALS									
RICE	$/MT	210.50	230.30	205.08	273.68	300.75	300.00	6.66	43.06
GRAIN SORGHUM	$/MT	82.41	72.76	69.89	76.40	92.58	114.60	-29.36	-1.80
MAIZE	$/MT	87.56	75.70	68.55	81.23	99.70	120.27	-32.55	-4.33
WHEAT	$/MT	160.64	133.52	137.75	136.65	165.62	197.67	-22.94	-12.26
FATS AND OILS									
PALM OIL	$/MT	257.00	342.58	331.00	384.33	440.33	496.00	-31.56	19.22
COCONUT OIL	$/MT	296.50	442.25	390.67	496.00	552.00	614.00	-25.06	35.96
*SOYBEAN OIL	$/MT	342.42	334.25	309.00	359.67	463.33	544.00	-41.56	1.24
SOYBEANS	$/MT	208.42	215.75	199.00	228.33	302.67	353.00	-3.86	44.59
OTHER FOODS									
BEEF	¢/KG	209.22	238.59	226.24	252.81	244.64	242.29	10.76	12.88
SUGAR	¢/KG	13.34	14.90	15.74	16.37	20.58	23.30	66.50	77.14
*ORANGES	$/MT	393.73	455.98	358.67	460.34	452.24	439.55	14.45	20.35
AGRIC. NON-FOODS									
COTTON	¢/KG	105.63	164.84	143.01	166.88	147.05	151.63	25.04	37.91
JUTE	$/MT	270.08	322.75	288.67	353.33	370.00	370.00	-44.63	14.43
*WOOL	¢/KG	330.66	445.95	387.13	490.99	399.14	621.59	25.09	14.39
RUBBER	¢/KG	94.46	111.66	101.83	118.22	136.05	155.74	20.84	47.62
LOGS	$/CUM	151.27	221.41	178.30	295.64	242.30	228.95	62.52	65.93
METALS AND MINERALS									
COPPER	$/MT	1,373.78	1,782.50	1,397.18	2,453.33	2,424.85	2,540.27	25.76	75.50
TIN:MALAYSIAN	¢/KG	616.14	668.98	667.75	684.02	685.53	703.58	-42.02	-34.62
NICKEL:FREE MKT	$/MT	3,881.24	4,872.22	3,671.43	6,430.13	16,875.53	15,589.80	-0.55	309.48
LEAD	¢/KG	40.61	59.68	47.05	63.42	66.51	67.75	52.70	69.44
ZINC	¢/KG	75.40	79.88	74.39	82.81	120.37	136.53	1.96	88.60
ALUMINUM	$/MT	1,261.16	1,607.64	1,338.04	1,836.02	2,818.09	3,308.11	44.80	165.69
*SILVER	¢/TOZ	547.00	700.88	556.60	700.45	668.59	703.68	14.11	10.15
IRON ORE	$/MT	21.99	22.23	21.64	23.66	22.78	22.27	-1.91	0.15
PHOSPHATE ROCK	$/MT	34.33	31.00	31.00	31.00	36.00	36.00	-8.60	7.46
SELECTED PRICE INDICES (1979/81=100)									
AGRICULTURE: FOOD		86.80	72.90	71.30	78.10	86.30	92.20	-10.99	4.98
AGRIC.: NON-FOOD (EXCL. LOGS)		68.00	84.70	77.50	87.20	88.80	95.30	13.69	30.40
METALS AND MINERALS		73.20	84.10	73.50	99.80	116.10	121.40	6.68	54.14
33 SELECTED COMMODITIES (EXCL. PETRO)**		80.40	80.50	74.40	90.10	97.50	102.60	0.88	24.39

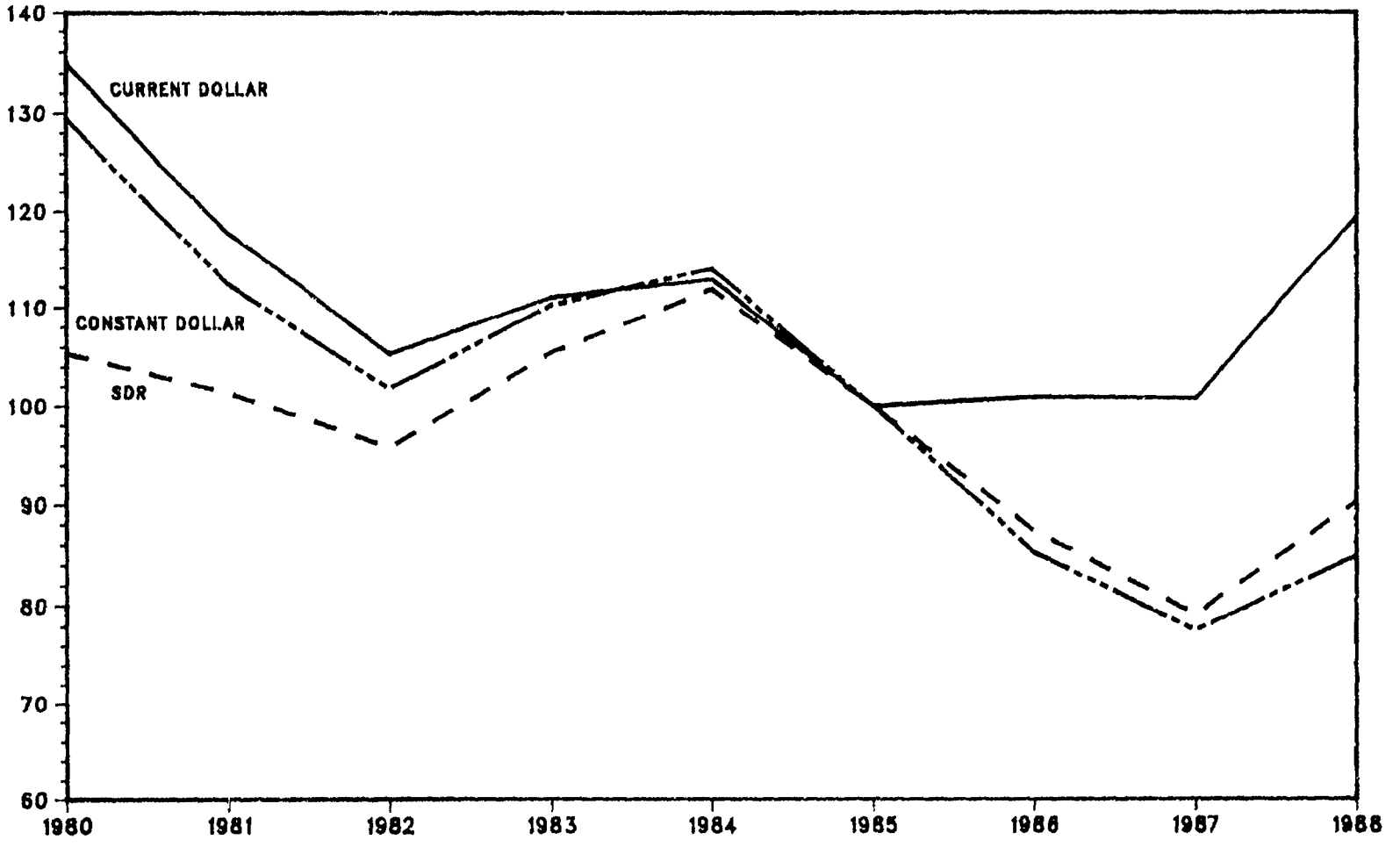
* = NOT INCLUDED IN INDEX.

** NOTE: THE 33 COMMODITY INDEX INCLUDES COMMODITIES SHOWN ABOVE PLUS BANANAS, COPRA, GROUNDNUT OIL, GROUNDNUT MEAL, SOYBEAN MEAL, TOBACCO AND BAUXITE. THE ASTERISKED ITEMS, HOWEVER, ARE NOT INCLUDED.

SOURCE: WORLD BANK.

FIGURE 1 : NON-FUEL PRIMARY COMMODITY PRICES , 1980 - 88

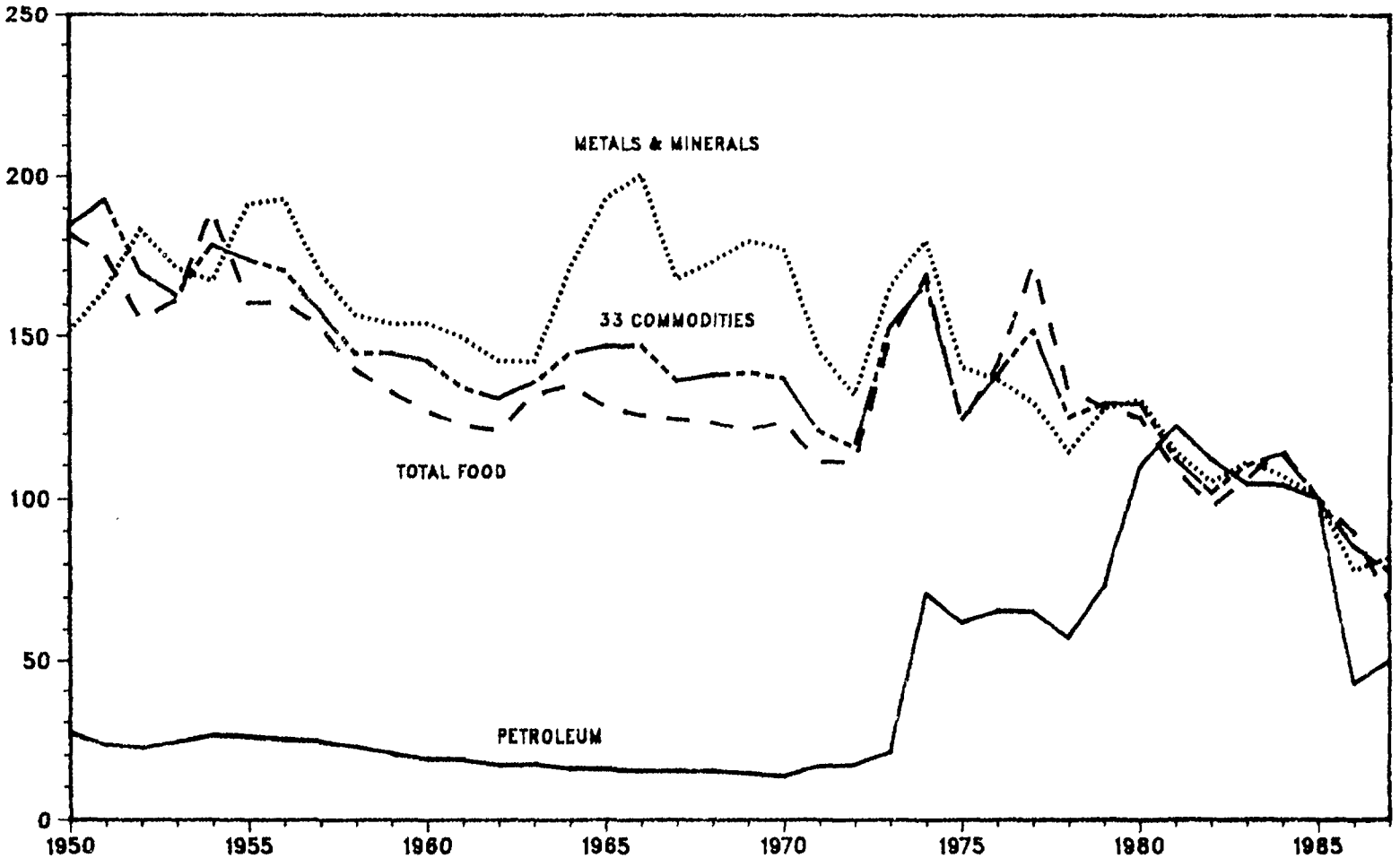
(CURRENT AND CONSTANT DOLLARS AND SDRS , 1985 = 100)



SOURCE : WORLD BANK .

FIGURE 2 : WORLD BANK INDICES OF PRIMARY COMMODITY PRICES , 1950 - 87

(CONSTANT US DOLLARS , 1985 = 100)



SOURCE : WORLD BANK .

5. The wide fluctuations in commodity prices during 1986-88 need to be understood against the backdrop of several important changes in the economic environment. These changes, however, do not provide adequate explanations for the observed commodity price behavior. The low commodity prices experienced in 1986 are not consistent with the moderate economic growth achieved in that year nor with the sharp depreciation of the US dollar. Low inflation, low petroleum prices, and lingering external debt problems in developing countries could have been important contributors to the low prices, but the sum of their effects falls short of accounting for the severity of the decline. The missing link could be the supply side. The sharp recovery of commodity prices in 1987-88 has been attributed to strong demand growth and supply adjustments that reduced capacity and stocks. However, could improved market fundamentals alone explain the sharp rises in prices? These are the questions we now turn to.

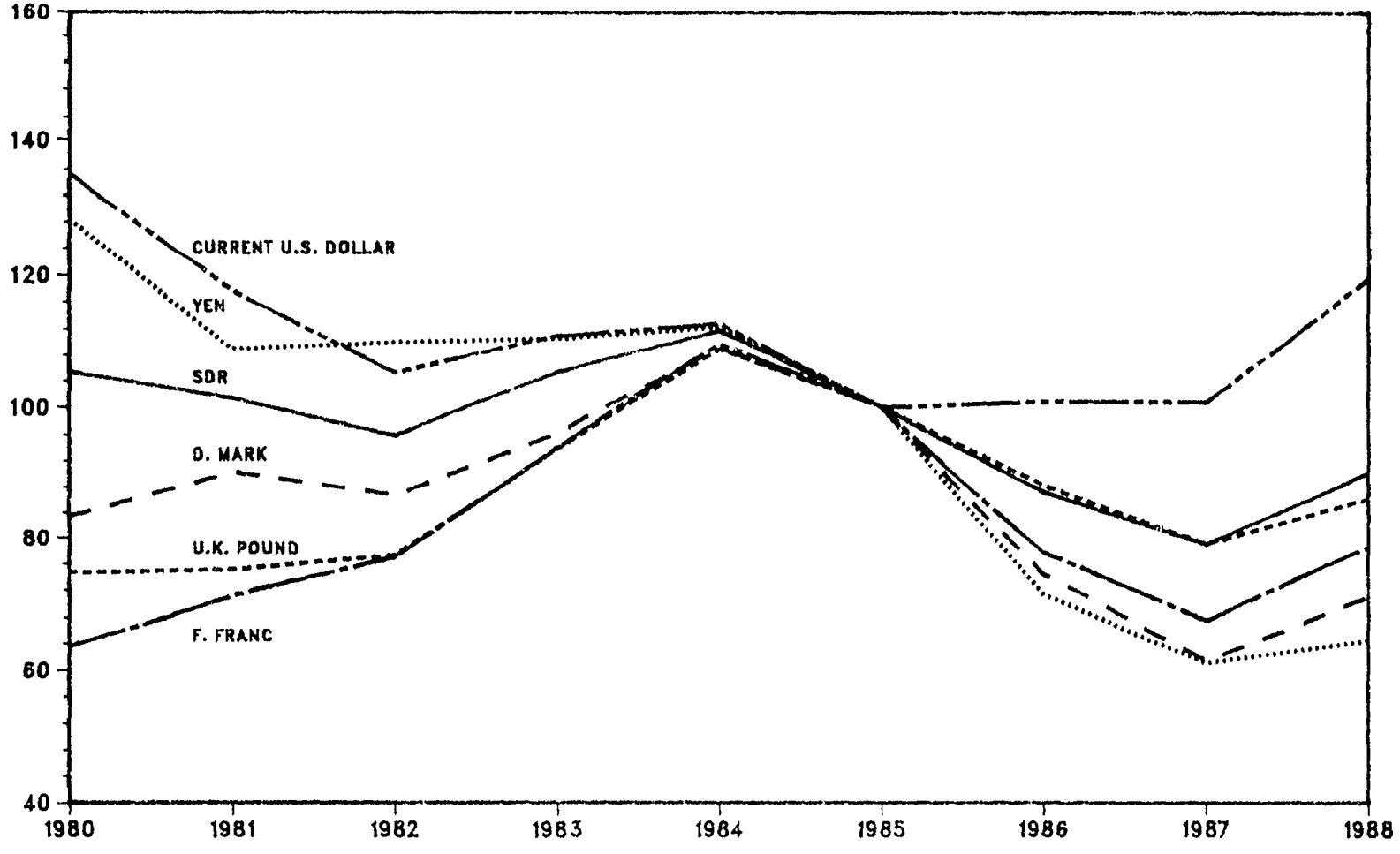
6. Between 1985 and 1987 the non-fuel commodity price index in current US dollar terms hardly changed. However, in terms of other major currencies it declined sharply: by 38.4% in German marks, by 38.8% in Japanese yen, by 32.5% in French francs, and by 20.2% in British pounds. In SDR terms, the decline was 20.8% (see Figure 3). Although one may argue that commodity prices would have been lower had the US dollar not depreciated, the outcome is rather surprising in view of the results from earlier studies that have indicated large short- and long-term impacts of exchange rate changes on commodity prices. Since the US dollar was relatively stable during 1987-88, the short-term exchange rate impact should have been negligible. It may be that the 1987-88 increase in commodity prices partly resulted from the delayed impact of US dollar depreciation during the period 1985-87. If so, the impact has taken considerably longer than before to work its way through. A more likely explanation of the lack of impact from the decline in the US dollar is that while the dollar depreciated against other major industrial country currencies, it did not depreciate against the currencies of the major producers of primary commodities among the developing countries and other producers such as Australia and Canada.

7. The most intriguing aspect of the 1984-87 decline in commodity prices is that it happened during a nonrecessionary period. The GDP growth rate of major industrial countries averaged 3.5% over the 1984-87 period (see Table 2). During this period, industrial production of industrial countries also expanded at moderate-to-rapid rates, except in 1986 when the growth rate averaged only 1%. Against this backdrop, world primary commodity consumption grew at a high rate of 3.4% in 1984, slowed down considerably in 1985 to less than 1%, picked up again strongly in 1986 to 5.1%, and slowed again in 1987 to 0.4% mainly because of a sharp decline in beverages consumption. All the major commodity groups followed this consumption growth pattern except agricultural raw materials, which had strong growth in 1985.

8. After increasing only slightly in 1985, world consumption of foodstuffs (excluding beverages) increased at an exceptionally high rate of 7.1% in 1986. Although the low consumption growth in 1985 may have contributed to the low prices in that year, the sharp increases in consumption of foodstuffs in 1986 do not appear to have had any impact on prices. This was largely because of several years of good harvests, including 1986, that resulted in large accumulations of stocks. World stocks of the major grains,

FIGURE 3 : COMMODITY PRICES IN MAJOR CURRENCIES , 1980 - 88

(1985 = 100)



SOURCE : WORLD BANK .

TABLE 2: CHANGES IN SELECTED ECONOMIC INDICATORS
(Percentages)

	1980	1981	1982	1983	1984	1985	1986	1987 a/
Economic Activity in the Major 7 Industrial Countries								
Real GDP	1.2	1.7	-0.4	2.8	5.2	3.2	2.8	3.0
Industrial Production	-0.2	0.6	-3.8	3.8	8.5	2.8	1.1	2.9
Gross Fixed Investment	-2.2	-0.2	-5.2	3.9	9.6	4.5	3.0	3.5
Prices and Interest Rates								
GDP Deflator (unadjusted) b/	9.3	8.7	6.9	4.5	3.9	3.5	3.1	2.7
Unit Value of Manufactured Exports (in US dollars)	9.7	0.5	-1.4	-2.6	-1.7	1.1	18.3	10.6
Petroleum Prices (in US dollars)	64.0	12.5	-9.6	-9.4	-2.1	-2.9	-49.1	26.5
SDR/US Dollar Exchange Rate	-0.8	10.4	6.7	3.3	4.3	0.9	-13.4	-9.3
6-Month US Dollar LIBOR	15.5	19.2	-18.7	-27.0	13.7	-23.5	-20.7	6.6
External Debt of Developing Countries	16.1	16.1	10.9	8.3	8.6	8.3	7.6	1.8
Index of Primary Commodity Production	0.1	3.1	-0.8	-0.6	7.9	1.5	-0.9	7.3
Food	-0.1	4.3	4.9	-3.7	8.0	2.0	2.9	-1.4
Beverages	3.7	9.5	-13.3	5.4	9.2	4.2	-10.7	21.3
Agricultural Raw Materials	-0.8	1.6	0.2	1.5	9.0	-0.3	-3.6	7.9
Metals and Minerals	1.3	-0.9	-6.5	1.2	5.4	1.1	-0.2	2.4
Index of Primary Commodity Consumption	-1.7	1.8	2.1	1.5	3.4	0.7	5.1	0.4
Food	-2.4	3.7	4.0	0.9	2.2	0.7	7.1	2.5
Beverages	1.7	2.4	2.3	0.0	3.4	-1.2	1.9	-5.6
Agricultural Raw Materials	0.7	0.2	2.6	2.7	5.0	5.3	3.3	3.6
Metals and Minerals	-3.6	-1.9	-3.5	3.5	5.8	-1.0	3.7	2.9

a/ Preliminary.
b/ GDP Deflator for Seven Industrial Countries.

Sources: World Bank and IMF.

soybeans, oilseeds, and sugar were reduced to more manageable levels only during 1987 when consumption grew at 2.5% while production declined by 1.4%. Prices of these commodities started to rise from then on.

9. Changes in industrial activity have been a key determinant of the prices of metals and minerals and agricultural raw materials. Therefore, the low industrial production growth rate in 1986, prima facie, provides sufficient explanation for the low prices of these commodities recorded in that year. There is, however, a minor twist to this story. Consumption of metals and minerals increased rather strongly (by 3.7%) in 1986 thanks to vigorous housing construction. On the other hand, production of metals and minerals fell, which meant that stocks were drawn down rapidly. These changes, however, failed to give a significant boost to prices in 1986 because stocks were still relatively high by the end of 1986, and excess production capacities were believed to be high. In the case of agricultural raw materials, production fell very sharply in 1986, while consumption recorded a sizable increase. However, world production of key agricultural raw material commodities exceeded world consumption through much of 1986, resulting in high stocks and low prices.

10. Continued expansion of industrial production in 1987-88 brought gradual tightening of market balances and higher prices for metals and minerals and other industrial raw materials. Industrial production of the major industrial countries increased at 2.9% in 1987 and 5.9% during the 12 months ending in April 1988. Spurred by increases in capital investments and manufacturing exports from the United States and a few other countries, and in domestic spending in Japan and Western Europe, consumption of metals and minerals and agricultural raw materials increased 2.9% and 3.6%, respectively, in 1987. World production of metals and minerals increased by 2.4% in 1987, resulting in persistent reductions in stocks. Consequent price increases have been sharp and persistent for most metals. The large excess capacities in metals and minerals that were believed to exist have not been forthcoming despite the higher prices. For many of the commodities, stocks fell to their lowest levels in recent memory. It appears that the long period of low prices for metals and minerals during the 1980s has indeed had the effect that we first forecast in 1984 of reducing the surplus capacity that grew out of the 1981-82 recession. For the agricultural raw materials, the estimated 7.9% increase in production in 1987 relates to the 1987-88 crop year. The large increase in 1987 in the agricultural raw materials price index largely reflects cotton price increases which peaked during the third quarter of 1987 when 1986/87 crop failure reduced stocks to a low level before the 1987/88 crop became available.

11. The extent to which speculative buying contributed to the rapid escalation of raw materials prices in 1987-88 is not clear. The fact that the equity market lost steam, particularly after the October 1987 stock market crash, with investors starting to look at commodities as undervalued, would at least have played some role in the price escalation. Some of the commodities may have been considered an inflation hedge. In early 1987, for example, inflation concerns were mounting, and there was some interest by speculators in primary commodities.

12. As in the past, supply developments have dominated the changes in beverage prices. The Brazilian drought that reduced the country's 1986-87 coffee crop by 50% led to a near doubling of coffee prices in early 1986. When the long-term impact of the drought on the coffee trees proved to be much less severe than initially thought and estimates for Brazilian production in 1987-88 far exceeded pre-drought levels, coffee prices rolled back in 1987 to well below their levels before the price rise.

13. Bad weather was the main cause for the peaking of tea prices in 1984 and relatively high prices in 1986. Tea prices declined sharply in 1985 and 1987 when production increased in response to high prices. World cocoa production has exceeded world consumption since the crop failure in 1983/84, resulting in ever-increasing stocks and lower prices. The production increases, mostly from the major cocoa-producing countries, overwhelmed the absorptive capacity of the International Cocoa Agreement through its buffer stock operations, negating its effectiveness as a price-stabilizing influence.

14. In summary, therefore, it appears that most non-fuel primary commodity prices experienced an upturn in 1987-88 as a result of sustained demand increases, structural adjustments within industries that led to sharply reduced capacity, and perhaps because of US dollar depreciation in the preceding years. Although the amplitude of the price changes during the period 1986-88 was exceptionally wide, it appears that they were driven mostly by changes in market fundamentals.

Petroleum

15. After their collapse in early 1986, petroleum prices remained low for most of the remainder of the year; prices picked up substantially from late-1986 and maintained relatively high levels until late-1987. Spot prices averaged about $17/barrel in the last quarter of 1987, but declined steadily to average about $13.20/barrel for the third quarter 1988. These price developments were precipitated largely by OPEC's oscillating ability to enforce production quotas. As a result, wide fluctuations in crude oil prices have been observed during this period--from less than $10/barrel in the first half of 1986 to about $17/barrel in 1987.

16. The 1986 fall was triggered by the decision of Saudi Arabia, which had absorbed the brunt of the earlier declines in world demand for OPEC oil, to seek a larger market share and abandon its role as the swing producer. This strategy appeared to be aimed at (i) convincing the other OPEC countries of the high cost of violating production agreements, (ii) reducing the growth in non-OPEC production, and (iii) holding down substitution of alternative energy supplies. OPEC was able to forge a production agreement in July 1986 which received support from most non-OPEC countries. As a result, the market balance turned to a slight excess of demand and the large stock overhang was substantially reduced. Although OPEC failed in its attempt to negotiate a reduced production quota in July 1987, the market remained relatively stable at around $18/barrel until the last quarter of 1987 as OPEC members broadly stayed within their agreed quotas. Towards the end of 1987, however, this discipline began to disintegrate. Both Iraq and Iran deviated from their quotas to finance their war efforts. After the United States applied

sanctions on its oil, Iran began to offer discounts to promote sales. Iraq made clear its intention to increase exports via the second pipeline through Turkey, thus exceeding its quota. The United Arab Emirates also exceeded its quota on a regular basis. In 1988, repeated attempts by OPEC to control production have proven futile, and crude oil prices have steadily declined.

17. Saudi Arabia has achieved a substantial part of the objectives of its 1986 policy shift. After declining from 1979 to 1985, world oil consumption has grown over the period 1986-88. Consumption increased by 3.5% in 1986 in the wake of the large price decline, while in 1987 there was a more moderate 1.7% increase; the slower growth was apparently a response to the sharp price increase during that year. Since the beginning of 1988 the decline in oil prices (as well, no doubt, as the rapid expansion of industrial production since mid-1987) has stimulated world oil consumption once again. For the first half of 1988 OECD crude oil consumption increased by an estimated 2% (year-on-year). Although lower oil prices have moderated the erosion of fuel oil's share in the power-generation sector, growth in demand for the lighter products has been the main factor behind the oil demand growth.

GLOBAL ASSUMPTIONS UNDERLYING THE PRIMARY COMMODITY FORECASTS

1. Commodities such as fuel, minerals, metals, and agricultural raw materials are essential inputs into production processes, and the demand for them is intimately linked to economic activity. Therefore, assumptions about major trends in the international economy, particularly the rate of activity in the industrial sector over the next 10 to 15 years, are of great importance in making long-term forecasts for the demand-side of world commodity markets. Income growth is also an important determinant of the demand for foodstuffs, particularly in the low-income countries.

2. In general, assumptions concerning four sets of macroeconomic variables form the basis for a forecast of most, if not all, international commodity markets. These variables are: GDP growth rates, inflation rates, exchange rates among major partners, and interest rates. These variables are often correlated, both with one another and across countries. Thus, any assumption about their prospective levels must not only ensure global consistency but also preserve the basic economic or behavioral relationships among them.

3. Views about future values of other variables, such as population growth rates, are also very important. Population growth is a key determinant of demand for commodities, particularly food and beverages. Population projections are implicit in the forecasts of per capita GDP growth rates presented herein. Demographic models suggest a substantial change in patterns of population growth in the 1990s: a further significant slowdown in the population growth of the industrial countries, and a rapid aging of their populations; and continuing rapid population growth in the developing countries, with youth becoming the dominant segment of the population.

4. An important aspect of the set of global assumptions presented in this chapter is the relationship between the major external/internal adjustments that have been taking place since the mid-1980s in the major industrial countries and the prospects for global inflation and economic growth. In 1987, the current account deficit of the United States amounted to more than $150 billion, while the combined payments surplus of the Federal Republic of Germany and Japan was in excess of $130 billion. Although these unprecedented imbalances have gradually declined as a percentage of industrial country GDP, by mid-1988 their absolute levels were still very large. These disequilibria, through the substantial pressures that they exert upon exchange and interest rates, prices of commodities, goods and assets, and financial and trade flows, are critically influencing the short- and medium-term prospects for world output and inflation.

5. The speed with which these external imbalances are assumed to be corrected influences the entire profile of the medium-term world outlook. Also, the manner in which the large current account deficits can be financed and massive surpluses allocated--particularly their geographical allocation--will determine to a large extent, both the level of inflation in the industrial countries and the level of financial flows to the developing

countries. This latter factor has become a key determinant of the supply-side of many commodity exports of the developing countries (e.g., financially strapped developing countries have been striving to increase their export revenues in order to service their external debt by diverting resources into the tradable goods sector). Both the level and the cost of international financial flows to the developing countries are major factors in determining the level of investment--and thereby economic growth in these countries.

6. The most prominent assumption imbedded in the macroeconomic forecasts is the prospective interaction between adjustment in the industrial countries and the macroeconomic policies undertaken. Policy thrust in the industrial countries is assumed to remain anti-inflationary. This has been reaffirmed in the Toronto meeting of the heads of government of the seven major industrial countries as recently as June 1988.

7. The US fiscal deficit, which has been identified as a major factor behind the sharp deterioration of that country's current account deficit, is expected to be significantly reduced in the next few years. Meanwhile, the burden of adjustment will fall upon prices--the dollar exchange rate and world interest rates. Prospective shifts in both of these variables are seen as playing an important role in the adjustment process. Inflation in the United States is expected to accelerate somewhat, the dollar could depreciate moderately, and nominal interest rates are expected to rise. The economic growth patterns among the major industrial countries will reflect their adjustments and policy responses to these trends in the short to medium term.

8. Fluctuations in the exchange value of the key reserve currency--the US dollar--and its interaction with local-currency-based inflation rates in the major industrial countries are key elements of the forecast. In general, since many commodities are priced internationally in dollars, the inflation rate of the industrial countries as a group, in terms of the US dollar, is the appropriate indicator linking global monetary conditions to commodity prices in dollars. The rate of change of the GNP deflator of the major industrial countries, in terms of the dollar, is expected to decelerate in the 1990s compared with the latter part of the 1980s. This is also reflected in the projected movements of the manufactured exports unit values (MUV).

9. Some studies with longer-term perspective, whose results have been taken into consideration here, paint a moderately optimistic picture of the "post-adjustment" world economy. If there are no major adverse shocks, including those stemming from macroeconomic policy errors, the 1990s could be an era of relatively rapid, noninflationary growth in the industrial countries. There have emerged a vast number of new innovations, still-unused technology, and the outlook is for declining long-run prices (real) of most raw materials. In many industrial countries labor and capital remain under-utilized, and in most developing countries and centrally planned economies demand for goods and services remain unsatisfied. Major prospective economic and institutional changes in Europe by 1992 and potential trade reforms from the Uruguay Round could also generate significant stimulus for the world economy.

10. Tables 1 and 2 summarize the main trends for key measures of the global economy. The projections to the year 2000 presented in these tables

TABLE 1: MAJOR INDUSTRIAL COUNTRIES: REAL GNP AND EXPORT UNIT VALUES OF MANUFACTURES (MUV): 1973-2000 (AVERAGE ANNUAL RATE OF CHANGE IN PERCENT)

	1973-80	1984	1985	1986	1987	1988 a/	Baseline Projections 1985-90	1990-2000
Real GNP/GDP								
France (GDP)	2.8	1.5	1.4	2.4	2.2	3.0	2.1	2.5
Germany, Fed. Rep. of	2.3	3.0	2.7	2.5	1.8	3.0	2.1	2.6
Japan	3.7	5.1	4.5	2.5	4.2	6.0	4.0	3.7
United Kingdom (GDP)	1.0	2.0	3.0	2.8	4.4	3.5	3.1	2.1
United States	2.2	7.0	3.1	2.9	3.4	3.5	2.4	3.0
Total b/	2.4	5.3	3.1	2.8	3.4	3.9	2.7	3.0
MUV indices in dollar terms								
France	11.5	-2.0	3.2	25.7	15.7	6.4	9.2	3.4
Germany, Fed. Rep. of	10.8	-9.4	1.3	32.3	17.8	7.0	13.0	3.9
Japan	9.7	0.0	-0.7	21.6	12.1	11.8	10.6	4.1
United Kingdom	16.3	-4.9	2.0	16.7	16.7	10.5	9.7	3.3
United States	11.7	0.8	2.5	3.1	1.7	5.0	3.9	4.5
Total c/	11.0	-2.1	1.3	17.6	9.8	8.3	8.7	4.0

a/ Preliminary estimates.

b/ Weighted by nominal GNP/GDP in 1982. These weights are: France, 0.091; Federal Republic of Germany, 0.104; Japan, 0.185; United Kingdom, 0.082; United States, 0.537.

c/ Weighted by exports of manufactures to developing countries. These weights, based on data for 1981-83, are: France, 0.111; Federal Republic of Germany, 0.167; Japan, 0.335; United Kingdom, 0.097; United States, 0.289 .

Note: Owing particularly to problems of projecting currency-denominated variables during and after major changes in exchange rates, the national price projections in dollar terms shown here are subject to great uncertainty. Inasmuch as errors associated with currency changes (i.e., mistaken projections of exchange rates or of their effects) will tend to be offsetting, somewhat less uncertainty attaches to aggregate figures for all the major countries.

Source: Historical data on MUV indices are based on data published in the UN Monthly Bulletin of Statistics. Projections: World Bank.

TABLE 2: NATIONAL INFLATION RATES AND RELATED VARIABLES: 1973-2000
(AVERAGE ANNUAL RATES OF CHANGE IN PERCENT)

	1973-80	1980-85	1986	1987	1988 a/	Baseline Projections 1985-90	Baseline Projections 1990-2000
National GNP/GDP Deflators b/							
France	11.0	9.2	5.0	2.8	2.8	3.3	4.0
Germany, Fed. Rep. of	4.8	3.2	3.1	2.1	1.8	2.1	2.4
United Kingdom	16.5	6.9	3.7	4.8	5.0	4.7	5.0
Japan	7.4	1.7	1.9	-0.2	1.5	1.7	2.2
United States	8.1	5.3	2.6	3.3	3.3	4.0	5.0
SDR/US$ Exchange Rate	-1.3	5.1	-13.4	-9.3	-5.2	-6.0	-0.1
5 Major Countries' GNP Deflator, in terms of:							
Local Currencies	8.3	5.1	3.0	2.6	2.8	3.2	4.0
US Dollars	9.7	0.0	20.9	12.7	8.2	10.0	4.0
US Real GNP	2.2	2.6	2.9	3.4	3.5	2.4	3.0
US Short-term Interest Rate c/	9.5	12.0	6.9	7.3	8.0	7.8	7.7
US Real Interest Rate d/	1.2	6.3	4.2	4.2	4.2	3.8	2.6

a/ Preliminary estimate.
b/ In terms of local currency.
c/ Six-month LIBOR, for projections and historically back to 1978. Prior to 1978, three-month EURODOLLAR rate.
d/ US short-term interest rate, as an index, deflated by the index of change of the US GNP deflator.

Note: Owing particularly to problems of projecting currency-denominated variables during and after major changes in exchange rates, the national price projections shown here are subject to great uncertainty. Inasmuch as errors associated with currency changes (i.e., mistaken projections of exchange rates or of their effects) will tend to be offsetting, somewhat less uncertainty attaches to aggregate figures for all the major countries.

Source: World Bank.

contain cycles for growth, inflation, and exchange rates. However, the exact timing of turning points, particularly for exchange rates, are difficult to predict. The same degree of difficulty applies to forecasting the precise magnitude of change in each variable, since these are often heavily influenced by speculative forces. The forecast figures presented in the tables below must therefore be viewed as illustrative of the most plausible scenario, given the assumptions made, and given the initial conditions of the projection--the state of the world economy in mid-1988.

Initial Conditions of the Projections: The World Economy in 1988

11. Recent data suggest that the massive payments imbalances of the major industrial economies, which characterized the first half of the 1980s, began the long process of unwinding after mid-decade. The sharp fall in the trade-weighted value of the dollar (despite some strengthening in 1988), and a decline of similar magnitude in oil prices, were accompanied by a loosening of monetary conditions in industrial countries. Together, these factors provided support for continuation of the economic expansion through 1988, despite a major collapse in equity markets worldwide in the latter part of 1987. Sources of growth during the current phase of recovery have shifted dramatically, as Japan and some European economies have stimulated domestic demand, while the United States shifts from consumption-led to export- and investment-led growth.

12. During 1988, the condition of the world economy improved beyond earlier-held expectations. Not only has the stock market crash of October 1987 barely affected world growth, but, in many instances, growth performance appears to have improved somewhat after the crash. Confidence was preserved by a general easing of monetary conditions, the delayed effects of cheaper oil began to come through, and policy action--especially by Japan--has begun to restructure the profile of economic activity. Nevertheless, while the process of adjustment seems to be well under way in the world economy, from the perspective of many developing countries, the beneficial impacts have yet to materialize.

13. The focal point of the growth recovery of 1988 has been the Far East, led by Japan. A strategic shift in Japanese policy to offset the deterioration in her export performance, by providing significant stimulus to domestic demand has borne fruit--investment spending is surging at double-digit rates, supporting GNP growth of nearly 6%. Rising Japanese imports have engaged the newly industrializing economies (NIEs) of the Pacific Basin in a mutually reinforcing expansion of demand. Moreover, trade between the Far East and Europe is growing rapidly. GNP in the largest three industrial economies of Europe is rising fast enough (at 3% in 1988) to achieve a modest reduction in the rate of unemployment. Nevertheless, a major weakness in the economy of Western Europe is the persistence of large payments imbalances among the major economies. Large surpluses accrued by the Federal Republic of Germany against its trading partners in Europe are exerting pressure on the European Monetary System (EMS).

14. For the United States, exports are being driven by strong growth of imports in the Far East, and by the gains in competitiveness associated with

the dollar's earlier decline. The improvement in US real net exports will contribute a full percentage point toward an expected GNP growth of about 3.5% during 1988. The surge in exports has, in turn, stimulated investment expenditure to gains of 11%, while reductions in the nominal trade deficit have finally become significant--the merchandise deficit amounting to an annual rate of $130 billion during the first half of 1988, contrasted with $160 billion in 1987.

15. Importantly, the gradual adjustment to date in the US trade position has tended to support the efforts of the monetary authorities to stabilize the dollar during 1988. Indeed, the US unit strengthened by some 12% in trade-weighted terms in the first nine months of 1988. Questions remain, however, about the impacts of the stronger dollar on the speed of adjustment of the external accounts, which are projected to remain large.

Short- and Medium-Term Effects on Developing Countries: Trade Flows and the Terms of Trade

16. The impact of the improved performance of the industrial economies upon a large number of developing countries is positive, although the picture is less than uniformly bright. Export growth has continued among those countries exporting mainly manufactures, and prospects remain favorable for relatively rapid growth over the coming years. The same has not been the case for developing countries exporting mainly primary commodities: oil markets have been slack, and are anticipated to remain so in the near term; non-oil primary commodity prices stopped falling (relative to manufactures' prices) only in 1987 (Table 3). Although primary commodities as a group have displayed a price surge during 1988, the benefits from stronger growth in the industrialized countries are likely to be delayed until continued gains in commodity-producers' terms of trade provide room for growth.

17. In some ways, the lack of immediate response of growth in the primary commodity exporters is not surprising. For example, up to mid-1988, two of the trends that are stimulating activity and confidence in the industrial countries do not seem to have had widespread benefits for developing counties. The strength of investment affects primarily transactions among the industrial countries, where capital goods and higher-technology machinery are key items in trade. Moreover, the reduction in the US current account deficit, however welcome from a global point of view, places further pressures on the export growth of some of the highly indebted countries--as growth in US import demand slackens, and as the United States regains foreign market share in agricultural and semiprocessed materials.

18. An increase in the imports of the industrial economies outside of the United States provided the key stimulus for the 5-6% p.a. advance in world trade volumes (about 14% p.a. gain in nominal dollar terms) during the 1987-88 period. As highlighted in Table 4, trade surged among the industrial countries and between the Asian NIEs and the industrial countries, while that of commodity-producing developing nations has been less robust. Of particular note is the growth in NIE trade with Japan: NIE exports to Japan rose by 50% in value terms, and imports from Japan advanced by some 30%. The role of Japan and, to a lesser extent, the NIEs, has become significant in supporting

TABLE 3: COMMODITY PRICES IN NOMINAL AND REAL TERMS, 1973-88

	1973-80	1984	1985	1986	1987	1988 a/
	(% p.a.)					
Non-oil commodity prices						
In dollars	9.0	1.5	-11.3	0.6	0.3	26.7
"Real" b/	-2.4	3.3	-12.1	-15.0	-10.1	..
Price of oil (spot)						
In dollars	41.4	-2.2	-2.9	-49.1	26.6	-13.7
"Real" b/	26.7	-0.4	-3.9	-56.9	13.4	..
G-5 export unit value of manufactures in dollars	11.0	-1.7	1.3	17.6	10.8	8.3
G-5 inflation in dollars	9.7	-0.5	2.3	20.9	12.7	8.2
G-5 inflation in local currencies	8.3	3.5	3.6	2.2	2.6	2.8

a/ Preliminary estimate. Changes in non-oil commodity prices and the oil price are for the second quarter 1988 over the second quarter 1987.

b/ Deflated by changes in the G-5 export unit value of manufactures in dollars.

Source: World Bank.

the ongoing process of international adjustment. Japan became the single most import source of growth in the world economy during the first months of 1988, with the volume of imports rising at an annual rate of more than 17%.

19. A more recent favorable trend for the developing countries' prospects is the sharp increase in the dollar price of several key primary commodities during the first half of 1988. Non-oil commodity prices, as measured by the World Bank aggregate price index of 33 commodities, stood some 26.7% above year-earlier levels in the second quarter of 1988. The main contributors to the rise in prices have been metals and agricultural foods raw materials.

20. While the external environment for exporters of primary commodities has improved considerably over the course of 1988, the impact on growth prospects is anticipated to vary widely among countries, depending on the particular commodities they export and on the ability of their economies to respond to the external stimulus. In Asia, many exporters are benefiting from the terms of trade gains due to higher commodity prices, while at the same time increasing their exports of manufactures. Growth prospects for the

TABLE 4: TRADE PATTERNS OF INDUSTRIAL COUNTRIES, OCTOBER 1987-MARCH 1988
(PREVIOUS SIX MONTHS CHANGES IN PARENTHESES; ALL FIGURES ARE PERCENT CHANGE AT ANNUAL RATE) a/

Importer:	United States	Japan	Germany, F.R.	Other Industrial Countries	Asian NIEs	Other Developing Countries	Total Exports of Row Country to World Volume	Total Exports of Row Country to World Value
Exporter:								
United States	-	34.5 (-3.2)	13.6 (12.7)	26.7 (20.9)	48.7 (29.0)	23.2 (12.3)	25.6 (13.2)	29.1 (15.5)
Japan	8.4 (0.6)	-	18.5 (11.4)	26.3 (9.2)	29.9 (29.0)	13.6 (-1.4)	2.7 (-1.2)	15.9 (5.6)
Germany, Fed. Rep.	6.6 (12.6)	44.0 (47.9)	-	21.6 (25.4)	28.7 (41.7)	9.2 (17.9)	6.8 (5.7)	18.7 (22.3)
Other Industrial Countries	11.6 (8.2)	39.2 (14.2)	21.6 (20.9)	26.7 (22.4)	51.7 (44.0)	10.6 (11.9)	7.4 (4.8)	21.2 (16.9)
Asian NIEs b/	17.7	47.4 (30.4)	29.6 (52.0)	36.8 (52.0)	- (40.8)	na	na	na
Other Developing Countries b/	19.5	37.1 (18.4)	10.3 (20.6)	1.0 (16.4)	na (15.6)	-	na	na
Total Import of Column Country from the World								
Volume		6.4 (2.0)	17.6 (6.6)	6.5 (5.6)	3.8 (4.1)	na	na	
Value		14.8 (11.4)	37.9 (20.2)	18.2 (19.7)	15.8 (17.9)	na	na	

a/ Percentage change in dollar value of exports--of country or country group in each row to country or country group in each column, compared with corresponding period in the previous year.

b/ Derived from import data of the industrial countries.

Note: Unit value and derived volume information is available for each industrial country's total imports and total exports only.

Source: Based on the IMF's Direction of Trade Statistics.

primary exporters of Africa remain less favorable, due in particular to the narrowness of their export base.

21. Analysis by the World Bank's country economists suggests that in 1988 growth of GDP in developing countries as a group is expected to remain at around 4%. Because of major disparities among the developing countries, however, this implies no growth in per capita terms for many countries. Oil-exporting countries are severely disadvantaged on their terms of trade; prices of beverages remain depressed, which hurts many countries in the tropical areas. Indebted countries with a high exposure to the United States--both regarding their export market and their debt service to US banks--are hardly growing in per capita terms (Table 5 and Figures a and b).

22. The developing countries that are most clearly benefiting from the strength of demand in the industrial countries are the exporters of manufactures, which are projected to grow by some 6% in 1988. Growth is anticipated to continue at a very strong pace among the Asian NIEs, with output rising by about 7.5%. Output is also expected to expand strongly in China; and the Indian economy has begun to recover strongly following last year's drought.

23. Although 1988 is the second consecutive year of gains in the developing countries' terms of trade (following an average 1.9% decline registered over the 1980-87 period), the question of the longevity of sustained commodity price increases arises. Some of the medium- and longer-term factors which have contributed to the depressed price levels of the 1980s remain at work. Primary product prices tend to boom in the early stages of an upswing in the industrial countries, and the upswing itself may give way to a significant deceleration. Yet the arrival of higher commodity prices was delayed in the current cycle, and further significant increases in raw materials prices over the next few years could occur. In the longer term, however, given the technological breakthroughs in synthetic products, the trend toward diminishing commodity inputs per unit of final output continues.

Setting the Stage for Future Growth: Achieving Greater Balance

24. On balance, the health of the world economy is no longer as vulnerable to a slowdown in the United States as it was earlier. So long as the maintenance of adequate growth in the world depended critically on the United States, it depended on a continuation of financial imbalances that were accurately perceived as unsustainable in the long term. This situation clearly jeopardized the prospects for world growth. The unfolding process of structural adjustment has allowed the United States to "pass the torch" to other countries, and thus the United States has gained a higher degree of freedom to take decisive actions to deal with its internal as well as external imbalances.

25. Given the international economic environment and the main channels of influence outlined above, the baseline projection for the industrial countries suggests that real GDP growth in this group will accelerate to about 3% in the 1990s. As population growth in these countries is likely to slow significantly--from current rates of 0.6% p.a. to about 0.3% p.a.--the

TABLE 5: TERMS-OF-TRADE CHANGES OF DEVELOPING COUNTRIES, 1965-88

	1965-73	1973-80	1980-87	1987	1988 a/
	(% p.a.)				
All Developing Countries	2.5	1.4	-1.9	0.9	0.8
By Regions					
Sub-Saharan Africa b/	-8.3	4.7	-5.1	1.9	-0.1
Eastern and Southern Africa	-1.9	-1.3	-2.3	-4.5	1.8
Western Africa (excl. Nigeria)	-1.6	1.9	-3.5	-2.3	-1.3
Nigeria	-11.2	13.9	-10.8	15.0	-10.0
Asia	5.0	-0.2	-0.8	0.2	0.9
China	3.2	-0.8	-2.7	2.3	-1.8
India	4.9	-3.5	3.2	-5.1	2.9
NIEs	2.6	-2.0	0.6	-2.7	0.8
Other Asia	4.9	2.9	-4.0	4.1	1.6
Europe, Middle East and North Africa, incl. Pakistan	-1.1	1.1	-2.1	2.5	-0.0
Latin America and Caribbean	3.8	2.5	-3.4	-0.8	0.4
Brazil	-2.7	-4.8	1.6	-5.6	2.3
Other Latin America	3.0	4.2	-5.0	1.6	-0.4
By Economic Groups					
Low Income Countries	7.5	-2.6	-0.9	-0.5	0.4
Large Low Income Countries	3.9	-2.2	-1.1	0.9	-0.8
Small Low Income Countries	9.1	-2.8	-0.9	-5.5	3.3
Middle Income Countries	0.5	2.0	-2.0	1.0	0.8
Memo items:					
Exporters of Manufactures	1.7	-2.7	0.3	-2.1	0.8
Non-Oil Primary Exporters	2.7	-2.8	-1.9	-2.2	2.7
Oil Exporters	-0.0	10.0	-7.8	11.3	-5.2
Highly Indebted Countries c/	1.4	3.5	-3.0	1.1	0.3
All LDCs excl. China, India	2.1	1.9	-3.0	1.5	0.3

a/ Preliminary estimate.
b/ Excluding South Africa
c/ Argentina, Brazil, Chile, Colombia, Côte d'Ivoire, Mexico, Morocco, Nigeria, Peru, Philippines, Venezuela, Yugoslavia, Uruguay, Ecuador, Bolivia, Costa Rica, Jamaica.

Note: Indices of change in imputed (unit value) prices of total exports deflated by the corresponding import prices, all in dollar terms.

Source: World Bank.

FIGURE a: GDP GROWTH RATES, 1966-88
percent per annum

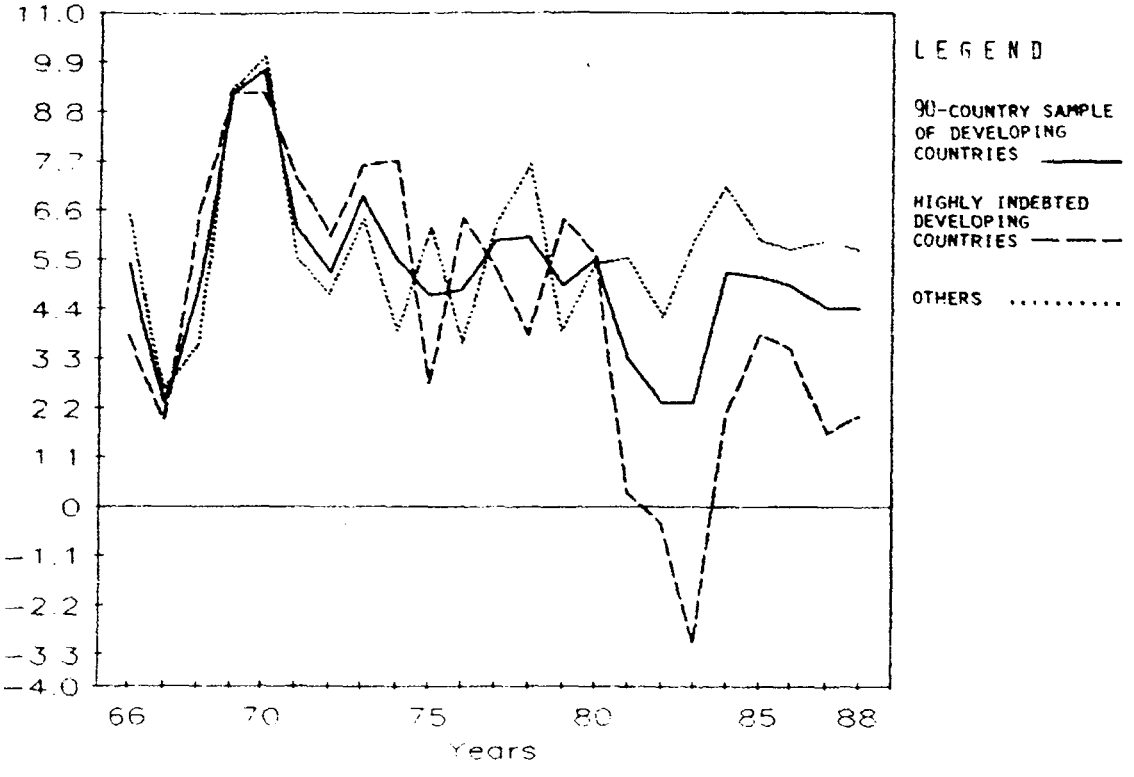


FIGURE b: GDP GROWTH RATES, 1966-88
percent per annum

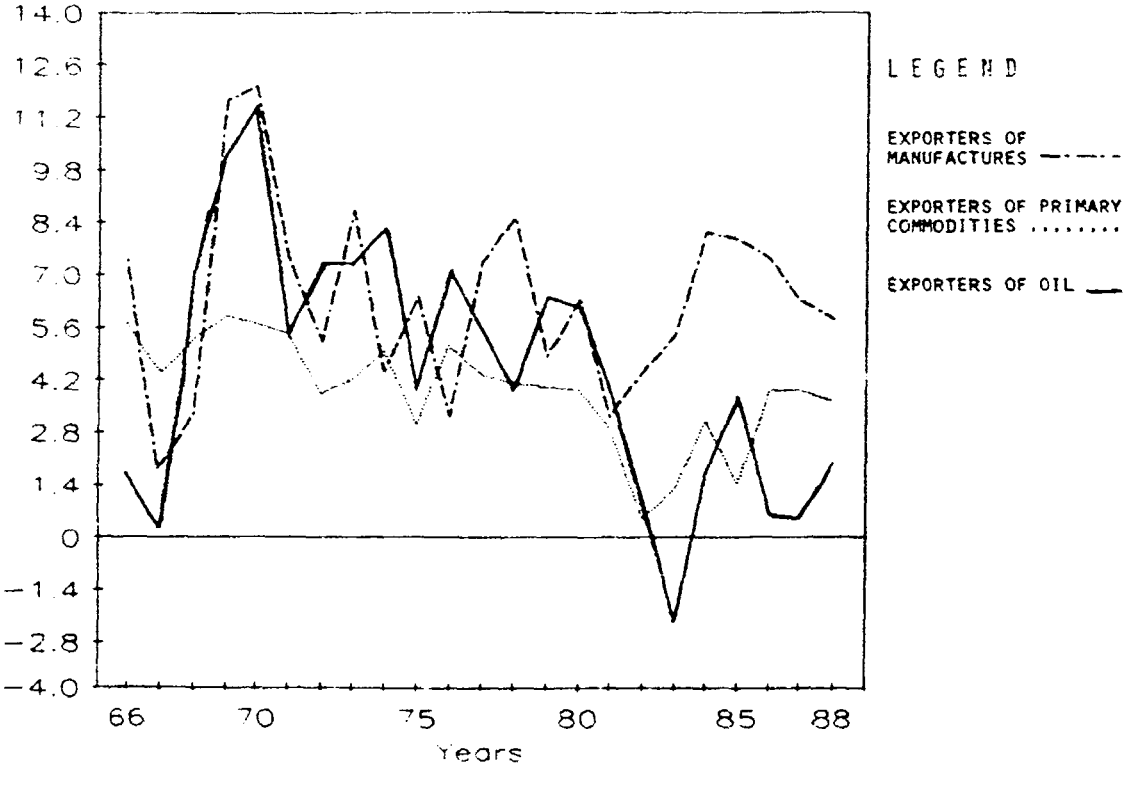


TABLE 6: GROWTH OF REAL GPD OF DEVELOPING COUNTRIES, 1965-88 (IN CONSTANT PRICES AND DOLLAR EXCHANGE RATES)

	Bils US$	(% p.a.)					
	1980	1965-73	1973-80	1980-87	1986	1987	1988 a/
90-Country Group Total	2,133.3	6.5	5.3	4.0	4.9	4.4	4.4
By Regions							
Sub-Saharan Africa b/	200.9	6.3	2.8	0.2	2.7	-1.7	3.1
Nigeria	103.3	8.5	2.7	-1.7	1.8	-4.4	4.4
Eastern and Southern Africa	55.0	4.5	1.9	1.9	3.6	2.9	3.3
Western Africa (excl. Nigeria)	42.6	4.2	4.3	2.2	3.1	-2.4	0.4
Asia	800.8	6.6	6.0	7.1	6.6	7.1	6.8
China	286.7	7.8	5.4	10.4	7.9	9.4	7.6
India	172.1	4.0	4.1	5.0	4.4	1.8	7.2
NIEs	142.5	9.9	9.1	7.6	10.4	11.0	7.4
Other Asia	199.5	6.2	6.8	3.2	3.2	4.1	4.2
Europe, Middle East and North Africa, incl. Pakistan	356.3	6.5	5.8	3.4	4.5	3.3	3.1
Latin America and Caribbean	695.7	6.6	5.4	1.4	3.6	2.5	1.8
Brazil	239.8	9.7	6.8	3.3	8.2	2.9	1.7
Other Latin America	456.0	5.5	4.8	0.4	1.0	2.2	1.8
By Economic Groups							
Low Income Countries	573.9	5.5	4.6	7.5	6.4	6.5	6.9
Large Low Income Countries	458.8	6.1	4.9	8.5	6.8	7.0	7.5
Small Low Income Countries	115.2	3.4	3.4	3.2	4.7	4.2	3.6
Middle Income Countries	1,559.4	6.9	5.6	2.5	4.2	3.3	3.2
Memo items:							
Exporters of Manufactures c/	961.3	7.4	5.9	6.4	7.4	6.3	5.8
Non-Oil Primary Exporters	635.2	5.1	4.2	2.3	3.9	3.9	3.6
Oil Exporters	536.8	6.9	5.7	1.1	0.6	0.5	2.0
Highly Indebted Countries c/	896.2	6.8	5.2	1.1	3.5	1.6	2.0
All LDCs excl. NICs	1990.8	6.3	5.1	3.7	4.4	3.8	4.1
All LDCs excl. China, India	1674.5	6.6	5.5	2.5	4.2	3.4	3.2

a/ Preliminary estimate.
b/ Excluding South Africa
c/ Argentina, Brazil, Chile, Colombia, Côte d'Ivoire, Mexico, Morocco, Nigeria, Peru, the Philippines, Venezuela, Yugoslavia, Uruguay, Ecuador, Bolivia, Costa Rica, Jamaica.

Source: World Bank.

resulting average growth of per capita income for this group of countries will be faster than experienced anytime since the early 1970s (Tables 7 and 8).

26. Several emerging trends suggest that economic growth in the industrial countries will accelerate somewhat during the second half of the 1990s (after the current disequilibria have been substantially corrected). Major investment undertakings envisaged by businesses in Japan and Europe for the next several years are likely to result in a significant advance in factor-productivity growth and an expansion of production capacity. Other important developments that could positively affect growth prospects in the industrial countries in the next 10 to 15 years are: ongoing privatization of industries and deregulation of product, labor, and financial markets; likely beneficial effects of trade liberalization measures now under consideration in the Uruguay Round; and availability of a large number of new innovations and techniques of production that not only could cut costs but also would bring about far greater flexibility into the production process.

27. The baseline forecast is that per capita income in North America and Western Europe will rise by an average 2.5% p.a., while that of the Pacific region (mainly Japan) will increase by about 3.5% annually. Moreover, there is strong empirical evidence that the very advanced technologies embedded in new capital equipment being installed in industrial countries will raise significantly the growth rate of total factor productivity. This in turn should allow an acceleration in the average growth of real output at relatively low rates of inflation.

28. Due to the anticipated deceleration in industrial country population growth and the rapid aging of population profiles in the 1990s, relatively rapid economic growth will require that new techniques of production be relatively less labor intensive, and that the process of automation (through greater use of robotics) become more widespread. The extent of such shifts, however, will depend on the pace of economic growth as well as the participation in labor markets of different age and sex groups, and greater flexibility in working hours and in the retirement age. Since the baseline projection assumed here imply a relatively rapid noninflationary growth of output in the industrial countries in the latter part of the 1990s, it entails a somewhat lower average unemployment rate than that in 1987-88.

29. The major uncertainty associated with the outlook for the industrial countries--and one which could change for the worse the relatively optimistic scenario presented here--concerns global monetary and financial conditions in the 1990s. Continuation of some degree of volatility in the movements of key currencies against one another would need to be a part of a realistic scenario for the 1990s. The baseline forecast presented here does assume some exchange rate movements, which, in turn, introduce similar fluctuations in the dollar MUVs.

30. The dollar index of manufacturing unit values (MUV) for the largest five industrial countries (the G-5) have previously been shown in Tables 1 and 2. Movements in local-currency based MUVs are determined by cost factors and terms of trade evolution in each of the major industrial countries. However, the dollar index of these prices is entirely conditioned by the movements of each country's currency vis-a-vis the US unit.

TABLE 7: ASSUMPTIONS ON THE GROWTH OF WORLD OUTPUT AND POPULATION

	Historical			Baseline Projections		Ratio of Average Annual Growth Rates: 1987-2000 Over 1965-87
	1965-73	1973-80	1980-87	1987-90	1990-2000	
	(% p.a.)					
GDP						
Developing countries a/	6.5	5.3	4.0	4.5	4.9	0.9
o/w Sub-Saharan Africa	6.3	2.8	0.2	3.1	3.7	1.0
Highly Indebted Countries	6.8	5.2	1.0	3.1	3.9	0.8
Asian NIEs	9.9	9.1	7.6	6.5	6.1	0.7
High Income Oil Exporters	10.0	7.9	-2.4	1.9	2.9	0.5
Industrial Countries	4.6	2.8	2.5	2.6	3.0	0.8
Population						
Developing Countries a/	2.5	2.1	2.0	2.0	1.8	0.8
o/w Sub-Saharan Africa	2.7	2.8	3.1	3.3	3.1	1.1
Highly Indebted Countries	2.6	2.4	2.2	2.2	1.8	0.8
Asian NIEs	2.3	1.8	1.5	1.3	1.1	0.6
High Income Oil Exporters	4.6	5.6	4.3	4.0	2.6	0.6
Industrial Countries	1.0	0.7	0.6	0.5	0.3	0.5

a/ 90-country sample.

Source: World Bank.

TABLE 8: ASSUMPTIONS ON THE GROWTH OF WORLD PER CAPITA REAL GDP

	Historical			Projections		Ratio of Average Annual Growth Rates of 1987-2000 Over 1965-87
	1965-73	1973-80	1980-87	1987-90	1990-2000	
	(% p.a.)					
Developing countries a/	3.9	3.1	1.9	2.4	3.0	0.9
o/w Sub-Saharan Africa	3.5	-0.0	-2.8	-0.2	0.6	0.9
Highly Indebted Countries	4.1	2.7	-1.6	2.1	2.6	1.1
Asian NIEs	7.4	7.2	6.0	5.1	4.9	0.7
High Income Oil Exporters	5.1	2.2	-6.4	-2.0	0.3	n.a.
Industrial Countries	3.6	2.1	2.0	2.1	2.6	1.1
o/w North America	2.2	1.9	1.9	1.4	2.5	1.3
Pacific	7.5	2.8	2.9	3.7	3.3	0.8
Western Europe	3.8	2.0	1.6	2.2	2.3	1.0

a/ 90-country sample.

Source: World Bank.

31. In the United States, the projected weakening of the dollar in 1989, together with rising labor costs, inflate the MUV by some 5% p.a. Over the 1990-2000 interval, an appreciating dollar first forces manufacturers to try to preserve competitiveness by reducing the rate of increase in export prices; later, renewed weakening of the dollar allows manufacturers to increase MUVs more rapidly to enhance profitability without the loss of market share. In Japan, the strength of the yen boosts the incentive to maintain price competitiveness (which forced down the yen MUV from 1987 to 1988) by limiting its rise in 1989 and 1990. As the dollar stabilizes, Japanese producers rebuild profit margins by raising yen-based export prices but will likely restrain increases to moderate rates. In Western Europe during the 1990s, relatively strong investment levels associated with Project 1992 should result in a faster pace of labor productivity growth and limit the advance of MUVs in terms of the ECU.

32. The baseline projections for the developing countries present a mixed picture for the 1990s. Despite a relatively optimistic outlook for the industrial countries, the economic situation in a number of developing countries will remain fragile, particularly in the medium term, as the trade and payments adjustment in the major industrial countries continues to unfold.

33. Per capita real GDP in China, India, and the Asian NIEs will continue to grow at rates above the average of the rest of the developing countries. The Asian NIEs, despite their expected above-average performance, will grow at a slower pace than in the 1970s and 1980s. The NIEs may encounter competition from other low-cost exporters of manufactures among the developing countries, as well as perhaps from some of the industrial countries with a greater technological base. Nonetheless, domestic demand in the NIEs is projected to grow at a vibrant pace, attracting growing imports of goods and services.

34. Average per capita real GDP growth in Sub-Saharan Africa is expected to remain well below 1% p.a. Although the average pace of per capita real income growth in the highly indebted countries is expected to accelerate to about 2.5% p.a. in the 1990s (compared with -1.6% p.a. in 1980-87), their situation is likely to remain quite difficult in the medium term in the face of continuing trade and payments adjustments in the larger industrial countries.

A View of World Trade Flows: 1988-2000

35. As a result of increasing global interdependence through the 1980s, growth in world trade has historically exceeded that of world GDP. Moreover, trade flows have tended to react with stronger sensitivity to business-cycle and financial conditions than have world income levels--reflecting with strong amplitude changes in key fundamental factors.

36. World trade is expected to expand by about 4% annually over the 1988 to 2000 interval. Annual growth in world GDP during the same period is anticipated to register 3.3%. As reflected in the world economic projection, important imbalances in the world economy are expected to unwind over the remainder of the 1980s and throughout the following decade. Major factors including slower population growth, the decline of the dollar, the dramatic

fall and eventual recovery in crude oil prices, the potential repercussions of trade liberalization measures, together with the lagged effects of the ongoing trade and payments adjustment among the major industrial countries, will serve to affect measurably the direction and commodity composition of world trade flows in the 1990s.

37. Significant shifts in the direction of trade dominate the outlook. US export volume surged by 12% in 1987 and 23% in 1988, and is likely to register advances of about 8% p.a. over the period through the mid-1990s. In contrast, US merchandise import growth decelerated from 15% in 1986 to 5-6% during 1987 and 1988, and is expected to remain relatively moderate or even stagnant over the next several years. Japanese export volumes have actually contracted over the 1986-87 period and remained weak in 1988; weak performance is expected to continue to characterize the outlook through 1990. Moreover, an emerging trend of strength in intra-Asian trades and Asia/Europe trades is becoming apparent, as exporters seek alternate markets to the United States (see Table 4)--markets where exchange rate impacts on competitiveness are likely to exert much smaller degrees of influence upon trade flows.

38. Significant changes in the commodity composition of trade characterize the forecast period. World trade in manufactures is expected to register relatively strong growth of 4-4.5% p.a. over the forecast period. Dollar-based unit labor costs in the United States have converged with those of Japan and Europe. Costs in all three major industrial areas, however, still stand far above those of the NIEs of Asia. Japanese manufactures exporters, although gaining within Asia, are expected to be confronted not only by the direct price effects associated with the rise of the yen, but also by the gain in competitiveness of the Asian NIEs. Potential increases in production efficiencies in China by the mid-1990s and stabilization of current debt and payments obstacles in Latin America by the later 1990s should underpin world trade in manufactures to high and sustainable rates of growth over the extended forecast period.

39. World trade in non-fuel primary commodities will be supported at relatively high rates of growth (of about 4% p.a.) by the influence of several factors. The competitive gains of US coarse grains and wheat exports have been achieved not only through the decline in the dollar, but also by the expected longer-term impacts of the 1985 US Farm Bill. Although competing in world markets with Australia, Canada, and Argentina, the United States should recoup market share in Asian, African, USSR, and Middle East markets. Steady longer-term GDP growth of 3% in the industrial countries should serve to underpin demand for basic raw materials and industrial commodities. As commodity prices firm and establish a positive growth path, increasing production and trade will likely be forthcoming from commodity-exporting Asia and Latin America. Finally, rapid population growth in the developing regions of Africa and Asia implies large and expanding import requirements for basic food and feedstuffs over the course of the forecast period. (The major constraint will lie on the demand side, however, as many developing countries will lack the financial capacity to increase food imports significantly.)

40. World trade in fuels is likely to average 3% p.a. growth over the extended projection period. The expected trade flows will be conditioned by several assumptions related to world supply and demand conditions. Primary

among these is the anticipated decline in reserves of crude petroleum in the non-OPEC regions of the world. A potential rise in crude oil prices in real terms beginning in the mid-1990s could induce a gradual movement toward coal, natural gas, and synthetics as alternate fuels.

The Uruguay Round and Developing Country Trade

41. World trade, particularly exports of developing countries, in the coming decade will be affected to a significant extent by the trade liberalization measures that are likely to result from the Uruguay Round trade negotiations. The year 1987 was the first full year of multilateral trade negotiations (MTN) under the Uruguay Round, launched at Punta del Este in September 1986. The MTN is seen by many as the main hope for strengthening the multilateral trading system. In scope and complexity, the Uruguay Round surpasses its predecessors, and the negotiations are widely expected to be difficult and lengthy. Agriculture remains a crucial and difficult area of negotiation; progress has been made in negotiations on trade in tropical products, while the discussion of trade in services is a major new dimension of the Round. At the heart of the negotiations lie the issues of removal of quantitative restrictions and other non-tariff barriers to trade (NTBs). As tariff negotiating is perhaps the most developed part of the GATT, early in the Round the contracting parties agreed to ambitious objectives: (i) expansion of tariff concessions among major participants; (ii) a significant liberalization of tariffs and NTBs, and to the maximum extent possible, their elimination; and (iii) particular progress to reduce higher tariffs and tariffs that escalate with the degree of value added.

42. Recent empirical studies suggest that elimination of subsidies to production and of barriers to imports of agricultural goods could carry benefits to both industrial and developing regions of the world. Under such a scenario, world agricultural prices might rise significantly, helping to boost the terms of trade of major commodity exporters. Moreover, resource efficiency in developing countries would be improved as the agricultural sector attracts labor and capital; finally, increases in government tax revenues from agriculture could permit a lowering of tax burdens on other sectors of the economy--underpinning wider efficiency gains. The upcoming Montreal mid-term review of the Round will likely be a watershed for the negotiations, particularly concerning the outcome of agricultural issues.

Impact of Structural Shifts in Industrial Countries

43. A common element which runs through the rapid growth recorded in many of the major countries in the period 1987-88, is the upturn in business capital formation. Gross fixed capital formation, which as a ratio to GDP had tended to stagnate or decline in the period 1975-85 in many industrial economies, has increased significantly during 1987-88 period in France, the Federal Republic of Germany, Italy, Japan, and the United Kingdom. A number of factors may lie behind this new found buoyancy: a catch-up from the depressed investment levels of the last decade; an improved profit picture; increasing competition in world export markets from the NIEs and the United States; and strong demand and high rates of capacity utilization in North

America. Major economic restructuring and expanding fiscal and monetary policy stances are the main factors behind the investment rebound in Japan. Project 1992 in Europe has already led to a significant rise in business investment in a number of countries.

44. Such a significant and widespread rise in investment in manufacturing as well as other economic sectors in industrial countries, together with declining labor force growth, suggests a tightening of labor markets and rising real wages over time, particularly in the United States. This in turn could encourage the substitution of capital for labor in many production processes. Thus, further investment in new and higher-technology equipment will be required to boost productivity in both the goods-producing and services sectors of the economy. Indeed, the prospect for sustained economic expansion in the United States at rates near 3% hinges critically upon the emergence of such capital spending.

45. A key question that arises in connection with the growth projections for the industrial countries in the 1990s is: to what extent will the growth affect the demand for commodity exports of the developing countries? During the 1970s and 1980s a major source of growth in the industrial countries was the services- as opposed to the goods-producing sector. Therefore, the demand for raw materials and fuel lagged behind the growth of the overall economy in comparison to the then existing historical relationship. Conservation, more efficient production techniques, and more widespread usage of synthetic products also contributed to the weakening of demand for commodities and the sharp decline in their real prices in the 1980s.

46. Some preliminary studies indicate that although the size of service industries will continue to rise rather rapidly in most industrial countries during the 1990s, their share in GDP may begin to stabilize before the end of the next decade. For example, the expected rapid aging of population in the industrial countries will substantially increase the demand for health care services. Other categories of services that may face a substantial increase in demand due to expected demographic changes are tourism, recreation, entertainment, and cultural activities.

47. Over the longer term, domestic market conditions in many of the major industrialized countries will be shaped by demographic, technological, and environmental changes. Even Western Europe, despite higher rates of unemployment than in North America, will have to tackle the evolution of an unfavorable age distribution, requiring structural changes in social contributions and benefits, with private savings placed in a much more important role in the funding of economic activity. Moreover, the rapid emergence of a large aging population in Japan--"the Silver Generation"--implies a longer-term reduction in that country's high savings rate. In contrast with the US experience, structural adjustment in Japan may offer foreign producers the prospect of large market potential over the next decade.

48. On balance, the anticipated shift of industrial country demand away from absorption of consumer goods and toward increasing requirements for capital goods and services may be a positive trend for developing country export performance. Demand for basic and semiprocessed materials as key inputs to the manufacture of higher-technology capital and durable goods

(various metals, communications equipment, and medical instrumentation as examples) could serve to underpin trade flows from commodity producers to manufacturers.

ENERGY

ENERGY

Demand Outlook

1. Table 1 provides a summary of the expected developments in the shares of the major fuel groups in energy consumption in the main economic regions. In the industrial countries the shares of the solid fuels and natural gas in total energy demand are expected to remain stable at around 20% over the forecast period to 2000. The industrial countries' commitment to reducing their dependence on imported oil and support for improvements in the efficiency of oil use should reduce the share of oil in total energy use from 43.3% in 1986 to about 40% in 2000. Electricity is a versatile and highly convenient form of energy and is the preferred fuel in many end-use applications. Consequently, electricity is expected to take an increasing share of the energy market in the industrial countries.

2. Because of their extremely large gas reserves, the bulk of growth in energy demand in the centrally planned economies (CPEs) is expected to be supplied by natural gas. The share of primary electricity is also expected to increase, while petroleum and coal are expected to become less important in the CPEs. The uncertainty surrounding future oil production increases in the USSR and its dependence on oil for foreign exchange should contribute to lowering oil's share in energy use in the CPEs. The industrial sector is the largest consumer of energy in this region, and there exist excellent prospects for energy-efficiency improvements--particularly in the energy-intensive industries such as iron and steel and chemicals. Electrification of railways is also expected to increase energy efficiency. Yet, given the competing possibilities for allocations of investments in energy, planners appear to prefer increased supplies to conservation.

3. Energy demand in the developing countries is largely a function of economic growth, the country's stage of development, and the structure of its economy, although technological improvements and energy prices affect demand to varying degrees. In recent years, rural population movements to urban areas and industrialization have played a significant role in the growth of energy demand. In many oil-importing developing countries, energy policies directed towards substitution away from oil have provided the industrial sectors with incentives to diversify fuel use. As a result, coal, electricity and, more recently, natural gas now account for a sizable share of their energy market.

4. Within the developing countries the rapid growth of primary electricity and natural gas supplies over the forecast period will ensure that the shares of these fuels in total energy consumption will increase substantially. The share of liquid fuels and solid fuels is expected to decline, though they will still be the main source of supplies.

TABLE 1: ENERGY CONSUMPTION BY COUNTRY GROUPS AND MAJOR FUELS, 1961-86 (ACTUAL) AND 1990-2000 (PROJECTED)

	1961		1970		1986		1990		2000	
Countries/Economies	MTOE	%	MTOE	%	MTOE	%	MTOE	%	MTOE	%
Industrial	1,930.5	100.0	3,121.2	100.0	3,707.1	100.0	3,965.4	100.0	4,591.2	100.0
Liquid Fuels	817.5	42.3	1,576.4	50.5	1,605.1	43.3	1,677.1	42.3	1,834.0	40.0
Natural Gas	322.1	16.7	621.1	19.6	705.1	19.0	758.6	19.1	865.0	18.8
Solid Fuels	646.1	33.5	705.9	22.6	798.1	21.5	853.5	21.5	1,000.1	21.8
Primary Electricity	144.8	7.5	226.8	7.3	598.8	16.2	676.2	17.1	892.1	19.4
Centrally Planned	652.0	100.0	1,052.4	100.0	1,834.8	100.0	1,977.2	100.0	2,438.5	100.0
Liquid Fuels	150.5	23.1	324.9	30.9	540.8	29.4	556.1	28.1	578.1	23.7
Natural Gas	68.2	10.5	188.8	17.9	586.5	32.0	659.7	33.4	951.7	39.0
Solid Fuels	416.7	63.9	503.0	47.8	593.9	32.4	622.8	31.5	683.5	28.0
Primary Electricity	16.5	2.5	35.6	3.4	113.6	6.2	138.4	7.0	225.2	9.3
Developing	412.6	100.0	789.5	100.0	1,866.2	100.0	2,165.8	100.0	3,100.8	100.0
Liquid Fuels	191.5	46.4	383.5	48.6	775.4	41.6	878.9	40.6	1,135.3	36.6
Natural Gas	19.2	4.7	50.9	6.4	165.7	8.9	212.1	9.8	395.1	12.7
Solid Fuels	179.1	43.4	301.6	38.2	730.6	39.1	830.5	38.3	1,130.5	36.5
Primary Electricity	22.7	5.5	53.5	6.8	194.5	10.4	244.3	11.3	439.8	14.2

Note: Details may not add to total due to rounding.

Sources: United Nations, Energy Statistics (actual); World Bank (projected).

5. Coal. In Table 2 (page 36), changes in the shares of the various fuels in global energy consumption are summarized for the period 1981-86, and forecasts for the period 1995-2000 are also given. The sharp decline in the international price of oil since 1985 has slowed the growth in world coal consumption. Further penetration of coal in the energy markets, especially in the industrial countries, will depend upon its price relative to other fuels and the development of coal utilization technologies capable of resolving environmental problems. Continued expansion of coal capacity in the electric power sectors in both the industrial and developing countries should lead to a 2% p.a. increase in coal consumption over the forecast period. Still, the share of coal in global energy consumption is expected to decline. Given the low oil prices expected up to the early 1990s, the growth in the coal market is likely to be demand constrained, thereby increasing competition among coal exporters and producers.

6. Natural Gas. Although the growth in natural gas consumption in the industrial countries has been minimal over the period 1970-86, mainly due to a decline in natural gas use in the United States, steady growth in other regions has led to a slight increase in the share of gas in global energy demand. The most significant increase in its share has occurred in the CPEs. Supported by the enormous natural gas reserves of the CPEs and the developing countries, natural gas consumption in these regions will continue to grow. In the developing countries the increase in the utilization of gas resources will be accompanied by expanding networks for gas transportation and distribution. The increase in the use of gas in the CPEs, besides providing the growing energy needs of the CPEs, will help retain a share of the international market for oil in order to earn the highly sought after foreign exchange.

7. Electricity. The growth in the demand for electricity has outpaced that of any other fuel since 1970. Between 1970 and 1986 global demand for electricity grew by 6.8% p.a., almost doubling its share of the total commercial energy market. Over the forecast period, growth in electricity demand is projected to remain strong at 3.9% p.a., and its share in global energy demand will increase. Despite concerns over the use of nuclear power, especially since the Chernobyl disaster, nuclear-generated electricity increased by almost 8.9% p.a. between 1980 and 1987. The number of nuclear-generating units increased from 70 to 107 over this period. The growth of nuclear electricity generation is expected to continue, at least over the short term, mainly due to the higher utilization of existing nuclear power plants and as units currently under construction come on-stream. Electricity generation through hydro power is expected to contribute an increasing supply of energy in the developing countries.

8. Crude Oil. Since 1986, the low international prices of oil have slowed the decline in the intensity of oil use in industrial production, and the decline in the share of petroleum in global energy use has also moderated. Based upon our expectation of weak oil prices over the short and medium term, the erosion in petroleum's share is likely to be slower as demand maintains reasonable growth. The pace of demand growth would be faster in the absence of the reluctance of most oil-consuming countries to pass through fully the recent declines in oil prices to consumers. Continued investments in energy conservation and further improvements in the efficiency of oil consumption should also serve to slow the growth in oil demand.

TABLE 2: GLOBAL ENERGY CONSUMPTION BY FUEL TYPE, 1961-86 (ACTUAL) AND 1990-2000 (PROJECTED)

	1961		1970		1986		1990		2000	
	MTOE	%	MTOE	%	MTOE	%	MTOE	%	MTOE	%
Liquid Fuels	1,159.7	38.7	2,285.9	46.0	2,921.3	39.4	3,112.1	38.4	3,547.1	35.0
Natural Gas	409.5	13.7	851.7	17.2	1,457.4	19.7	1,630.5	20.1	2,211.8	21.8
Solid Fuels	1,241.9	41.5	1,510.6	30.4	2,122.6	28.7	2,306.9	28.4	2,814.4	27.8
Primary Electricity	184.0	6.1	315.9	6.4	906.8	12.2	1,058.9	13.1	1,557.2	15.4
Total	2,995.1	100.0	4,964.1	100.0	7,408.1	100.0	8,108.4	100.0	10,130.5	100.0

Note: Details may not add to total due to rounding.

Sources: United Nations, Energy Statistics (actual); World Bank (projected).

9. Since the transportation sector is likely to remain tied to liquid fuels over the forecast period, the increase in multi-firing capacity in the power generation, industrial, and, to some extent, the residential/commercial sectors will provide the main areas of interfuel substitution--particularly for oil. Although the continuing introduction of more energy-efficient transport equipment will reduce the rate of growth of transport fuels, the demand for transport fuels is nevertheless anticipated to grow at a rate somewhat faster than that experienced in recent years, as a result of higher per capita income growth.

10. Within the industrial sector of the industrial countries, oil's share has fallen sharply since the second oil price shock--from 38.5% in 1979 to around 28% in 1986. Since the first oil embargo in 1973 the consumption of oil by the power-generation sector in the industrial countries has almost halved. The most significant decline has taken place in North America. However, the decline in this sector appears to have stabilized since 1986 as a result of the sharp decline in oil prices. The substitution of coal for oil has been fastest in the iron and steel and cement industries. However, substitution for oil in other energy-intensive industries, though potentially high, remains comparatively slow because of the uncertainty surrounding industrial growth prospects, the old age of the existing capital stock, and environmental and regulatory concerns. Given the recent sharp drop in oil prices, substitution by coal in the industrial sector is likely to be, at best, very slow in the medium term. Environmental considerations and high costs of coal desulfurization are also likely to limit the penetration of coal. Expectations of volatile prices and concerns over security of supply have encouraged major industrial energy consumers to increase investments in multi-fired facilities. This form of investment increases the ability of consumers to change the fuel mix quickly in response to relative price movements. In the industrial countries, there currently exists a fuel-switching capacity of almost 100 million tons of oil equivalent (mtoe), mostly in power generation. In the United States, where the industrial and power-generation sectors provide the largest possibilities for fuel substitution, as much as 30% of the energy consumption may be switchable, of which almost 60% would be substitution between fuel oil and natural gas, while the rest would be between natural gas, distillates, liquified petroleum gas and other fuels, noticeably coal. It is estimated that the extent of switchability in the power-generation and the industrial sectors in the United States is over 80% and 50%, respectively, over a short period of time. If oil prices remain low over the short term, the flexibility in fuel use provided by the multi-fired systems will slow the erosion of fuel oil's share. Beyond 1990, the projected increases in oil prices will, once again, create incentives for an increase in the rate of substitution.

Supply Outlook

11. Actual and expected changes in the shares of the various fuels in total energy supplies in the major country groups are shown in Table 3 for the 1961-86 and 1986-2000 periods. One of the strongest trends evident in the energy sector is the rapidly increasing production of primary electricity, basically reflecting the enormous expansion of nuclear energy not only in industrial countries and CPEs but also in many developing countries. The

TABLE 3: ENERGY PRODUCTION BY COUNTRY GROUPS, 1961-86 (ACTUAL) AND 1990-2000 (PROJECTED)

	1961		1970		1986		1990		2000	
Countries/Economies	MTOE	%	MTOE	%	MTOE	%	MTOE	%	MTOE	%
Industrial	1,539.4	100.0	2,135.5	100.0	2,783.8	100.0	2,939.4	100.0	3,340.7	100.0
Liquid Fuels	439.1	28.5	604.2	28.3	786.7	28.3	773.7	26.3	758.0	22.7
Natural Gas	325.3	21.1	620.1	29.0	618.0	22.2	654.2	22.3	704.0	21.1
Solid Fuels	629.8	40.9	684.6	32.1	780.1	28.0	834.5	28.4	985.5	29.5
Primary Electricity	145.2	9.4	226.5	10.6	599.0	21.5	677.0	23.0	893.2	26.7
Centrally Planned	696.7	100.0	1,121.5	100.0	1,991.2	100.0	2,135.0	100.0	2,545.5	100.0
Liquid Fuels	184.5	26.5	377.9	33.7	639.7	32.1	651.8	30.5	610.5	24.0
Natural Gas	67.8	9.7	188.8	16.8	617.6	31.0	693.9	32.5	1,000.3	39.3
Solid Fuels	427.7	61.4	503.0	46.3	618.4	31.1	649.1	30.4	706.8	27.8
Primary Electricity	16.6	2.4	35.6	3.2	155.4	7.8	140.2	6.6	228.1	8.9
Developing	759.8	100.0	1,767.6	100.0	2,633.1	100.0	3,034.0	100.0	4,244.3	100.0
Liquid Fuels	842.2	71.4	1,358.8	76.9	1,494.9	56.8	1,686.7	55.6	2,178.6	51.3
Natural Gas	20.4	2.7	56.0	3.2	221.8	8.4	282.3	9.3	507.5	12.0
Solid Fuels	174.7	23.0	299.4	16.9	724.1	27.5	823.3	27.1	1,122.3	26.4
Primary Electricity	23.6	3.0	53.4	3.6	192.3	7.3	241.7	8.0	435.9	10.3

Note: Details may not add to total due to rounding.

Sources: United Nations, Energy Statistics (actual); World Bank (projected).

share of electricity in the total energy market is projected to increase in all countries as the pace of electrification in developing countries increases and as production from non-utility cogeneration and other small power producers increases in the industrial countries. Another recent trend of considerable intensity is the rapid expansion of natural gas supplies in the CPEs, and further expansion is expected to increase natural gas output from 618 mtoe in 1986 to 1,000 mtoe in 2000 as natural gas fills in the energy demand gap in the Eastern European countries once oil exports from the USSR stagnate. Given the relatively small size of petroleum reserves in industrial countries, not much increase is expected to take place in oil production in those countries.

12. The share of industrial countries in global energy production is projected to decline further--from 37.6% in 1986 to 33% in 2000--while the share of the CPEs is expected to fall marginally. The developing countries' share in total energy production is therefore expected to grow to about 41.9% in 2000 (up from 35.5% in 1986). Details of these changes in the shares of energy produced in the major country groups are given in Table 4.

13. World petroleum reserves and oil production potential remains concentrated in the Gulf region. While there is considerable exploration activity in several non-OPEC developing countries, supply constraints in the industrial countries (noticeably the United States and the UK sector of the North Sea) are expected to adversely affect supplies from non-OPEC sources. It is projected that an increase in international oil prices after the early 1990s will strengthen the search for oil finds, especially in the oil-exporting developing countries. Supplies from non-OPEC countries (excluding CPEs) are expected to increase by 1% p.a. over the forecast period to reach over 1,556 mtoe by 2000. In the period beyond 1995 it is expected that there will be a decline in net exportable quantities from the CPEs and that there will be a leveling off of exports from non-OPEC oil-exporting developing countries. Therefore, given our growth rate forecast of 1.4% in global oil demand, the demand for OPEC oil will increase by almost 500 mtoe by 2000. This would mean that OPEC production would reach 1,413 mtoe, and its share in world production (which had dropped from its peak of 53.9% in 1973 to 32% in 1986) would increase to 32.8% in 1990 and thereafter increase to 39.8% by 2000.

TABLE 4: ENERGY PRODUCTION BY COUNTRY GROUPS, 1961-86 (ACTUAL) AND 1990-2000 (PROJECTED)

	1961		1970		1986		1990		2000	
Countries/Economies	MTOE	%	MTOE	%	MTOE	%	MTOE	%	MTOE	%
Industrial	1,539.4	51.4	2,135.5	42.5	2,783.8	37.6	2,939.4	36.2	3,340.7	33.0
Centrally Planned	696.7	23.2	1,121.5	22.3	1,991.2	26.9	2,135.0	26.4	2,545.5	25.1
Developing	759.8	25.4	1,767.6	35.2	2,633.1	35.5	3,034.0	37.4	4,244.3	41.9
World	2,995.9	100.0	5,024.5	100.0	7,408.1	100.0	8,108.4	100.0	10,130.5	100.0

Note: Details may not add to total due to rounding.

Sources: United Nations, Energy Statistics (actual); World Bank (projected).

TABLE A1: ENERGY - PRODUCTION BY MAIN COUNTRIES AND ECONOMIC REGIONS

COUNTRIES/ ECONOMIES	ACTUAL				PROJECTED					GROWTH RATES A/		
	1969-71	1979-81	1986	1987/B	1988	1989	1990	1995	2000	1961-86	1970-86	1987 - 2000
	(MILLION TONS OF OIL EQUIVALENT)									(% PER ANNUM)		
INDUSTRIAL	2,110	2,537	2,784	2,828	2,870	2,907	2,939	3,126	3,341	2.3	1.8	1.1
NORTH AMERICA	1,600	1,748	1,789	1,816	1,839	1,860	1,875	1,974	2,078	1.8	0.6	0.9
UNITED STATES	1,435	1,500	1,499	1,511	1,523	1,537	1,546	1,610	1,670	1.4	0.3	0.7
CANADA	165	247	290	305	316	323	330	365	408	5.1	2.8	1.9
EEC-10	363	514	609	608	615	623	633	660	707	2.3	1.5	1.0
UNITED KINGDOM	107	200	247	242	243	243	244	235	241	3.5	6.5	0.0
GERMANY, FED. REP.	122	124	127	124	127	130	135	142	153	-0.1	0.3	1.4
OTHER WESTERN EUROPE	48	120	166	174	184	187	190	210	230	6.9	8.9	1.9
JAPAN	49	57	78	80	83	88	91	105	126	1.1	3.7	3.0
OCEANIA	49	98	142	149	149	148	151	176	200	8.4	5.5	2.0
AUSTRALIA	45	91	130	137	137	136	138	162	184	8.9	5.5	2.0
NON-MARKET	1,128	1,697	1,991	2,039	2,071	2,097	2,135	2,320	2,546	4.2	3.6	1.5
USSR	866	1,377	1,635	1,675	1,702	1,722	1,754	1,912	2,105	4.7	4.1	1.5
EASTERN EUROPE	262	320	356	364	368	374	381	408	440	2.3	1.9	1.3
POLAND	90	117	128	132	134	136	139	152	165	3.0	1.8	1.5
DEVELOPING	1,748	2,569	2,633	2,701	2,789	2,905	3,034	3,619	4,244	4.9	1.6	3.1
ASIA	1,073	1,702	1,650	1,699	1,752	1,818	1,876	2,270	2,711	5.3	1.2	3.2
CHINA	209	444	609	624	644	669	694	827	967	8.1	6.3	3.0
SAUDI ARABIA	198	502	251	224	229	239	248	308	367	6.1	-0.8	3.3
IRAN	206	114	104	125	123	135	141	189	234	1.7	-7.1	4.3
INDIA	51	92	146	152	158	165	171	211	254	6.2	7.3	3.5
AFRICA	318	400	416	425	438	456	484	553	611	6.7	1.3	2.5
NIGERIA	53	98	73	69	71	74	82	98	105	13.5	-1.0	2.9
SOUTH AFRICA	34	66	94	96	98	99	102	111	131	5.7	7.4	2.1
AMERICA	323	424	508	515	535	564	604	708	812	2.9	3.5	3.1
VENEZUELA	201	138	118	118	117	121	124	151	157	-2.2	-3.6	1.9
MEXICO	39	137	175	181	183	188	205	232	263	9.8	12.8	2.5
SOUTHERN EUROPE	34	44	59	61	64	66	69	87	108	4.4	2.9	3.8
WORLD	4,986	6,804	7,408	7,568	7,730	7,907	8,108	9,065	10,130	3.6	2.2	2.0

A/ LEAST SQUARES TREND FOR HISTORICAL PERIODS (1961-86); END-POINT FOR PROJECTED PERIODS (1987-2000).
B/ ESTIMATE.

SOURCES: UNITED NATIONS ENERGY STATISTICS (ACTUAL);
WORLD BANK, INTERNATIONAL ECONOMICS DEPARTMENT (PROJECTED).

TABLE A2: ENERGY - APPARENT CONSUMPTION BY MAIN COUNTRIES AND ECONOMIC REGIONS

COUNTRIES/ ECONOMIES	ACTUAL				PROJECTED					GROWTH RATES A/		
	1969-71	1979-81	1986	1987/B	1988	1989	1990	1995	2000	1961-86	1970-86	1987 - 2000
	(MILLION TONS OF OIL EQUIVALENT)									(% PER ANNUM)		
INDUSTRIAL	3,097	3,686	3,707	3,770	3,833	3,896	3,965	4,274	4,591	2.5	0.7	1.3
NORTH AMERICA	1,744	2,023	1,994	2,020	2,050	2,079	2,106	2,278	2,422	2.0	0.5	1.2
UNITED STATES	1,574	1,785	1,748	1,771	1,796	1,920	1,843	1,988	2,105	1.8	0.3	1.2
CANADA	157	224	234	237	242	247	251	276	303	3.9	2.2	1.7
EEC-10	904	1,068	1,067	1,089	1,105	1,123	1,145	1,225	1,316	2.4	0.5	1.3
GERMANY, FED. REP.	234	279	272	277	280	285	294	312	337	2.2	0.5	1.3
UNITED KINGDOM	211	209	211	216	221	224	229	239	254	0.6	-0.6	1.1
FRANCE	158	201	207	207	210	212	215	236	258	3.0	1.2	1.5
OTHER WESTERN EUROPE	121	153	172	174	176	179	182	196	211	3.4	1.7	1.3
JAPAN	270	359	383	395	407	419	434	465	519	5.3	1.3	1.8
OCEANIA	57	83	91	92	94	96	98	110	123	4.3	2.7	1.9
AUSTRALIA	49	72	77	78	80	81	83	93	104	4.4	2.7	1.9
NON-MARKET	1,059	1,578	1,835	1,880	1,908	1,938	1,977	2,191	2,438	4.2	3.4	1.7
USSR	762	1,155	1,382	1,417	1,437	1,456	1,486	1,648	1,840	4.4	3.7	1.8
EASTERN EUROPE	296	423	452	463	472	482	491	542	598	3.5	2.7	1.7
POLAND	81	119	124	128	129	133	135	150	165	3.6	2.6	1.7
DEVELOPING	785	1,466	1,866	1,918	1,989	2,074	2,166	2,600	3,101	6.5	5.4	3.3
ASIA	446	861	1,143	1,175	1,220	1,274	1,329	1,599	1,899	7.2	5.8	3.3
CHINA	213	445	595	609	632	660	689	825	968	7.9	6.0	3.1
INDIA	62	113	160	166	174	183	190	237	293	5.8	6.3	3.9
AFRICA	85	154	197	202	208	216	224	257	305	5.7	5.6	2.8
SOUTH AFRICA	44	65	80	82	83	85	87	92	107	4.4	3.8	1.8
AMERICA	195	348	398	406	420	438	459	556	677	5.4	4.6	3.5
MEXICO	40	92	105	106	109	112	116	140	171	7.4	7.2	3.2
BRAZIL	39	91	113	117	122	128	135	168	209	7.9	6.1	4.0
SOUTHERN EUROPE	58	102	127	133	138	145	152	186	217	6.3	4.6	3.3
WORLD	4,940	6,729	7,408	7,568	7,730	7,907	8,108	9,065	10,130	3.6	2.3	2.0

A/ LEAST SQUARES TREND FOR HISTORICAL PERIODS (1961-86); END-POINT FOR PROJECTED PERIODS (1987-2000).
B/ ESTIMATE.

SOURCES: UNITED NATIONS ENERGY STATISTICS (ACTU
WORLD BANK, INTERNATIONAL ECONOMICS DE.

TABLE A3: ENERGY - GROSS EXPORTS BY MAIN COUNTRIES AND ECONOMIC REGIONS

COUNTRIES/ ECONOMIES	ACTUAL				PROJECTED					GROWTH RATES A/		
	1969-71	1979-81	1986	1987/B	1988	1989	1990	1995	2000	1961-86	1970-86	1987 - 2000
	(MILLION TONS OF OIL EQUIVALENT)									(% PER ANNUM)		
INDUSTRIAL	289	500	640	662	676	683	690	733	788	6.6	4.6	1.2
NORTH AMERICA	122	168	200	214	219	224	228	246	267	5.4	1.9	1.5
UNITED STATES	49	79	95	98	98	100	101	104	107	4.6	5.2	0.6
EEC-10	143	237	289	285	286	285	285	275	281	5.9	4.4	-0.1
NETHERLANDS	42	85	86	83	83	83	83	86	86	8.6	3.3	0.3
UNITED KINGDOM	19	62	108	102	101	97	94	75	70	9.9	13.8	-2.5
OTHER WESTERN EUROPE	9	61	88	95	104	106	108	124	140	15.1	17.1	2.6
NORWAY	3	47	69	76	84	86	87	102	116	21.7	24.7	2.9
JAPAN	1	2	2	2	2	3	3	3	3	5.7	1.5	1.5
OCEANIA	13	31	61	66	65	65	66	86	97	12.2	8.8	2.7
NON-MARKET	151	280	338	347	355	357	362	363	375	6.1	5.3	0.5
USSR	116	235	277	283	291	292	296	296	308	7.0	6.0	0.6
EASTERN EUROPE	36	45	61	64	65	65	66	67	67	3.2	2.8	0.3
DEVELOPING	1,261	1,556	1,229	1,259	1,289	1,332	1,385	1,613	1,819	3.2	-1.5	2.5
ASIA	737	1,038	742	764	779	801	814	971	1,159	3.8	-2.1	2.8
SAUDI ARABIA	180	472	212	185	187	197	204	258	307	5.8	-1.6	3.4
IRAN	181	75	64	84	80	91	95	132	166	0.3	-9.6	4.7
IRAQ	75	107	74	98	115	115	116	132	178	0.8	-3.2	4.0
UNITED ARAB EMIR	40	83	68	73	72	69	66	81	107	0.0	0.7	2.6
AFRICA	268	293	270	275	283	296	316	359	375	6.9	-0.6	2.1
LIBYA	147	82	48	47	45	46	50	65	67	5.2	-6.6	2.5
NIGERIA	50	90	63	58	60	63	69	82	87	13.3	-1.8	2.7
ALGERIA	42	55	61	65	68	72	75	81	85	4.2	1.7	1.9
AMERICA	253	212	204	208	216	224	242	270	269	-0.4	-0.9	1.7
MEXICO	4	46	72	77	77	79	92	95	96	16.8	33.4	1.5
VENEZUELA	178	100	75	74	73	75	75	89	81	-3.7	-5.8	0.6
SOUTHERN EUROPE	2	13	13	11	11	12	12	13	14	10.9	11.5	1.5
WORLD	1,700	2,336	2,207	2,268	2,321	2,372	2,436	2,710	2,982	4.3	0.6	1.8

A/ LEAST SQUARES TREND FOR HISTORICAL PERIODS (1961-86); END-POINT FOR PROJECTED PERIODS (1987-2000).
B/ ESTIMATE.

SOURCES: UNITED NATIONS ENERGY STATISTICS (ACTUAL);
WORLD BANK, INTERNATIONAL ECONOMICS DEPARTMENT (PROJECTED).

TABLE A4: ENERGY - GROSS IMPORTS BY MAIN COUNTRIES AND ECONOMIC REGIONS

COUNTRIES/ ECONOMIES	ACTUAL				PROJECTED					GROWTH RATES A/		
	1969-71	1979-81	1986	1987/B	1988	1989	1990	1995	2000	1961-86	1970-86	1987 - 2000
	(MILLION TONS OF OIL EQUIVALENT)									(% PER ANNUM)		
INDUSTRIAL	1,292	1,694	1,563	1,604	1,639	1,672	1,716	1,882	2,039	4.2	0.0	1.6
NORTH AMERICA	276	469	404	418	431	443	459	549	611	4.7	0.3	2.6
UNITED STATES	196	387	344	358	371	383	398	483	541	5.5	1.4	2.8
EEC-10	685	803	747	766	776	785	798	839	890	3.5	-0.3	1.0
GERMANY, FED. REP.	137	184	165	173	175	176	181	194	209	4.4	0.3	1.3
FRANCE	120	168	131	132	134	136	139	145	156	4.1	-0.3	1.1
ITALY	123	139	135	140	141	144	146	153	162	3.7	0.0	1.0
UNITED KINGDOM	122	73	72	76	79	78	79	80	83	-0.8	-5.3	0.5
NETHERLANDS	69	85	96	94	96	98	99	104	109	3.9	1.3	1.0
OTHER WESTERN EUROPE	84	97	94	95	97	98	100	110	121	3.3	-0.1	1.6
JAPAN	225	307	308	317	326	333	345	363	396	6.9	0.8	1.5
OCEANIA	22	17	10	10	10	12	14	20	21	-1.9	-2.6	5.5
NON-MARKET	83	166	181	188	193	199	204	233	268	7.4	4.3	2.4
USSR	13	14	24	25	25	26	27	32	43	6.3	0.2	3.7
EASTERN EUROPE	70	152	158	163	168	173	177	201	225	7.5	5.0	2.2
DEVELOPING	301	466	462	475	489	502	516	594	675	4.4	2.4	2.4
ASIA	113	203	235	240	247	256	267	301	347	6.4	5.0	2.5
KOREA, REPUBLIC OF	10	32	45	47	49	51	54	65	78	17.4	9.8	3.5
SINGAPORE	20	39	47	48	48	49	50	53	58	8.4	5.1	1.3
AFRICA	38	50	50	52	54	55	57	62	69	3.5	1.5	1.9
SOUTH AFRICA	12	17	16	17	18	18	19	20	23	5.8	1.1	2.1
AMERICA	124	139	94	99	101	98	97	118	134	1.2	-2.3	2.1
BRAZIL	21	50	38	39	39	36	32	41	50	6.9	2.7	1.7
SOUTHERN EUROPE	26	73	82	83	86	90	95	112	123	8.6	6.8	2.7
WORLD	1,676	2,326	2,207	2,268	2,321	2,372	2,436	2,710	2,982	4.5	0.8	1.8

A/ LEAST SQUARES TREND FOR HISTORICAL PERIODS (1961-86); END-POINT FOR PROJECTED PERIODS (1987-2000).
B/ ESTIMATE.

SOURCES: UNITED NATIONS ENERGY STATISTICS (ACTUAL);
WORLD BANK, INTERNATIONAL ECONOMICS DEPARTMENT (PROJECTED).

TABLE A5: PRIMARY ELECTRICITY - PRODUCTION BY MAIN COUNTRIES AND ECONOMIC REGIONS

COUNTRIES/ ECONOMIES	ACTUAL				PROJECTED					GROWTH RATES A/		
	1969-71	1979-81	1986	1987/B	1988	1989	1990	1995	2000	1961-86	1970-86	1987/B - 2000
	(MILLION TONS OF OIL EQUIVALENT)									(% PER ANNUM)		
INDUSTRIAL	230	421	599	616	634	656	677	776	893	6.0	6.1	2.5
NORTH AMERICA	112	211	277	285	294	303	310	355	403	6.3	5.5	2.3
UNITED STATES	72	137	182	187	191	197	202	231	261	6.6	5.6	2.3
CANADA	40	74	95	99	102	106	108	124	142	5.7	5.2	2.5
EEC-10	49	88	157	161	167	173	182	214	255	6.5	7.9	3.1
FRANCE	15	34	77	80	82	84	85	96	106	8.4	11.6	1.9
GERMANY, FED. REP.	5	16	31	31	32	33	36	43	52	10.3	13.0	3.5
OTHER WESTERN EUROPE	42	70	91	92	93	95	96	102	108	4.7	5.1	1.1
NORWAY	15	22	28	28	29	30	30	34	37	4.5	3.7	1.8
SWEDEN	12	22	33	33	33	34	34	34	34	5.2	6.6	0.2
JAPAN	22	43	65	68	71	76	79	94	115	5.8	7.5	3.6
OCEANIA	6	8	9	10	10	10	10	11	12	4.4	2.4	1.8
NON-MARKET	35	73	115	122	128	134	140	179	228	7.8	8.3	4.3
USSR	32	61	96	100	105	109	114	141	174	7.3	7.7	3.7
DEVELOPING	53	130	192	203	214	227	242	330	436	9.2	8.4	5.2
ASIA	20	47	79	84	90	96	103	142	194	9.2	8.9	5.7
CHINA	6	18	34	37	40	43	46	66	93	11.7	10.8	6.4
INDIA	7	13	15	16	17	19	20	29	39	7.3	5.4	6.0
AFRICA	6	14	13	14	15	16	17	22	29	8.2	4.9	5.0
AMERICA	20	56	85	88	92	97	103	140	180	9.9	9.5	4.9
BRAZIL	10	32	48	51	54	57	60	84	111	10.6	10.4	5.3
SOUTHERN EUROPE	7	13	16	16	17	18	19	25	33	7.0	5.6	4.7
WORLD	318	624	907	940	975	1,017	1,059	1,284	1,557	6.7	6.8	3.4

A/ LEAST SQUARES TREND FOR HISTORICAL PERIODS (1961-86); END-POINT FOR PROJECTED PERIODS (1987-2000).
B/ ESTIMATE.

SOURCES: UNITED NATIONS ENERGY STATISTICS (ACTUAL);
WORLD BANK, INTERNATIONAL ECONOMICS DEPARTMENT (PROJECTED).

TABLE A6: PRIMARY ELECTRICITY - APPARENT CONSUMPTION BY MAIN COUNTRIES AND ECONOMIC REGIONS

COUNTRIES/ ECONOMIES	ACTUAL				PROJECTED					GROWTH RATES A/		
	1969-71	1979-81	1986	1987/B	1988	1989	1990	1995	2000	1961-86	1970-86	1987 - 2000
	(MILLION TONS OF OIL EQUIVALENT)									(% PER ANNUM)		
INDUSTRIAL	230	421	599	616	634	656	676	774	892	6.0	6.1	2.5
NORTH AMERICA	112	211	277	285	294	303	310	355	403	6.3	5.5	2.3
UNITED STATES	72	144	193	199	204	210	215	244	274	6.9	6.0	2.2
CANADA	39	67	84	86	90	93	95	111	129	5.1	4.5	2.7
EEC-10	50	92	161	166	171	177	185	217	259	6.5	8.0	3.0
FRANCE	15	35	71	73	74	75	75	86	98	8.1	11.2	2.0
GERMANY, FED. REP.	7	18	32	33	35	36	40	46	55	9.2	10.7	3.4
OTHER WESTERN EUROPE	40	66	86	88	89	90	92	98	103	4.7	4.9	1.1
NORWAY	15	22	25	26	26	27	27	30	32	4.2	3.4	1.5
SWEDEN	12	22	32	33	33	33	33	35	35	5.2	6.2	0.5
JAPAN	22	43	65	68	71	76	79	94	115	5.8	7.5	3.6
OCEANIA	6	8	9	10	10	10	10	11	12	4.4	2.4	1.8
NON-MARKET	35	72	114	120	126	132	138	177	225	7.7	8.2	4.3
USSR	31	56	88	93	97	102	107	134	166	6.9	7.5	3.9
DEVELOPING	53	130	195	205	216	229	244	334	440	9.2	8.5	5.2
ASIA	20	47	79	84	90	96	103	142	194	9.3	8.9	5.7
CHINA	6	18	34	37	40	43	46	66	93	11.8	10.9	6.4
INDIA	7	13	15	16	17	19	20	28	39	7.3	5.4	6.0
AFRICA	6	14	13	14	15	16	17	23	29	8.2	5.0	5.0
AMERICA	20	56	85	88	92	97	103	140	180	9.8	9.5	4.9
BRAZIL	10	32	49	52	55	58	61	85	112	10.7	10.5	5.3
SOUTHERN EUROPE	7	14	17	18	19	20	22	29	36	7.5	6.5	4.8
WORLD	318	623	907	940	975	1,017	1,059	1,284	1,557	6.7	6.8	3.4

A/ LEAST SQUARES TRFND FOR HISTORICAL PERIODS (1961-86); END-POINT FOR PROJECTED PERIODS (1987-2000).
B/ ESTIMATE.

SOURCES: UNITED NATIONS ENERGY STATISTICS (ACTUAL);
WORLD BANK, INTERNATIONAL ECONOMICS DEPARTMENT (PROJECTED).

TABLE A7: PRIMARY ELECTRICITY - GROSS EXPORTS BY MAIN COUNTRIES AND ECONOMIC REGIONS

COUNTRIES/ ECONOMIES	ACTUAL				PROJECTED					GROWTH RATES A/		
	1969-71	1979-81	1986	1987/B	1988	1989	1990	1995	2000	1961-86	1970-86	1987 - 2000
	(MILLION TONS OF OIL EQUIVALENT)									(% PER ANNUM)		
INDUSTRIAL	13	29	39	41	43	45	47	50	52	8.4	7.3	1.6
NORTH AMERICA	2	9	13	14	14	14	15	15	16	9.7	10.8	0.8
CANADA	2	8	12	13	13	14	14	14	15	12.8	13.2	0.7
EEC-10	6	11	15	15	16	18	19	20	20	9.2	6.6	2.1
GERMANY, FED. REP.	2	4	4	3	3	3	3	3	4	7.7	5.4	0.7
FRANCE	1	3	8	9	10	11	12	13	13	12.2	11.7	2.9
OTHER WESTERN EUROPE	5	9	12	12	13	13	13	15	16	6.8	5.6	1.9
NON-MARKET	3	9	13	14	14	14	14	15	15	12.6	9.1	0.8
USSR	1	5	7	7	7	7	8	8	8	20.4	10.2	0.5
DEVELOPING	1	4	3	3	3	4	4	4	4	10.0	19.6	1.5
ASIA	0	0	0	0	0	0	0	0	0	0.0	20.7	0.7
AFRICA	0	3	1	1	1	1	1	1	1	6.4	17.3	0.8
AMERICA	0	0	1	1	1	1	1	1	1	26.9	26.4	2.0
SOUTHERN EUROPE	0	1	1	1	1	1	1	1	2	15.8	17.9	2.0
WORLD	16	42	56	58	60	62	64	68	72	9.2	8.2	1.4

A/ LEAST SQUARES TREND FOR HISTORICAL PERIODS (1961-86); END-POINT FOR PROJECTED PERIODS (1987-2000).
B/ ESTIMATE.

SOURCES: UNITED NATIONS ENERGY STATISTICS (ACTUAL);
WORLD BANK, INTERNATIONAL ECONOMICS DEPARTMENT (PROJECTED).

TABLE A8: PRIMARY ELECTRICITY - GROSS IMPORTS BY MAIN COUNTRIES AND ECONOMIC REGIONS

COUNTRIES/ ECONOMIES	ACTUAL				PROJECTED					GROWTH RATES A/		
	1969-71	1979-81	1986	1987/B	1988	1989	1990	1995	2000	1961-86	1970-86	1987 - 2000
	(MILLION TONS OF OIL EQUIVALENT)									(% PER ANNUM)		
INDUSTRIAL	13	29	39	41	43	44	46	48	51	8.6	7.3	1.4
NORTH AMERICA	2	9	13	14	14	14	15	15	16	9.9	11.1	0.8
UNITED STATES	2	8	12	13	13	14	14	14	15	12.8	13.4	0.7
EEC-10	7	15	19	20	20	22	23	23	25	8.0	7.2	1.5
GERMANY, FED. REP.	4	5	5	6	6	6	6	6	7	5.0	2.1	1.2
ITALY	1	2	6	6	6	6	6	6	6	13.1	14.3	0.0
FRANCE	1	4	2	2	2	2	2	2	5	5.8	3.3	7.4
BELGIUM-LUXEMBOURG	1	2	2	2	2	2	3	3	2	11.1	5.5	0.5
OTHER WESTERN EUROPE	4	5	8	8	8	8	9	10	11	8.9	4.1	2.3
NON-MARKET	3	8	11	11	12	12	12	13	12	11.4	7.8	0.5
EASTERN EUROPE	3	8	11	11	12	12	12	12	12	11.4	8.2	0.5
DEVELOPING	1	5	5	5	6	6	6	7	8	11.5	22.4	3.0
ASIA	0	0	1	0	0	0	0	0	1	...	...	0.0
AFRICA	0	3	1	1	1	1	1	1	1	6.8	18.6	1.3
AMERICA	0	0	1	1	1	1	1	1	1	12.1	18.6	1.7
SOUTHERN EUROPE	0	1	3	3	3	4	4	5	5	21.3	27.5	3.9
WORLD	16	42	56	58	60	62	64	68	72	9.3	8.2	1.4

A/ LEAST SQUARES TREND FOR HISTORICAL PERIODS (1961-86); END-POINT FOR PROJECTED PERIODS (1987-2000).
B/ ESTIMATE.

SOURCES: UNITED NATIONS ENERGY STATISTICS (ACTUAL);
WORLD BANK, INTERNATIONAL ECONOMICS DEPARTMENT (PROJECTED).

PETROLEUM

Summary

1. The recovery of oil prices to an average of $17.20/bbl in 1987 following the mid-1986 plunge to below $10/bbl (from $27/bbl in 1985) was reversed in 1988 despite growth in demand. The main cause of the 1988 decline was production increases from both OPEC and non-OPEC sources. By September 1988, prices had fallen to $12.10/bbl with production from OPEC around 19.5 mb/d. Volatility in oil prices has continued which, by and large, has been generated by changes in expectations over the outcome of the various OPEC meetings.

2. Global consumption of petroleum declined from a peak of 3,178 million tons of oil equivalent (mtoe) in 1979 to around 2,833 mtoe in 1985; it steadily increased over the next two years to total 2,957 mtoe in 1987, and a further substantial increase was estimated for 1988. The recent increase in oil demand has been due mainly to the sharp decline in prices, as well as to the rapid growth in industrial production and incomes in the industrial countries and some of the industrializing developing countries.

3. Petroleum consumption is expected to grow throughout the 1990s at an average rate of 1.4% p.a. The forecast of a return to growth in crude oil demand, albeit slow, is based on the lower oil prices generating demand increases and the solid growth assumed in OECD GNP. It also assumes continued investment in oil conservation and efficiency improvements which will allow further substitution away from oil. Since the transportation sector is likely to remain tied to liquid fuels over the forecast period, the power-generation, industrial, and residential/commercial sectors will provide the main areas of substitution for oil. However, the continuing introduction of more energy-efficient transportation equipment will also reduce the rate of growth of demand for transport fuels. Energy pricing policies in many countries have restricted the extent of the pass-through of the recent decline in oil prices to final consumers; it is assumed that these policies will continue which will also constrain the increase in oil demand. The income elasticity of demand is thus projected to remain much lower than it was prior to the 1970s.

4. In the industrial countries, the recent trend towards the consumption of lighter products is expected to continue over the forecast period. The shift in demand towards high octane fuel, linked largely to the demand for high-performance vehicles, will continue to exert pressures on refineries to invest in the conversion and upgrading of their refinery capacity. 1/ While all the major economic regions are projected to share in the increased demand for petroleum, the sharpest increase is anticipated to occur in the developing

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1/ High-performance vehicles, by and large, do not need high-octane fuels. The increase demand for high-octane fuels has resulted mostly from marketing efforts by the oil companies, since profits from high-octane fuels are higher than from low-octane fuels.

countries. Increased motorization in combination with growth in per capita incomes (mainly in Asia) will be the main factors behind this strong performance.

5. Since 1980 non-OPEC supplies have increased by around 2.2% p.a. to 2,014 mtoe in 1987. Over the projection period the outlook for supplies from the non-OPEC countries is for an increase of a little less than 1% p.a. The lower prices, the lesser prospects for big oil discoveries, and progress towards resolution of the debt crisis (by reducing debt-servicing pressures to increase oil production) should all contribute to this slowdown. Given the current rate of production in relation to their reserves, it is projected that production from the industrial countries will begin to decline during the period 1990-95. A decline in the net exports from the CPEs is expected during the 1995-2000 period. During this latter period there is also expected to be a leveling out of the growth in exports from the non-OPEC oil-exporting developing countries.

6. Increases in supplies from non-OPEC countries have diminished OPEC's dominant position in the world oil markets. (OPEC production has declined by almost 30% since 1980.) As OPEC attempted to control its output in an effort to support prices, non-OPEC production filled the gap between OPEC supply and global demand. OPEC's policy since 1986 of attempting to regain its market share has not been entirely successful. Its production has increased, and its share has also increased somewhat, but non-OPEC suppliers have also been able to increase production to share in the demand increase.

7. Given the rates at which non-OPEC reserves have been depleted in recent years, however, and the slowdown expected in non-OPEC output, OPEC is expected to fill a significant portion of the future increase in oil demand. With growth at 1.4%, petroleum consumption would reach 2,950 mtoe (excluding the CPEs) in the year 2000. If non-OPEC supplies increase to around 1,556 mtoe, the demand for OPEC oil will increase to 1,415 mtoe--almost 500 mtoe above their current level.

8. The conflict between its Gulf members has been a key contributor to the polarization among OPEC members and to the reduction of its market control in recent years. It is expected that the resolution of the Gulf conflict would increase the cohesiveness of OPEC and its ability to control production. The recent period of low prices and oil revenues as well as the Gulf conflict has increased the pressure on OPEC countries to exceed their allocated quotas. However, in the longer run this experience may lead to a more cooperative attitude toward production control. Our expectation, therefore, is that as its share of total supply increases OPEC will be able to exert somewhat more control over production than it has recently. However, our understanding of cartel behavior leads us to expect that such cohesiveness will wax and wane depending on circumstances, leading to substantial fluctuations in prices as experienced in the past.

9. Because of the recent build-up in demand and assuming increased production control by OPEC, we expect crude oil prices to average slightly above 1988 levels (in nominal terms) for the next few years. With OECD GNP growth expected in the neighborhood of 2% p.a. for 1989 and 1990, oil demand growth will be slowed--even though the low prices will provide some

stimulus. These relatively low price levels will also lead to a slowing of the development of alternative energy projects and of the pace of energy-saving and oil-switching technologies. They will also impede exploration for oil in various regions. Beyond the early 1990s there is expected to be an upward trend in oil prices in real terms (from $10-11/bbl in 1985 dollars for the 1988-90 period to $15.40/bbl in 2000). While improved relations among OPEC members will assist in their control of production, basically the price increase will derive from the development of the global supply and demand picture which favors an increase in OPEC's market share. The 3% p.a. average growth in GNP expected for OECD countries over the 1990s would provide substantial impetus for crude oil demand. The accompanying inflation rate of around 4.5% would be likely to be reflected in oil prices. In nominal terms, therefore, the trend in oil prices is expected to be from $22/bbl to $35/bbl over the 1995-2000 period. However, we emphasize that oil prices will continue to be highly variable and policy makers should take appropriate risk management strategies to cope with such variability. This upward trend in nominal and real prices for the 1990s should not be extrapolated beyond our forecast period. While we have not looked at the situation in detail, our position at this stage is that the forecast path for crude oil prices in the 1990s may well be the upswing part of the next long-term cycle in prices and that beyond 2000 prices could decline again in nominal and real terms.

Recent Developments within OPEC

10. Following OPEC's December 1985 conference when its decision to defend its "fair market share" of world oil production was announced, petroleum prices fell very sharply. The events that led to the price decline began to unfold in June 1985. At that time Saudi Arabia (with production as low as 2.5 mb/d in May 1985) indicated its intention of acting outside OPEC's resolution on production controls if other members continued to violate OPEC's official prices and production quotas. When it apparently perceived that other OPEC members' pricing and quota violations were likely to continue, Saudi Arabia abandoned its role as a swing producer and began to produce up to its imputed quota of 4.35 mb/d.

11. By the end of June, 1986, OPEC's production had reached approximately 20 mb/d. In the Rotterdam market, prices fell below $10/bbl, while Brent crude traded at around $8.55/bbl and the Arabian light netback values dropped to around $7/bbl. At one point the average of netback prices for OPEC crude fell as low as $8.40/bbl. Since then oil prices have been subject to extreme volatility--strengthening during periods of perceived disciplined OPEC behavior and weakening in response to increases in OPEC production accompanied by price discounts. By and large, the volatility in oil prices has been dictated by changes in expectations over the outcome of various OPEC meetings. OPEC's production discipline has been weakened during this period by the conflict between Iran and Iraq, with Iraq standing aside from the cartel and producing in excess of its allocated quota.

12. The issue of bringing Iraq back into cartel discipline dominated OPEC's end-1987 conference. However, the Saudi Arabian-backed plan to increase Iraq's official quota to the same level as Iran's was not accepted by Iran. Hence, excluding Iraq, the 12-member OPEC production quota was agreed at

15.06 mb/d. With 0.4 mb/d production in the Neutral Zone and Iraq's assumed production of approximately 2.6 mb/d, the effective ceiling was around 18.6 mb/d.

13. Against the backdrop of low and volatile oil prices, a first joint meeting of the OPEC states and non-OPEC Third World oil exporters was held in Vienna on April 26, 1988 to discuss strategies to ease the downward pressure on oil prices. The discussions centered around a proposal by non-OPEC producers to implement a 5% export cut by both the OPEC and non-OPEC producers. This proposal was not accepted by OPEC members on the grounds that a uniform percentage cut in production would result in greater revenue losses by OPEC due to their larger share in total world production.

14. Despite its unsuccessful outcome, the meeting between OPEC and non-OPEC producers has nevertheless laid the ground work for establishing a relationship that could lead to future cooperation. The key message conveyed at the meeting was that oil market stability is the responsibility of all producers both inside and outside the OPEC cartel, and that action by the major non-OPEC producers to reduce exports to support oil prices would act as a cushion against an oil price crash similar to that experienced in 1986.

15. In the past several non-OPEC countries have indicated their willingness to cooperate with OPEC on production control. Though some output losses could be traced to marketing difficulties, especially at the beginning of 1986, a few countries such as Mexico and Egypt deliberately reduced production. Others, notably Oman, Malaysia, Angola, and later Norway, announced production cuts from previously set targets. The USSR and China also announced export cuts.

16. At its meeting starting June 10, 1988, OPEC members agreed to a six-month extension of the production limits of 15.06 mb/d set in December 1987 for its 12 members 2/ and the continuation of the theoretical benchmark price of $18/bbl. Saudi Arabian-backed efforts to bring Iraq into the cartel by giving it a production quota at parity with Iran were again opposed by Iran and proved unsuccessful. The perceived lack of cohesion among OPEC members increased the downwards pressure on oil prices.

17. The main point of discussion within the cartel has been the issue of production cuts to increase prices. While Saudi Arabia and other OPEC members with large reserves argue that keeping prices low is needed to stimulate demand for oil, other OPEC members such as Algeria and Nigeria favor a production cut to increase prices. Debate over this issue has at times appeared almost irrelevant because of the difficulties the coalition has had in obtaining adherence to existing quotas.

2/ The current OPEC member quota (excluding Iraq and Neutral Zone production) of 15.06 mb/d (agreed by OPEC members at the December 1987 conference) is distributed among its members (in thousand barrels per day) as follows: Algeria 667; Ecuador 221; Gabon 159; Indonesia 1,190; Iran 2,369; Kuwait 996 (excluding its share of Neutral Zone); Libya 996; Nigeria 1,301; Qatar 300; the UAE 948; Venezuela 1,570; and Saudi Arabia 4,343 (excluding its share of Neutral Zone production).

18. If efforts to persuade Iran to accept a quota on parity with that of Iran succeed, up to 600,000 b/d of crude could be taken off the market. Iraq's current production is running about 2.6-3 mb/d while Iran's production quota is around 2.4 mb/d. A further reduction in the OPEC quota would also come about because production from the Neutral Zone (estimated to be around 0.5 to 0.6 mb/d) is regarded as part of Iraq's quota and would be folded into Iraq's quota. OPEC members such as Venezuela have indicated their intention of allowing reductions in their quotas to accommodate Iraq.

19. One of the issues that has surfaced since 1982 when OPEC introduced production quotas concerns the definition of crude oil to be used in setting the quota. The lack of a clear definition of NGL condensates to be included in the official member quota has allowed some OPEC members to disguise their production levels. Current OPEC production of liquid gases is estimated to be around 1.7 mb/d oil equivalent. Abiding by the American Petroleum Institute's definition of NGL and condensates would mean the inclusion of up to 0.5 mb/d of the current NGL production in OPEC quotas. Although OPEC has commissioned a study on the issue by a group of experts, it is unlikely that the question of redefinition will be resolved in the near future, given its complexity.

Recent Developments in Non-OPEC Supplies

20. Oil producers outside the OPEC cartel have continuously posed a threat to OPEC's attempt to prop up prices. Between 1981 and 1986 non-OPEC oil production increased from 1,127.1 mtoe to 1,347.81 mtoe, while OPEC production declined from 1,161.5 mtoe to 933.8 mtoe. The increase in non-OPEC production has come mainly from the North Sea region, Mexico, Oman, Malaysia, and China. There have also been considerable production increases in Brazil, Columbia, and India (see Table 1, page 52). New non-OPEC producers have entered the market, such as the Yemen Arab Republic, which has the capacity to produce 9 mtoe by the early 1990s.

21. Among the industrial countries, the North Sea region has emerged as the dominant producer and exporter of crude--producing about 16% of total non-OPEC oil and 8% of oil output outside the CPEs. North Sea production reached about 178.5 mtoe in 1986, of which more than 70% was exported and almost all traded in the spot market. However, exploration activity in the North Sea region slowed down after the 1986 oil price crash.

22. The deleterious effects on crude oil production of the 1986 price fall has been nowhere more evident than in the United States. Estimates for the United States indicate that expenditure for exploration and production was slashed from $33.3 billion in 1985 to $16.4 billion in 1986. The bulk of this decline was, of course, in exploration and drilling--from $26.6 billion in 1985 to $13.2 billion in 1986. The end result was a 43% decline in the number of wells drilled--nearly 40,000 wells were drilled in 1986, down from 69,300 in 1985 (Table 2). (The extent of the decline may be better appreciated if it is noted that some 30% of wells drilled annually are dry wells.) There was also a steep drop in the number of exploratory wells--from nearly 12,000 in 1985 to 7,900 in 1986. By the end of 1986 the number of active rigs had dropped to 988 from 1,898 at the end of 1985. Drilling activity in the United States has picked up from the second quarter of 1987, however.

TABLE 1: PRODUCTION OF PETROLEUM IN MAJOR NON-OPEC COUNTRIES

	1981	1982	1983	1984	1985	1986	1987
	('000 TOE)						
Angola	7,157	6,399	8,789	10,072	11,450	13,924	17,115
Argentina	25,581	25,504	25,765	25,724	24,682	23,379	21,751
Australia	20,086	19,798	19,346	23,408	27,025	25,606	27,016
Brazil	10,916	13,265	16,921	23,663	28,110	29,450	28,556
China	101,204	102,106	106,050	114,594	124,874	130,608	134,596
Columbia	7,126	7,401	7,966	8,546	9,077	15,378	19,519
Egypt	29,826	33,223	36,462	41,878	45,120	41,195	43,897
India	14,940	19,784	25,062	28,019	31,037	32,336	32,572
Malaysia	12,561	14,750	18,670	21,367	21,417	23,804	24,571
Mexico	28,079	151,964	148,400	152,435	152,254	140,621	145,711
Norway	24,003	25,107	31,929	36,145	41,537	45,341	52,136
Oman	16,714	16,790	19,144	20,762	24,843	26,700	28,344
USSR	617,984	620,737	624,706	621,101	605,207	620,128	627,310
United Kingdom	90,588	105,432	115,355	126,407	129,031	130,429	126,284

Sources: United Nations, Energy Statistics; World Bank.

TABLE 2: US DRILLING ACTIVITY, 1973-86

	Oil Wells	Gas Wells	Dry Wells	Service Wells	Total Wells	Total Footage
	('000)					million ft
1973	10.2	7.0	10.5	1.0	28.7	141.9
1974	13.7	7.2	12.2	1.4	34.4	156.6
1975	14.0	8.2	13.7	1.9	40.8	184.9
1976	17.7	9.4	13.8	1.7	42.6	190.9
1977	18.7	12.1	15.0	1.5	47.3	219.6
1978	19.1	14.4	16.6	1.6	51.7	242.5
1979	20.7	15.2	16.0	1.5	53.4	247.3
1980	32.2	17.2	20.3	2.1	71.8	316.9
1981	42.8	19.9	27.2	2.4	92.3	414.4
1982	40.2	17.2	25.8	2.2	85.4	379.4
1983	38.1	12.6	23.6	2.0	76.4	318.1
1984	43.5	14.6	24.9	2.2	85.2	369.6
1985	35.0	12.3	20.4	1.6	69.3	312.7
1986	20.1	8.4	10.4	1.0	39.9	186.8

Source: Oil and Gas Journal; World Oil; Energy Information Administration.

23. The collapse of crude oil prices in 1986 had an immediate effect on stripper well production in the United States. It is estimated that around 150,000 b/d may have been lost due to the shutting-in of stripper wells. In addition, the decline in production drilling activity adversely affected the producibility of fields throughout the United States. The precipitous drop in exploratory drilling is bound to affect future production capacity. Despite an approximate 5% increase in oil production in Alaska during 1987, crude oil production in the United States fell by the largest amount in over a decade to an average of 470 mtoe in 1987. With the exception of Missouri, Nevada, New York, and Pennsylvania, production in all other lower-48 states declined in 1987. Production in Texas, the largest producing state, declined by about 9% in 1987 to 105 mtoe, the lowest level since 1949.

24. Elsewhere in the world (outside the CPEs), the pace of drilling activity also slowed down in 1986, though not as dramatically as in North America. The number of active rigs fell by nearly 29%--from 1,247 at the end of 1985 to 879 at the end of 1986 (see Table 3). In Africa, the bulk of the

TABLE 3: NUMBER OF ACTIVE OIL DRILLING RIGS OUTSIDE NORTH AMERICA

	End-Dec. 1984	End-Dec. 1985	End-Dec. 1986	End-Sep. 1987	End-Dec. 1987
Africa	146	164	116	116	111
Western Europe	204	241	127	151	184
Middle East	134	131	75	87	99
Asia (including China)	249	236	227	227	242
Latin America	438	439	318	339	354
Oceania	37	36	16	26	23
Total	1,211	1,247	879	946	1,013

Source: Oil and Energy Trends.

1986 decline in active rigs took place in Libya--a decline of 22 rigs--though drilling activity in Egypt suffered, too. There was a decline in drilling activity in several European countries, notably the United Kingdom, the Netherlands, Italy, France, and the Federal Republic of Germany. In the Middle East, the largest decline in drilling activity took place in Iraq (15 rigs), followed by Abu Dhabi (8 rigs). In Asia (including China), the decline in drilling operations in Indonesia (34 rigs) was largely offset by the increase in active rigs in India (31 rigs). Operations in both Mexico and Argentina were heavily affected--down to 135 and 34 rigs from 195 and 77 rigs, respectively, while the number of active rigs in Venezuela and Colombia also declined. In Australia, drilling activity was slashed as active rigs fell from 28 at the beginning of 1986 to 13 at the end of 1986.

25. Drilling activity outside North America recovered in 1987. By the end of the year the number of active rigs had increased by 15% to 1,013 units. In Europe the increase was most noticeable in the North Sea sector. In the Middle East, Iraq and Syria increased drilling activity considerably. Significant increases in the number of on-shore rigs in Argentina and Mexico resulted in an 11% increase in the number of active rigs operating in Latin America. In Africa, however, the rig count declined mainly due to declines in Algeria and Egypt.

26. These figures may not fully reflect the new circumstances because in many instances oil companies could not suspend drilling operations in view of the contractual obligations assumed as a part of their long-term commitments to the host governments. Given the new environment, international oil companies have become increasingly selective in their foreign operations; and many host governments have found it necessary to modify their terms and conditions in order to attract foreign capital.

27. Exploration and development efforts in the USSR and China seem to have paid dividends. Among the East European countries, production has increased by over 1% in 1987 to 646 mtoe, exclusively due to an increase of about 6.4 mtoe in the USSR. The largest loss was suffered by Romania where production dropped by around 1.7% to 11 mtoe. China's production increased in 1987 by over 3% to reach 135 mtoe.

28. The most significant change from the pre-1986 period is, therefore, the new outlook for supply. US crude oil production has stabilized to around 470 mtoe in 1987--over 2% lower than in 1986--and there are now strong indications that production in the UK section of the North Sea peaked in 1986--production in 1987 was about 125 mtoe (3%) lower than in 1986. The decline in oil production in the United States and the United Kingdom has been offset by production increases in the non-OPEC developing countries such as Angola, China, Columbia, India, Malaysia, Oman, and the Yemen Arab Republic, where combined production reached 257.41 mtoe in 1987, up almost 6% over 1986.

29. Despite the development of new horizontal directional drilling technology in the industrial countries--mainly the United States and North Sea--that has cut oil production costs considerably, a decline in oil prices below $12/bbl in real terms could be expected to adversely affect supplies from the industrial countries. In the United States, for instance, the decline in oil prices during 1988 has reduced stripper well production by around 1 mb/d, while a further decline of 0.4 mb/d in production is expected if prices fall below $12/bbl. It is anticipated that production that would be cut at prices below $12/bbl would require prices to rise above $20/bbl in order to restore it (because of the fixed costs involved). In the North Sea area, where production costs have also been slashed due to the adoption of the new technology, additional costs arising from safety concerns (emerging from the recent incident that took many lives in the North Sea Piper fields) and environmental constraints are likely to partially offset these gains. It is projected that in order to sustain supplies from the industrial countries at their present levels, real oil prices would be required in the range $15-20/bbl over the forecast period.

Petroleum Demand

30. Recent Developments. Despite the collapse in oil prices in 1986, demand outside of the CPEs grew by only 50 mtoe in 1986, of which almost 80% was generated in the OECD (over one-half of which was in the United States). The slow response of demand to the change in price was partly due to the energy-saving technological bias and conservation efforts that followed the sharp oil price increases in 1973/74 and 1979/80. Data in Table 4 show the decline in the share of oil in total energy demand since 1973.

31. The sharp declines in oil product prices in the OECD countries--by 27.9% and 22.7% for industry and households, respectively--and the changes in petroleum product demand are presented in Tables 5 and 6. In the United States the consumption of motor gasoline registered an increase of around 3% from 341.5 mtoe in 1985 to 351 mtoe in 1986 (see Table 6). This increase was the result of stimulated discretionary and business driving occasioned by moderate economic growth and the decline in the average gasoline price by around 22%. Although the average price of heating oil declined by 20% in 1986, several factors (such as the warmer-than-normal winter) restrained heating oil consumption for heat and power. In contrast, the continued growth in highway use of diesel fuel was the main reason behind the modest increase in the consumption of distillate fuel oils--by only 1% to 145 mtoe. The consumption of jet fuels in 1986 continued its upward trend, increasing by about 7% to 65 mtoe.

32. The bulk of the increase in petroleum product demand in the United States took place in the electric utilities and industrial plants. As prices for residual fuel oil at times dropped well below the break-even price for natural gas and coal, consumption of residual fuel oil for power and heat increased. The increase of some 10 mtoe in the consumption of residual fuel--from 60 mtoe in 1985 to 70 mtoe in 1986--was the first gain in almost a decade.

33. Developments in Western Europe and Japan have been somewhat different (see Table 6). The Federal Republic of Germany's demand for petroleum products grew by a healthy 5.7%--motor gasoline by 4.3%, gas/diesel oil by 8.3%, and residual fuel oil by 14.9%. In Italy, too, the demand for petroleum products increased by nearly 3.4%, with all products except motor gasoline sharing in the growth--the average price of gasoline in Italy was only slightly reduced from 1,321 lira per liter in 1985 to 1,280 lira per liter in 1986 (as taxes were increased from 851 lira to 1,001 lira per liter).

34. In Japan, a further 8% increase in nuclear power generation was responsible for a large part of the drop in the consumption of residual fuel oil in the power sector. In 1986 oil and nuclear sources accounted for 23% and 27%, respectively, of total generated power.

35. For the developing countries, preliminary estimates indicate that the larger part of the 25-30 mtoe increase in the consumption of petroleum products in 1986 can be accounted for by the strong growth of demand in only a few countries (namely Brazil, India, and Republic of Korea). The widespread low rates of economic growth and continuing debt problems in the oil-importing developing countries restrained growth in petroleum product consumption.

TABLE 4: HISTORICAL PERSPECTIVE ON WORLD DEMAND FOR ENERGY AND OIL

	1961	1973	1980	1981	1982	1983	1984	1985	1986	1987
	(mtoe)									
Energy Consumption										
Ind. Countries	1,930	3,533	3,691	3,569	3,476	3,470	3,617	3,634	3,707	3,770
CPEs	652	1,210	1,582	1,602	1,643	1,677	1,729	1,787	1,835	1,880
Dev. Countries	413	990	1,460	1,501	1,557	1,619	1,714	1,786	1,866	1,918
Total World	2,995	5,732	6,733	6,672	6,676	6,766	7,060	7,207	7,408	7,568
Energy Supply										
Non-Oil	1,835	2,901	3,684	3,746	3,855	3,948	4,179	4,360	4,487	4,611
Oil	1,160	2,831	3,049	2,926	2,815	2,802	2,833	2,817	2,921	2,957
Non-OPEC	694	1,328	1,732	1,760	1,826	1,883	1,952	1,981	1,987	2,014
Stock Change	-6	-52	-50	5	-1	-5	-1	0	0	0
OPEC	472	1,555	1,367	1,161	990	924	882	836	934	943
Share Of Oil (%)	38.7	49.4	45.3	43.9	42.2	40.2	40.4	39.3	39.4%	39.1%

Sources: United Nations, Energy Statistics; OPEC Annual Statistical Bulletins; World Bank.

TABLE 5: OECD: CHANGE IN REAL ENERGY PRICES FOR END-USERS, 1984-87 a/

	1984	1985	1986	1987
	(%)			
OECD				
Total Energy				
Industry	-0.8	-1.8	-16.8	-8.7
Households	-2.0	-2.0	-13.9	-5.2
Oil Products				
Industry	0.7	-1.2	-27.9	-2.3
Households	-3.0	-2.5	-22.7	-2.5
United States				
Total Energy				
Industry	-1.3	-3.4	-16.9	-7.7
Households	-3.3	-3.9	-13.0	-5.1
Oil Products				
Industry	0.3	-2.1	-29.2	7.3
Households	-5.5	-4.8	-24.1	-0.7
Europe				
Total Energy				
Industry	1.4	-0.2	-19.1	-10.5
Households	-0.7	+0.1	-16.5	-7.1
Oil Products				
Industry	2.4	-0.1	-30.7	-4.2
Households	-0.8	0.3	-25.6	-4.1
Japan				
Total Energy				
Industry	-3.5	-2.6	-16.6	-10.6
Households	-5.1	-3.9	-11.3	-6.4
Oil Products				
Industry	-3.0	-2.6	-19.9	-14.4
Households	-6.9	-5.1	-14.6	-5.4

Source: IEA, Energy Prices and Taxes, fourth quarter 1987.

a/ Refers to local currencies.

TABLE 6: PETROLEUM PRODUCTS CONSUMPTION IN MAIN OECD COUNTRIES, 1985-86

	United States			Four Main European Countries			Japan			Total Main Consuming Countries		
	1985	1986	% Change	1985	1986	% Change	1985	1986	% Change	1985	1986	% Change
	(mtoe)											
Motor Gasoline	341.5	351.0	2.8	86.0	89.0	3.5	31.5	32.5	3.2	459.0	472.5	2.9
Gas/Diesel Oil	143.5	145.0	1.0	131.5	138.0	4.9	40.0	42.0	5.0	315.0	325.0	3.2
Residual Fuel	60.0	70.0	16.7	60.0	58.0	-3.3	47.0	43.5	-7.4	167.0	171.5	2.7
Other Products	241.5 a/	241.0	-0.2	98.0	102.0	4.1	104.0	106.0	1.9	443.5	449.0	1.2
Total	786.5	807.0	2.6	375.5	385.5	3.1	222.5	224.0	0.7	1,384.5	1,418.0	2.4

a/ Includes NGL, liquified petroleum gas, etc.

Sources: IEA; EIA; Petroleum Economics Ltd; World Bank.

36. In the early part of 1987, the growth of demand for petroleum products moderated considerably in the OECD countries. This was due to both the lackluster economic activity in most countries and the sharp increase in prices. The demand for residual fuel oil receded in the United States as other fuels, notably natural gas, reestablished themselves in both the industrial and power-generation markets. For 1987, the increase in the demand for petroleum products in the OECD countries is estimated to have reached about 16 mtoe, a little less than a 1% increase over 1986. Demand for oil in the six major industrial countries has increased much faster in 1988, especially in the United States, where consumption registered an increase of some 6.4% during the first quarter largely due to a higher-than-expected economic growth rate and the increase in gasoline demand. Gasoline demand, which accounts for about 43% of total oil use in the United States, increased by about 4.4% during the first quarter. About one-quarter of this growth could have been due to the increase in demand resulting from increasing the road speed limits from 55 mph to 65 mph in some parts of the country. The once-and-for-all impact on oil use of the speed limit change appears confirmed by the growth rates for April and May when the growth in demand for oil slowed significantly. Preliminary estimates for the four major European countries also reflect a slowdown in April from the buoyant level of gasoline demand in March. However, compared to the corresponding period in 1987, the demand for petroleum products is still strong in the major European countries, especially in the United Kingdom, where the demand for products in June 1988 was around 10% higher than the demand in June 1987.

37. There has been a recent trend in the industrial countries towards consumption of lighter products (mainly gasoline in the United States and middle distillates in the European market), while the share of fuel oil has been declining. The decline in the demand for oil between 1980 to 1985 was overwhelmingly due to the reduction in fuel oil use. The recent increase in the demand for gasoline is largely linked to the increase in the demand for high-performance vehicles, accelerating the demand for high-quality fuels. In the European countries, particularly in France and the United Kingdom, residual fuel consumption has declined as demand for light and middle distillates has increased in response to increased transportation activity and heating needs. This shift in demand towards the lighter end of the barrel is exerting pressure on refineries to invest in conversion facilities to increase the octane level of premium fuels and to upgrade refineries.

38. Given the extent of the conservation measures of the past and the ongoing interfuel competition, it is anticipated that any growth in the demand for petroleum products in the OECD countries will come mainly from the transportation sector. In the power-generation and industrial sectors, natural gas is expected to replace oil use as the abrogation of the EEC's 14-year ban on gas use for power generation takes effect by the end of 1988 and as electricity generation in the United States utilizes natural gas-fueled combined cycle plants.

39. In the developing countries the demand for oil increased to over 792 mtoe in 1987--an increase of about 2%. Demand appears to have grown sharply during the first quarter of 1988. The growth in demand has been most pronounced in the Asia-Pacific region, where consumption grew by 6% in the first quarter of 1988 (year-over-year). This strong consumption growth is largely attributed to the growth in the size of the motor vehicle fleet that

has accompanied the strong economic growth. While fuel oil use is shrinking--as it is being replaced by non-oil fuels--there also appears to be a shift in consumption in most of the countries in the Asia-Pacific region towards the use of the lighter end of the barrel, which is leading to the modification and upgrading of refinery capacity.

40. While lower taxes on middle distillates like kerosene and diesel contributed to the substantial increase in demand for middle distillates in developing countries between 1986 and 198[illegible] (Pakistan by 12.67%, the Philippines by 11.2%, Thailand by 12.25%, Republic of Korea by 10.63%), stronger economic growth and increased motorization have generated growth in demand for motor gasoline. In Republic of Korea, for instance, growing numbers of buses and trucks and sedan cars increased the demand for light oil by about 12% in 1987. The higher number of vehicles in use in Malaysia and Pakistan resulted in an increase in demand of over 6% for light oil in both countries between 1986 and 1987.

41. Demand Outlook. The demand projections have been derived in part from country energy balance sheets. The estimations of the demand for petroleum took into account the GDP forecasts and the potential for substitution of petroleum with other fuels at different relative price levels. The evaluation of this potential was based on a comparison of sectoral trends in the consumption of the various fuels, as well as assumptions about investment plans and energy policies in the various countries. For example, it was assumed that consuming countries will allow only a partial pass-through of lower oil and other fuel prices to consumers. The demand for OPEC crude oil was derived as the residual demand that will not be met either by domestic production or supplies from non-OPEC countries. The demand forecasts for the major regions and major consuming countries are given in Table A2. World (including the CPEs) consumption growth is forecast at 1.2% p.a. with the fastest-growing region the developing countries (2.4% p.a.). The changes in petroleum consumption shares of the major economic regions implied by these forecasts are shown in Table 7.

42. With the financial plight of the highly-indebted countries mostly unchanged at least for the medium term, the main growth in demand for petroleum in the developing region will probably come from a few major oil-importing developing countries of the Asian continent (China, India and Republic of Korea). Lower oil prices and the fact that many oil-importing developing countries have little capability for shifting their dependence from oil to other fuels account for the 230 mtoe expected increase in oil consumption of this group of countries. Still, the share of oil in total energy consumption of oil-importing developing countries is anticipated to decline--from 33% in 1986 to 29.7% in 2000. Not much growth in demand is anticipated from the oil-exporting developing countries in the short term as they continue to adjust to substantially lower oil incomes. In the medium to longer term their demand should grow faster with incomes responding to higher oil prices.

43. The industrial countries appear committed to reducing their dependence on imported oil. This observation is based upon their repeated affirmation to improve energy and oil efficiency. In the past, conservation policies have contributed substantially to reducing oil intensities. It is anticipated that such policies will continue while other policies designed to

encourage the use of substitutes, such as electricity in specific end-uses, will complement these oil-saving efforts.

44. Energy-pricing policies in some countries also point in the direction of reducing the share of oil in total energy demand. In some industrial countries and in most developing countries this was reflected in policies which restricted the pass-through of the sharp decline in world oil prices of 1986 to consumers by increasing taxes on petroleum products. For instance, in France, taxes on the industrial uses of heavy fuel oil rose from 10% in 1985 to 32% in 1986, while the tax on the industrial uses of light fuel oil rose from 23% to 33%. Similar sharp increases in taxes were also observed in Greece, the Netherlands, and Spain. In many developing countries gasoline is subject to high taxes relative to other products. For instance, in mid-1987 taxes and duties on premium gasoline in the Philippines, Singapore, Hong Kong, and Thailand were in excess of 50% of retail prices. This taxation policy reflects governments' pricing strategies which are designed to put the heaviest tax burden on the most affluent sector of the population (gasoline is mainly used in private cars).

45. Since the transportation sector is likely to remain tied to liquid fuels over the forecast period, the power-generation, industrial, and residential/commercial sectors will provide the main areas of interfuel substitution, particularly for oil. Although the continuing introduction of more energy-efficient transport equipment will reduce the rate of growth of transport fuels, the demand for transport fuels is nevertheless anticipated to grow at a rate somewhat faster than that experienced in recent years, as a result of higher per capita incomes.

46. Within the industrial sector of the industrial countries, oil's share has fallen sharply since the second oil price shock--from 38.5% in 1979 to 28.1% in 1986. However, it appears to have stabilized since 1986 as a result of the sharp decline in oil prices. The substitution of coal for oil has been fastest in the iron and steel and cement industries. Substitution for oil in other energy-intensive industries, though potentially high, remains comparatively slow because of the uncertainty surrounding industrial growth prospects, the old age of the existing capital stock, and environmental and regulatory concerns. Given the recent sharp drop in oil prices, substitution by coal in the industrial sector is likely to be, at best, very slow in the medium term. Environmental considerations and high costs of coal desulfurization are also likely to limit the penetration of coal.

47. Expectations of volatile prices and concerns over security of supply have encouraged major industrial energy consumers to invest in multi-fired facilities. This form of investment increases the ability of consumers to change the fuel mix quickly and provides a ceiling to the upwards movement in oil prices beyond the turn of the century. In the industrial countries there currently exists a fuel-switching capacity of almost 100 mtoe, mostly in power generation. In the United States, where the industrial and power-generation sectors provide the greatest possibilities for fuel substitution, as much as 30% of the energy consumption may be switchable. Almost 60% of this would be substitution between fuel oil and natural gas while the rest would be between natural gas, distillates, liquified petroleum gas and other fuels, notably coal. It is estimated that the extent of switchability in the US power-generation and industrial sectors is above 80% and 50%, respectively, over a

short period of time. Given that oil prices are expected to remain low over the short term the flexibility of fuel use provided by the multi-fire system will slow down the erosion of fuel oil's share. Beyond 1990, the projected increases in oil prices will, once again, create incentives for an increased level of substitution.

48. Due to the supply constraints facing the USSR, consumption of oil in the CPEs is expected to grow only marginally--from 541 mtoe in 1986 to 578 mtoe in 2000--with their share of world liquid fuel consumption anticipated to drop from 18.5% in 1986 to 16% in 2000 (Table 7). Since interfuel substitution in these countries is usually a matter of public policy and supply availability, energy planners are placing emphasis on the use of natural gas and nuclear energy. The aim is not only to provide for their domestic energy needs, but also to retain a share of the international market for oil in order to earn the highly sought-after foreign exchange.

Non-OPEC Supply Forecast

49. While North Sea producers will continue to play an important role, it appears that North Sea oil production will peak in 1988 at almost 195 mtoe and begin to decline thereafter as production in the United Kingdom declines. The remaining proven reserves in the United Kingdom are estimated to be around 2.05 billion toe. In the UK sector of the North Sea, where production increased dramatically in 1985 when the first oil field came on-stream, production is expected to decline by more than 20% by the mid-1990s. A similar outlook faces the Federal Republic of Germany, where production should decline from the peak of 5 mtoe in 1987 to about 4 mtoe in the mid-1990s as the high level of production in recent years is not likely to be sustained by the limited oil reserves.

50. Norway, the only sector in the North Sea region where production is expected to increase up to the early 1990s, has lowered its crude oil production target for the mid-1990s from 100 mtoe to 83 mtoe. Norwegian Government policy, while restricting oil production to around 80-85 mtoe, is encouraging the development of the country's huge gas reserves. The case for limiting oil production has been forcefully argued in a government white paper on the grounds of the need for a more moderate depletion rate as well as the avoidance of excessive pressure on the Norwegian economy. Estimated Norwegian production for 1987 was around 52 mtoe, over one-half of which came from its major Statfford field.

51. Despite aggressive exploration drilling activity, US oil discoveries have been very limited since 1981. The pessimistic outlook for oil prospects in the United States was further strengthened by the failure of the Mukluk well in the Beaufort Sea in 1984. Previously, the area was considered the most promising prospect. Recent estimates of US oil reserves (end of first quarter 1988) are as low as 4.7 billion toe (excluding Federal offshore waters), which amounts to around 10 years of reserves--compared to 11.31 billion toe reported by the US Geological Survey in 1981. In the absence of major new oil discoveries, which appear unlikely, crude oil production in the United States is expected to decline by around 8-10% by the year 2000.

TABLE 7: PETROLEUM CONSUMPTION BY COUNTRY GROUPS, 1961-86 (ACTUAL) AND 1990-2000 (PROJECTED)

	1961		1970		1986		1990		2000	
Countries/Economies	MTOE	%	MTOE	%	MTOE	%	MTOE	%	MTOE	%
Industrial	817.5	70.5	1,576.4	69.0	1,605.0	55.0	1,677.1	53.9	1,834	51.7
Centrally Planned	150.5	13.0	324.9	14.2	540.8	18.5	556.1	17.9	578.1	16.3
Developing	191.5	16.5	383.5	16.8	775.5	26.5	879.0	28.2	1,135.1	32.0
World	1,159.7	100.0	2,285.9	100.0	2,921.3	100.0	3,112.2	100.0	3,547.2	100.0

Note: Details may not add to total due to rounding.

Sources: United Nations, Energy Statistics (actual); World Bank (projected).

52. Signs of declining USSR production were noticed first in 1984 and gained strength in 1985 when production declined to around 600 mtoe as a result of technical difficulties. Despite the increases in USSR production since then (due largely to investments and the use of new technology imported from western countries), it appears that production has indeed peaked. Based upon the extremely difficult operating conditions facing oil extraction in the Kazakhistan region and in the huge Tengiz fields, it is unlikely that the USSR production target of 635 million tons for 1990 will be met. With proven oil reserves estimated at 8.22 billion toe and a low probability of major discoveries given the geological limitations, production will most likely decline to about 600 million tons by the end of the 1990s. These estimates would be revised upwards if the political constraints facing technological imports and foreign participation in the USSR oil industry are removed.

53. In the developing countries a number of oil discoveries have been made in new parts of the Middle East, Latin America, and Western Africa. The most significant discovery in recent years has been made in the Llanos Basin in the Cano Limo field in Colombia. As a result, in 1984 the estimate of Colombian proven oil reserves jumped from 85.5 mtoe to 200-280 mtoe. New finds, combined with the export pipeline from the Cano Limo field to Port Covenas, saw production double from 1985 to 1987. Colombia is now in the size category of smaller OPEC members such as Gabon and Ecuador. The rate of growth of the last few years is unlikely to continue, however, as government controls over oil production, pipelines, and export terminals tighten, and foreign investment in the sector is restricted. Colombian oil production is expected to stabilize at around 25 mtoe in the mid-1990s.

54. Brazil is another area of intense exploration activity in Latin America, where discoveries in the Campos Basin and the most recent finds at the mouth of the Amazon River have improved the outlook for Brazilian oil supplies considerably. While the extent of the recent finds may have been exaggerated, we estimate that Brazil's oil production could reach 40 mtoe by the mid- to late-1990s. If the recent finds are as large as some statements assert, production could go up to 50-60 mtoe by 2000 and allow Brazil to emerge as an oil exporter. (Oil production forecasts by Brazil's National Oil Company and the major operator are an optimistic 60 mtoe for 2000.)

55. Angola has been the center of exploration activity in West Africa. The decline in production from the fields discovered before the mid-1970s (mainly the Malongo Tobias and Quenguela fields) has been offset by a number of new fields being brought on-stream. Production is expected to increase from the 1987 level of a little over 17 mtoe to around 27 mtoe by 2000. Uncertainties regarding civil disturbances could be a deterrent to the pace of exploration activity in Angola.

56. Since 1981 Egyptian production has increased by around 50%--reaching 45 mtoe in 1987. Proven oil reserves increased from 438 mtoe in 1981 to 600 mtoe in 1987. Production is expected to rise only moderately up to the mid-1990s and then stabilize as declining oil supplies from the country's major producing area in the Gulf of Suez are offset by discoveries in the western desert area. In Oman, oil production has increased about 70% since 1981 to reach around 28 mtoe. The discovery of new fields at Dhulaima, Wafra, and Tayyadh has improved the reserves position. Oman's proven oil reserves at the end of 1987 were estimated to be around 562 mtoe. The Yemen Arab Republic has

become a significant producer since the first discovery in 1984. Reserves at the end of 1987 are estimated to be around 137 mtoe, attributed largely to oil discoveries at Alif in the Mareb-Janof concessions. The outlook is also very promising in the Shabwa fields in the People's Democratic Republic of Yemen. With both nations encouraging foreign participation in exploration and development, the prospects for oil production appear very promising. The discovery of large oil fields at Al-Thayyem in Syria in 1984 has reversed the pessimism over its future oil supplies, as production in the country's main oil-producing northeast region appeared to have peaked. By 2000, Syria's crude oil production is expected to double its 1987 level of around 11 mtoe.

57. Indian oil production has more than doubled since 1981 (to reach 32.5 mtoe in 1987) with two-thirds of production coming from a single field--Bombay High off the West Coast. With production already stabilized in this field (currently sustained by injecting water) and with prospects only for developing small-to-marginal fields in Bombay and other regions (namely, Heera, Ratna, and Panra), Indian production is likely to peak at around 40 mtoe by the mid- to late-1990s.

58. The rapid growth of China's oil production during the 1970s (over 7% p.a.) has declined in the 1980s to less than 5% p.a. Three-fourths of China's oil production comes from Daqing, Shengli, Liaohe, and Bohai See. Despite the possibility that production from Daqing may have peaked, the recent discovery of the Weizhou Field in the South Sea, the Xijiang Field in the Pearl River Basin and another in the Liaodong Bay northeast of Bohai, have revived interest in offshore exploration. These new discoveries, together with the trend towards more liberal policies with regard to foreign oil company participation in exploration and development, are likely to result in a continuing increase in production.

59. In addition to the supply prospects referred to in the previous paragraphs, small increases are expected in many countries such as Pakistan, Thailand, and Malaysia. In Sudan, for example, there exists potential for 4-5 mtoe.

60. The supply forecasts are presented by major economic region and for major producers in Table A1. The outlook for supplies from the non-OPEC countries is an increase from 1,348 mtoe in 1986 to around 1,524 mtoe in 2000 (see Table 9). Growth in production in the non-OPEC oil-exporting developing countries is expected to be around 2% p.a. Even so, the share of non-OPEC supplies in the global total should decline from 59% in 1986 to 51% in 2000 (see Table 8). The decline expected in the rate of production in the oil-exporting industrial countries would reduce the share of industrial countries from 27% in 1986 to around 21% in 2000. While production in the CPEs is expected to decline marginally by 2000, their share in global oil supplies is expected to decline from 22% to 17% over this period.

OPEC Oil Production Forecasts

61. Declining world demand for oil, combined with rising availability of non-OPEC supplies, reduced the demand for OPEC oil from 1,345 mtoe in 1980 to 920 mtoe in 1986. During this period OPEC's share in global production declined from 42.6% to around 32%.

TABLE 8: PETROLEUM PRODUCTION BY COUNTRY GROUPS, 1961-86 (ACTUAL) AND 1990-2000 (PROJECTED)

	1961		1970		1986		1990		2000	
Countries/Economies	MTOE	%	MTOE	%	MTOE	%	MTOE	%	MTOE	%
Industrial	439.1	37.7	604.2	25.8	786.6	26.9	773.7	24.9	758.0	21.4
Centrally Planned	184.5	15.8	377.9	16.1	639.7	21.9	651.8	20.9	610.5	17.2
Developing	542.2	46.5	1,358.8	58.1	1,495.0	51.2	1,686.7	54.2	2,178.7	61.4
World	1,165.7	100.0	2,340.9	100.0	2,921.3	100.0	3,112.2	100.0	3,547.2	100.0
Memo:										
Market Economies	981.3	100.0	1,963.0	100.0	2,281.6	100.0	2,460.4	100.0	2,936.7	100.0
OPEC	472.2	48.1	1,172.8	59.7	933.8	40.9	1,021.0	41.5	1,413.0	48.1
Non-OPEC	509.1	51.9	790.2	40.3	1,347.8	59.1	1,439.4	58.5	1,523.7	51.9

Note: Details may not add to total due to rounding.

Sources: United Nations, Energy Statistics (actual); World Bank (projected).

TABLE 9: PETROLEUM PRODUCTION BY COUNTRY GROUPS, 1961-86 (ACTUAL) AND 1990-2000 (PROJECTED)

Region	1961 MTOE	1973 MTOE	Growth 1961/73 (%)	1986 MTOE	Growth 1973/86 (%)	2000 MTOE	Growth 1986/2000
Market Economies	981.3	2,426.8	7.8	2,282.0	-0.5	2,936.6	1.8
OPEC	472.2	1,554.6	10.4	933.8	-3.8	1,412.9	3.0
Non-OPEC	509.1	872.2	4.6	1,347.8	3.4	1,523.7	0.9
Oil-Exporting Developing	41.1	153.7	11.6	438.8	8.4	572.1	1.9
Oil-Importing Developing	28.9	65.8	7.1	122.3	4.9	193.6	3.5
Oil-Exporting Industrial	30.9	101.7	10.5	259.6	7.5	269.5	0.3
Oil-Importing Industrial	408.2	551.0	2.5	527.0	-0.3	488.5	-0.5

Sources: United Nations, Energy Statistics (actual); World Bank (projected).

62. OPEC's attempt to regain market share has already led to a sharp drop in prices and a considerable loss of oil revenues. OPEC's aggregate export revenues declined drastically from its peak of around $300 billion in 1980/81, when the international price of oil was over $30/bbl, to around $100 billion after the collapse of oil prices to $13.50/bbl in 1986. Over the same period its current account surplus of $104 billion moved to a deficit of $30 billion.

63. In the short and medium term, OPEC and non-OPEC exporters are expected to share almost equally in the supply of additional quantities. In the mid-1990s, however, the world will depend increasingly on OPEC for additional supplies as many producing areas will reach maturity. It is anticipated that by 2000 production in OPEC countries will increase to 1,413 mtoe, with OPEC's share of total petroleum output climbing to around 48% (see Table 9). OPEC's attainment of a more dominant position in the world oil market will be largely due to its enormous low-cost reserves vis-a-vis non-OPEC producers. Proven oil reserves in OPEC countries such as Saudi Arabia and Kuwait are around 23.3 billion toe and 12.6 billion toe, respectively, followed by Iran and Iraq with reserves at 6.6 billion toe and 6.04 billion toe, respectively (see Table 10). Based upon end-1986 estimates, out of the approximate 90 billion toe of proven recoverable world oil reserves, only 27 billion toe are located in the non-OPEC countries (including the CPEs), while 70% lie in OPEC countries. The reserves-to-production ratio for the non-OPEC suppliers is around 14 compared to about 70 for OPEC. Preliminary estimates at the end of 1987 show that recent petroleum reserves found mainly in Iran, Iraq, and Abu Dhabi may have increased proven global reserves by over 14 billion toe, increasing the estimates for OPEC's share of the global world reserves to around 77%.

Trade Outlook

64. The United States is expected to remain the largest importer of crude oil and to have one of the fastest growth rates in its imports. It is expected to account for over one-third of the increase in gross imports over the projection period (see Table A4). The import requirements of industrial countries are projected to be supplied almost entirely by the oil-exporting developing countries, mainly OPEC countries, as total exports from the CPEs diminish from 99 mtoe in 1987 to around 32 mtoe by 2000. While industrial countries and oil-exporting developing countries will remain major trading partners, increasing quantities of petroleum will be traded between the oil-exporting and the oil-importing developing countries.

65. By the end of the projection period, OPEC's share in global exports will have grown to 80.3% (from nearly 71% in 186). The share of non-OPEC, oil-exporting developing countries is expected initially to increase from its present level of nearly 20% to approximately 21.7% by 1990 and then drop to around 17.5% by 2000 as its rate of production slows (see Table 11 and Table A3). Net exports from the CPEs are expected to claim a declining share throughout the period mainly due to a decline in production in the USSR.

66. While the total volume of net trade is anticipated to grow from 1,072 mtoe in 1986 to 1,433 mtoe in 2000, a growing share of the trade of petroleum will be in the form of products, as more export-oriented refineries come on-stream in OPEC countries. OPEC is expected to supply the largest part of the

TABLE 10: PROVEN RECOVERABLE RESERVES, SUSTAINABLE PRODUCTION CAPACITY, PREFERRED PRODUCTION LEVEL, AND RESERVES-TO-PRODUCTION RATIO IN OPEC COUNTRIES

	Proven Recoverable Reserves a/	Sustainable Production Capacity	Preferred Production Level	Reserves-to-Production Ratio b/
	(mtoe)			(Years)
Algeria	1,210.0	40.0	35.0	35
Ecuador	226.0	15.0	15.0	15
Gabon	71.0	8.0	8.0	9
Indonesia	1,164.4	75.0	75.0	15
Iran c/	6,557.5	200.0	150.0	43
Iraq d/	6,042.5	175.0	150.0	40
Kuwait d/	12,666.0	125.0	75.0	169
Libya	2,918.0	95.0	75.0	39
Nigeria	2,274.0	100.0	100.0	23
Qatar	452.0	27.5	17.5	26
Saudi Arabia d/	23,492.0	515.0	425.0	55
UAE	4,520.5	100.0	75.0	60
Venezuela	3,505.5	110.0	110.0	32
Total	65,097.0	1,580.0	1,310.0	50

a/ Source: Oil and Gas Journal.
b/ Based on reserves at the beginning of 1986 and production at preferred levels.
c/ Based on prewar estimates.
d/ Includes one-half of Neutral Zone production.

TABLE 11: NET EXPORTS/IMPORTS OF PETROLEUM BY COUNTRY GROUP, 1970-86 (ACTUAL) AND 1990-2000 (PROJECTED)

Country Classification	1970	1986	1990	1995	2000
	(mtoe)				
Total Net Imports	1,162.0	1,072.0	1,174.4	1,327.7	1,433.0
Industrial Countries	995.0	818.4	903.4	1,012.1	1,075.7
Oil-Importing Countries	167.0	254.0	271.0	315.6	357.4
Total Net Exports	1,162.0	1,072.0	1,174.4	1,327.7	1,433.0
CPEs	53.0	98.9	95.7	62.0	32.44
Non-OPEC Oil-Exporting Developing Countries	16.0	214.3	254.6	261.2	250.7
OPEC	1,093.0	758.8	824.1	1,004.5	1,149.9
Share of CPEs (%)	4.6	9.2	8.2	4.7	2.3
Share of non-OPEC Oil-Exporting Developing Countries (%)	1.4	20.0	21.7	19.7	17.5
Shar of OPEC (%)	94.0	70.8	70.2	75.7	80.2

Note: Details may not add to totals due to rounding.

Sources: United Nations, Energy Statistics (actual); World Bank (projected).

oil-importing developing countries' needs for petroleum. Intraregional trade is projected to decline (from 51% in 1986 to around 45% in 2000) as both the industrial and oil-importing developing countries become increasingly dependent on exports from oil-exporting developing countries, mainly OPEC countries.

Changing Structure of the Oil Industry

67. In recent years the structure of the international oil industry has undergone many changes. A change that is gaining momentum and that is likely to affect the international oil industry significantly is the move of the national oil companies in the oil-producing countries into downstream operations in the industrial countries (in the form of refineries and service stations). The 1986 collapse of international oil prices and the world stock market crash in October 1987 resulted in a decline in the equity share of oil companies. Also, the existence of surplus capacity and the oil industry's changing financial state have forced governments to reduce their stakes in national oil companies. Such factors have resulted in the shrinking of national oil companies and in restricting the ability of major oil companies to support offshore developments--thereby allowing some producing countries to participate in downstream operations in the consuming countries.

68. Kuwait and Venezuela, which were among the pioneers of the strategy of downstream diversification by acquiring interests in refining and distribution, have been followed by Mexico, Norway, Abu Dhabi, and Libya. While Kuwait and Venezuela have affirmed their interest in further expansion of their downstream operations, Saudi Arabia (which does not possess any downstream operations) is presently negotiating for the acquisition of major interests in downstream activities in the United States and Europe. 4/

69. The Nigerian National Petroleum Corporation is currently in negotiation with the Irish National Petroleum Company for the purchase of a refinery in Ireland and expects to acquire equity also in Eastern Europe and North America. Nigeria's new sales strategy involves selling crude directly to those refineries where it has acquired equity interest and eliminating third party contracts with other trading companies.

70. This new form of integration between oil producers and consumers has advantages for both sides. By participating in joint ventures abroad in the areas of refining and distributing oil products, producers will be ensured of secure outlets for their crude. Refineries in the consuming countries, on the other hand, will be guaranteed access to stable crude oil supplies at stable prices. As producers holding large oil reserves find European and American partners, it is expected that the refining industry and the petroleum product market will become more competitive. Competition will not be confined only to price but will also include product quality resulting from refinery

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4/ Kuwait leads the producing countries in the acquisition of equity holdings. Since 1983 it has purchased refineries in the Netherlands and Denmark. For an estimated $4.7 billion it has also acquired a 22.06% shareholding in British Petroleum.

modification and upgrading. Refineries and small oil companies that are unable to raise their levels of investment to face such competition may well lose out, leaving fewer, larger, and more efficient refineries to supply refined petroleum products. Currently almost 55 mtoe of crude is channeled through refineries where producers have equity holdings (of which OPEC crude accounts for some 84%). This volume does not include Kuwait's crude supply resulting from its equity purchases in British Petroleum. If Saudi Arabia is able to acquire downstream operations in the United States and if other OPEC members succeed in acquiring interests currently under negotiation, the volume of crude passing through producer-owned refineries is expected to exceed 150 mtoe over the next decade. This would result in an increase in the volume currently being marketed by OPEC members through downstream operations from a little less than 7% of total OPEC exports to over 20%.

71. While crude producers expect integration to aid in securing outlets for their output in an oil market which supply increases are pushing down prices, the question remains whether s objective will still be a reasonable one for OPEC when oil prices rise ected in the mid-1990s. If producers' interests continue to grow in ming countries, it is unlikely that a cartel that controls oil through various stages from the oil well to the consumer can ever be established. This could result in the weakening and perhaps even the eventual disintegration of OPEC. However, the extent and speed with which producers can increase their involvement in consuming countries would depend upon the extent to which consuming countries are prepared to allow indigenous refining capacity to be subject to foreign control. Although foreign investment of this form does not appear to be a major concern at present, national energy policies could well become an important factor in exerting control over foreign interests in such a vital sector as energy.

Commoditization of Oil

72. In the years since the second price shock in 1979/80, the traditional market system--characterized by long-term offtake contractual agreements--has gradually been replaced by active trading on the spot market. With the emergence of spot trading, the previously highly regulated oil industry is now engaged in intense competition. Spot trading is now being used by companies to unload excess supplies during periods of glut or to make purchases to satisfy higher demand during excess demand periods. Since the early 1980s this form of trading has reduced the role of inventories as a hedge against shocks and has provided a more flexible means of balancing supply and demand. Thus, there has come into existence a mechanism whereby oil markets are functioning in a manner similar to a classical commodity market subject to fluctuations.

73. The spot market has been sustained to a large extent by oil supplies from OPEC as well as from non-OPEC oil producing countries (notably the United Kingdom, Norway, and the USSR). In the six-year period between 1979 and 1985, about 35 non-OPEC producers either started to produce for the first time or increased their production. In the Persian Gulf region, Arabian light (which traditionally enjoyed the largest volume) is being dominated by Dubai crude traded in the spot market. A number of Mideast producers--for instance, Saudi

Arabia, Kuwait, Iran, Iraq, and Qatar--are now devising pricing strategies that link market-related prices to term contract supplies to Dubai crude. In fact, the spot market has become so dominant that many of the contracts entered into by producers have price clauses that are in some way related to the movements in spot prices. Spot trading and spot-related arrangements have served an important purpose in maintaining the flow of oil at a time when buyers have become increasingly worried about longer-term contracts. However, the heightened instability in the petroleum market will continue to give rise to the issuing of crude oil futures contracts on the New York Mercantile Exchange (NYMEX).

74. The NYMEX opened futures trading activity in heating oil in 1978, followed by crude oil and gasoline futures. Crude oil options were introduced in late 1986. As the pace of spot trading has increased, more trading companies, producers, and brokers have become participants in these markets. During 1987, the volume of crude oil futures traded on the NYMEX rose to about 14.6 million contracts--from the 8.3 million contracts traded in 1986. Crude oil futures contracts are now the most actively traded nonfinancial futures contracts on the NYMEX.

75. The emergence of the paper markets in petroleum has assisted the development of the trend towards market-related pricing systems. The development of the futures market has increased the liquidity of the oil market and has offered arbitrage opportunities between futures trading and the spot market. A combination of spot and futures markets has provided the necessary infrastructure for many types of trading by the industry (such as basis pricing with the seller in and the buyer out of futures, or the reverse, or both buyers and sellers in futures). The futures market is likely to continue to flourish in the presence of perceived price volatility in the petroleum markets due to the inherent uncertain nature of the market and of the behavior of OPEC members.

Price Outlook

76. Developments in world oil markets starting from late-1985--when Saudi Arabia resorted to the netback pricing formula and subsequently abandoned its swing-producer role--resulted in reducing OPEC's control over international oil prices and replacing OPEC crude as the price leader. As more and more OPEC members ignored their "official" prices in favor of market-related pricing strategies and resorted to offering price discounts, prices fell and volatility increased.

77. From the early 1980s to late-1988 prices nearly halved in nominal terms. Since 1985, the loss in the real value of oil prices has been over 60%. Before the large 1986 oil price decline, OPEC members were fairly well committed to their benchmark price for crude and to the maintenance of their production quotas. However, non-OPEC members generally had no such constraints and they responded to any demand gaps allowed by lower OPEC production and exports. Increasing fragmentation of OPEC has been partly responsible for the increased day-to-day volatility in oil prices.

78. The price forecasts presented below have been derived by drawing together the crude oil demand projections and the expected outputs from non-OPEC sources and then assessing the implications of these demand and supply assumptions for OPEC output behavior. Over the long run the basic demand and supply characteristics of the oil market will play a large part in determining the path of oil prices. OPEC could also have an important impact on the long-run price trend as well as on the short-run movements. OPEC has been and will presumably continue to attempt to manage the petroleum market by managing its own supplies as well as other suppliers indirectly. This behavior has to be also taken into account.

79. Various scenarios about future developments in oil prices can be imagined. We present below three scenarios which we believe have a reasonable probability of being realized.

(a) The first scenario envisages the further disintegration of OPEC, leading to a price war--ostensibly to discipline not only the defecting OPEC members but also the non-OPEC exporters. The sharp decline in prices would probably lead to the consuming countries taking steps to protect their domestic energy industries. Given the large, low-cost production capacity in OPEC countries and the quest on the part of all exporters to win larger shares of the market, nominal prices could remain below $10/bbl for several years. The lowered prices would stimulate demand and reduce the pace of energy-saving technological changes in the industrial countries, thereby increasing their dependence on imported oil. Beyond the early 1990s, despite the absence of a cartel, the expected decline in non-OPEC supplies and the likely sharp increase in demand would dictate a moderate increase in oil prices--envisaged to reach $11-12/bbl (in terms of 1985 dollars) by 2000.

(b) A second scenario foresees a weak but functioning OPEC. This scenario would be characterized by continuing discord among members, conflicting demands, and a tendency to produce in excess of quota. Under this scenario, OPEC would make intermittent efforts to regain control of the market, the result of which would likely to be highly unstable prices. A period of relatively low prices envisaged for the next several years would stimulate demand, reduce non-OPEC supplies and ultimately lead to a period of price increases through OPEC exercising greater market control. The higher prices would, in turn, trigger forces which would lead to demand reductions, lower prices, and less cohesion among OPEC members.

(c) If, however, the current efforts to arrive at a more long-lived consensus among OPEC members are reasonably successful a third scenario could be imagined. Under this scenario internal bargaining would make sure that prices are not allowed to climb quickly. OPEC would opt for an increase in its share of the market, fully cognizant of the fact that any cooperation by non-OPEC producers would be short-lived. Its policy would, therefore, be dictated by the consideration that the survival

of its pricing objectives would, to a large extent, depend in practice on a vigorous demand trend for OPEC oil. For the near and medium term, it would decide on a price path that would slow down the development of alternative energy projects and impede exploration for petroleum in other parts of the world. These forces would lead to a higher growth path for oil, a stronger role for OPEC, and higher prices.

80. Despite the divergent and often conflicting forces that have taxed the ingenuity of the members of the group in their efforts to forge a consensus, it is not likely that OPEC's position as a dominant player in the world oil market will disappear; but it will be limited in its ability to control world supplies. Because of declining oil revenues, most OPEC members have been forced to undergo economic adjustments. In most countries, not only have budgets been sharply cut, but growth expectations have been generally lowered. While in the short term such difficulties lead OPEC members to act more individually, over the long term it is reasonable to assume that the perception of continued losses in revenues will lead to more cohesiveness within the cartel. This assumption leads us to favor scenarios (b) and (c) over scenario (a). However, in choosing between (b) and (c) we believe that scenario (b), in which OPEC's ability to control production waxes and wanes over time, is more likely than the stable, cohesive OPEC of scenario (c).

81. The price forecasts are provided in detail below (see Table 12). Naturally, given the uncertainty of markets and especially the assumptions made in this report pertaining to the tax policies of consuming countries and the ability of OPEC to control its production, decisionmakers should use these forecasts with the appropriate degree of caution.

82. Short-Term Price Projection. Over the next few years demand is expected to grow at around 1.6% p.a. under the influence of relatively low oil prices, but the robustness of its growth could be slowed by a slowdown in OECD GNP growth in 1989 and 1990. It is expected that in the next few years OPEC will have difficulty in exercising greater control over production than recently. The average OPEC price for the first half of 1988 is $15/bbl. With the presence of excess non-OPEC supplies, the lack of any indication that OPEC members are taking steps to reduce production levels and the slowdown in the momentum of world oil demand, prices have averaged around $12.90/bbl during the third quarter of 1988. Prices in nominal terms are expected to increase to $15/bbl during the fourth quarter as demand picks up during the Northern Hemisphere winter. Therefore, prices should average around $14/bbl for 1988. Prices are expected to fluctuate in the area of $16/bbl in nominal terms until 1990 due to the buildup in demand. Owing to the current level of disarray in OPEC ranks, and the high likelihood of production increases from that source, the short-term price forecasts should be viewed as having a high downside risk.

83. Medium- and Long-Term Price Projections. The period of 1990-95 is likely to be characterized by a decline in the production of petroleum in industrial countries, particularly the United States, while net exportable quantities from the non-OPEC, oil-exporting developing countries are expected to remain level. With the CPEs' exports on the decline, OPEC's share in global net exports is expected to grow from 46% in 1990 to 50% by 1995. In

this period crude oil demand would be stimulated under our macroeconomic assumption of OECD GNP growing at around 3% p.a. These circumstances should lead to an increase in petroleum prices in nominal and real terms. Our forecast is for petroleum prices in constant 1985 dollars to increase from $11/bbl in 1990 to $12.20/bbl in 1995.

84. Beyond 1995, it is projected that net exports from the surplus regions, i.e., the CPEs and non-OPEC oil-exporting developing countries, will decline. Demand will continue to grow steadily under our assumption of 3% OECD GNP growth. Given that global demand for oil reaches 2,950 mtoe (excluding the CPEs) by 2000 and that non-OPEC supplies increase to around 1,550 mtoe, the demand for OPEC oil will increase to 1,415 mtoe--almost 500 mtoe higher than the current level.

85. Petroleum prices are therefore projected to increase to around $15.40/bbl in 1985 constant dollar terms by 2000. It is expected that once demand for OPEC oil approaches the preferred output level of Persian Gulf countries, the tendency will be for a large jump in oil prices, followed by a period of stable or even declining prices similar to what was experienced at the beginning of the 1980s. If OPEC develops more cohesiveness than we now expect, prices in real terms could trend upwards more quickly throughout the 1990s to reach $17/bbl by 2000 in constant dollars. On the other hand, there is a significant likelihood that OPEC will lose market power over time. Under this scenario, prices would be generally lower, fluctuating around a mean of $9-10/bbl (in 1985 dollars) for several years. Beyond the early 1990s, as demand for OPEC oil increases in response to the low prices, the price of oil in real terms could tend toward $12/bbl.

86. The upward trend we forecast in oil prices to 2000 should not be extrapolated beyond the forecast period. Our opinion at this point in time is that the time path for crude oil prices forecast for the 1990s may well be the upswing part of the next long-term cycle in oil prices. Beyond 2000, new resource discoveries, technological developments, fuel efficiencies, and conservation measures may well lead to another downturn in crude oil prices. We would emphasize that oil prices will continue to be highly variable and policy makers should take appropriate risk management strategies to cope with such variability.

TABLE 12: OPEC PETROLEUM--AVERAGE PRICES, a/ 1960-87 (ACTUAL) AND 1988-2000 (PROJECTED)

	Current $	1985 Constant $	
		MUV b/	US GNP c/
Actual			
1960	1.5	5.0	5.4
1961	1.5	4.9	5.4
1962	1.4	4.5	4.9
1963	1.4	4.6	4.8
1964	1.3	4.2	4.4
1965	1.3	4.1	4.3
1966	1.3	4.0	4.2
1967	1.3	4.0	4.1
1968	1.3	4.0	3.9
1969	1.3	3.8	3.7
1970	1.3	3.6	3.5
1971	1.7	4.4	4.3
1972	1.9	4.5	4.6
1973	2.7	5.6	6.1
1974	11.2	19.0	23.2
1975	10.9	16.6	20.6
1976	11.7	17.6	20.8
1977	12.8	17.5	21.3
1978	12.9	15.4	20.0
1979	18.6	19.6	26.5
1980	30.5	29.2	39.8
1981	34.3	32.7	40.8
1982	31.0	30.0	34.7
1983	28.1	27.9	30.3
1984	27.5	27.8	28.5
1985	26.7	26.7	26.7
1986	13.6	11.5	13.3
1987	17.2	13.3	16.4
Projected			
1988	14.0	9.9	12.8
1989	15.5	10.4	13.6
1990	16.6	10.9	13.8
1995	22.0	12.2	14.1
2000	35.0	15.4	17.9

a/ For the period 1960-73, this price refers to Saudi Arabian light, 34 - 34.9 API, f.o.b. RAS Tanura; for the years following this period, it refers to the weighted average f.o.b. price of petroleum exports from OPEC countries.

b/ Deflated by Manufacturing Unit Value (MUV) Index.

c/ Deflated by US GNP Deflator.

Sources: International Crude Oil And Product Prices, Energy Economic Research, Ltd., Lebanon; Oil Industry Developments; Petroleum Economics, Ltd., (actual); World Bank, (projected).

TABLE A1: LIQUID FUELS - PRODUCTION BY MAIN COUNTRIES AND ECONOMIC REGIONS

COUNTRIES/ ECONOMIES	ACTUAL				PROJECTED					GROWTH RATES A/		
	1969-71	1979-81	1986	1987/B	1988	1989	1990	1995	2000	1961-86	1970-86	1987 - 2000
	(MILLION TONS OF OIL EQUIVALENT)									(% PER ANNUM)		
INDUSTRIAL	603	700	787	787	791	781	774	755	758	2.2	1.9	-0.3
NORTH AMERICA	577	559	560	555	555	549	545	530	520	0.9	-0.2	-0.4
UNITED STATES	508	478	476	467	463	456	450	440	430	0.6	-0.2	-0.5
CANADA	68	81	84	88	92	93	95	90	90	3.6	0.0	0.1
EEC-10	14	95	153	150	148	145	143	133	136	12.0	21.7	-0.7
GERMANY, FED. REP.	8	5	6	5	5	4	4	4	3	-1.9	-2.2	-3.6
UNITED KINGDOM	0	83	130	126	125	121	118	100	95	46.6	63.7	-1.9
OTHER WESTERN EUROPE	3	24	47	53	61	63	64	76	86	14.8	20.6	3.2
JAPAN	1	1	1	1	1	1	1	1	1	-2.3	-3.3	0.3
OCEANIA	9	22	27	28	27	24	21	16	17	41.5	3.9	-3.5
NON-MARKET	378	628	640	647	650	651	652	631	611	5.3	3.4	-0.4
USSR	359	608	620	627	630	630	630	610	590	5.5	3.5	-0.4
DEVELOPING	1,345	1,766	1,495	1,524	1,564	1,621	1,687	1,960	2,179	3.9	-0.6	2.4
ASIA	793	1,166	884	911	931	959	978	1,178	1,376	4.4	-1.3	2.8
SAUDI ARABIA	197	501	247	220	223	234	243	303	359	6.1	-0.9	3.3
IRAN	196	102	94	115	112	126	128	169	200	1.3	-7.3	3.8
IRAQ	78	115	84	108	127	126	126	143	188	1.4	-2.3	3.7
UNITED ARAB EMIR	40	83	71	76	76	73	70	85	111	0.0	1.0	2.5
AFRICA	272	292	263	265	273	285	305	344	353	6.8	-0.8	1.9
LIBYA	148	84	52	51	50	52	56	71	75	5.3	-5.9	2.6
NIGERIA	53	96	70	65	68	71	78	92	95	13.8	-1.2	2.5
AMERICA	269	301	340	340	351	368	394	428	438	1.6	2.2	1.7
MEXICO	24	105	141	146	147	150	164	174	180	11.3	15.5	1.4
VENEZUELA	191	119	95	94	93	96	98	119	119	-3.0	-4.7	1.6
SOUTHERN EUROPE	11	7	8	8	8	9	9	10	10	4.0	-3.6	1.7
WORLD	2,326	3,094	2,921	2,957	3,005	3,053	3,112	3,346	3,547	3.7	0.8	1.2

A/ LEAST SQUARES TREND FOR HISTORICAL PERIODS (1961-86); END-POINT FOR PROJECTED PERIODS (1987-2000).
B/ ESTIMATE.

SOURCES: UNITED NATIONS ENERGY STATISTICS (ACTUAL);
WORLD BANK, INTERNATIONAL ECONOMICS DEPARTMENT (PROJECTED).

TABLE A2: LIQUID FUELS - APPARENT CONSUMPTION BY MAIN COUNTRIES AND ECONOMIC REGIONS

COUNTRIES/ ECONOMIES	ACTUAL 1969-71	1979-81	1986	1987/B	PROJECTED 1988	1989	1990	1995	2000	GROWTH RATES A/ 1961-86	1970-86	1987 - 2000
	(MILLION TONS OF OIL EQUIVALENT)									(% PER ANNUM)		
INDUSTRIAL	1,570	1,792	1,605	1,618	1,637	1,653	1,677	1,767	1,834	2.5	-0.7	0.8
NORTH AMERICA	757	893	822	824	834	839	847	909	942	1.7	-0.2	0.9
UNITED STATES	673	792	741	744	752	757	764	825	856	1.7	-0.1	0.9
CANADA	71	88	70	69	69	70	70	71	72	2.0	-0.8	0.3
EEC-10	527	559	479	488	492	498	503	520	536	2.8	-1.5	0.6
GERMANY, FED. REP.	122	132	116	118	119	120	122	126	132	3.1	-1.3	0.8
FRANCE	96	111	85	84	84	85	86	91	93	3.5	-1.9	0.7
UNITED KINGDOM	101	84	78	80	82	82	83	85	87	0.8	-2.5	0.6
ITALY	92	99	87	90	91	93	93	96	98	3.4	-1.0	0.6
OTHER WESTERN EUROPE	69	70	64	64	65	65	66	68	71	2.6	-1.5	0.7
JAPAN	188	236	209	211	216	220	230	235	250	6.0	-0.7	1.2
OCEANIA	28	34	31	31	31	32	32	34	35	3.2	0.3	0.8
NON-MARKET	323	549	541	547	550	553	556	569	578	5.5	3.1	0.4
USSR	269	447	447	451	452	454	455	460	461	5.2	3.1	0.2
DEVELOPING	385	698	776	793	817	847	879	1,010	1,135	6.2	4.3	2.4
ASIA	172	341	394	405	419	435	451	528	599	7.7	5.0	2.6
CHINA	36	105	113	117	121	126	131	154	178	12.5	6.0	2.8
INDIA	19	33	44	45	47	50	52	65	77	6.8	5.2	3.6
KOREA, REPUBLIC OF	9	26	29	31	32	34	35	42	48	16.2	7.1	3.0
AFRICA	41	73	91	94	96	100	103	115	129	6.0	5.3	2.2
AMERICA	139	222	227	228	235	242	251	281	313	4.3	3.1	2.1
MEXICO	25	61	71	71	73	74	75	84	93	7.8	7.9	1.8
BRAZIL	27	53	53	53	55	57	58	59	63	6.3	3.2	1.2
SOUTHERN EUROPE	32	60	62	65	66	69	72	85	93	7.4	3.5	2.5
WORLD	2,278	3,039	2,921	2,957	3,005	3,053	3,112	3,346	3,547	3.7	1.0	1.2

A/ LEAST SQUARES TREND FOR HISTORICAL PERIODS (1961-86); END-POINT FOR PROJECTED PERIODS (1987-2000).
B/ ESTIMATE.

SOURCES: UNITED NATIONS ENERGY STATISTICS (ACTUAL);
WORLD BANK, INTERNATIONAL ECONOMICS DEPARTMENT (PROJECTED).

TABLE A3: LIQUID FUELS - GROSS EXPORTS BY MAIN COUNTRIES AND ECONOMIC REGIONS

COUNTRIES/ ECONOMIES	ACTUAL 1969-71	ACTUAL 1979-81	ACTUAL 1986	ACTUAL 1987/B	PROJECTED 1988	PROJECTED 1989	PROJECTED 1990	PROJECTED 1995	PROJECTED 2000	GROWTH RATES A/ 1961-86	GROWTH RATES A/ 1970-86	GROWTH RATES A/ 1987 - 2000
	(MILLION TONS OF OIL EQUIVALENT)									(% PER ANNUM)		
INDUSTRIAL	168	270	384	386	395	395	396	396	415	7.2	4.5	0.5
NORTH AMERICA	59	77	94	98	100	102	104	103	106	6.9	3.9	0.5
EEC-10	102	160	232	223	222	219	218	207	214	6.6	5.2	-0.3
UNITED KINGDOM	17	58	106	100	99	95	92	73	68	11.6	14.5	-2.6
OTHER WESTERN EUROPE	4	29	51	58	67	69	69	82	92	17.2	17.9	3.1
JAPAN	1	1	1	1	1	1	1	1	1	-0.9	-7.9	1.1
OCEANIA	2	4	6	7	6	5	3	3	2	6.2	7.3	-7.6
NON-MARKET	105	184	210	214	216	215	214	191	171	6.0	4.7	-1.5
USSR	95	167	188	191	193	192	191	168	149	6.2	4.6	-1.7
DEVELOPING	1,250	1,492	1,123	1,145	1,170	1,207	1,249	1,447	1,596	2.9	-2.1	2.2
ASIA	732	1,010	695	715	727	746	756	901	1,060	3.6	-2.4	2.7
SAUDI ARABIA	180	472	212	185	187	197	204	258	307	5.8	-1.6	3.4
IRAN	179	73	64	84	80	91	94	129	156	0.2	-9.4	4.2
KUWAIT	145	87	60	57	52	50	47	62	72	-3.1	-7.9	1.6
IRAQ	75	107	73	97	113	113	113	128	172	0.8	-3.3	3.9
UNITED ARAB EMIR	40	81	65	70	70	67	64	78	104	0.0	0.3	2.7
AFRICA	265	261	219	220	226	237	254	285	285	6.2	-2.0	1.8
LIBYA	147	80	47	46	44	45	49	63	65	5.1	-6.6	2.4
NIGERIA	50	90	63	58	60	63	70	82	84	13.3	-1.8	2.5
AMERICA	252	208	198	201	207	214	229	250	237	-0.4	-1.0	1.1
MEXICO	3	44	72	77	77	79	91	92	90	19.4	34.8	1.0
VENEZUELA	178	100	75	74	73	75	75	89	81	-3.7	-5.8	0.6
SOUTHERN EUROPE	2	12	12	10	10	10	10	11	12	10.9	11.5	1.4
WORLD	1,522	1,946	1,717	1,745	1,781	1,816	1,859	2,034	2,182	3.8	-0.4	1.5

A/ LEAST SQUARES TREND FOR HISTORICAL PERIODS (1961-86); END-POINT FOR PROJECTED PERIODS (1987-2000).
B/ ESTIMATE.

SOURCES: UNITED NATIONS ENERGY STATISTICS (ACTUAL);
WORLD BANK, INTERNATIONAL ECONOMICS DEPARTMENT (PROJECTED).

TABLE A4: LIQUID FUELS - GROSS IMPORTS BY MAIN COUNTRIES AND ECONOMIC REGIONS

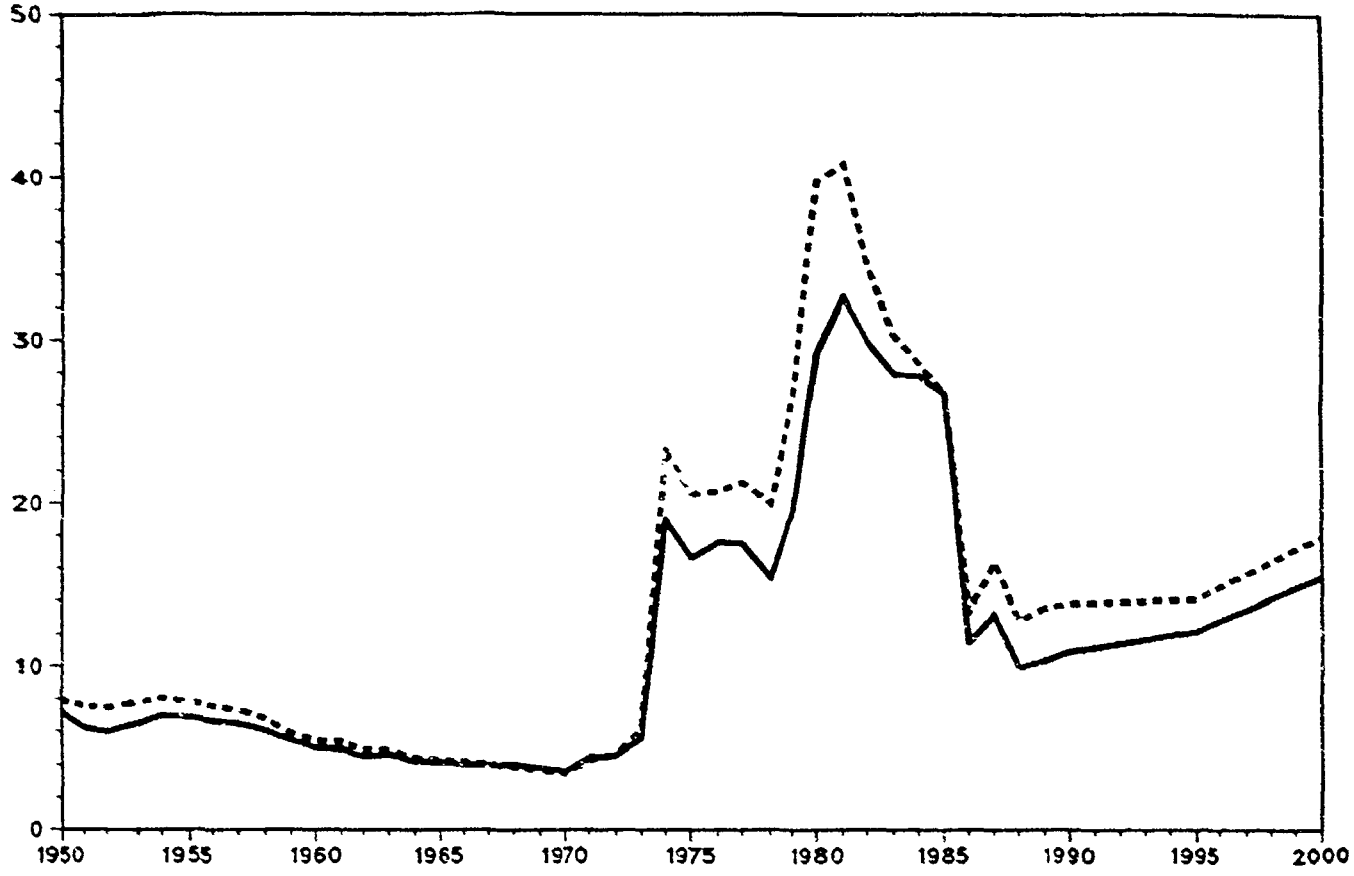
COUNTRIES/ ECONOMIES	ACTUAL 1969-71	1979-81	1986	1987/B	PROJECTED 1988	1989	1990	1995	2000	GROWTH RATES A/ 1961-86	1970-86	1987 - 2000
	(MILLION TONS OF OIL EQUIVALENT)									(% PER ANNUM)		
INDUSTRIAL	1,148	1,387	1,202	1,217	1,241	1,267	1,299	1,408	1,491	3.7	-1.1	1.4
NORTH AMERICA	240	422	356	367	379	392	406	483	528	4.8	0.2	2.5
UNITED STATES	173	350	305	317	330	342	355	426	468	5.4	1.3	2.6
EEC-10	623	632	559	561	566	572	578	595	614	2.7	-1.8	0.6
GERMANY, FED. REP.	123	138	117	119	120	122	125	131	137	3.4	-1.3	1.0
FRANCE	105	126	94	94	94	95	96	96	96	3.5	-1.8	0.2
ITALY	114	114	99	101	101	103	103	105	109	2.9	-1.6	0.5
NETHERLANDS	65	78	85	82	82	83	84	86	87	4.1	0.6	0.4
OTHER WESTERN EUROPE	72	78	69	69	70	71	71	74	77	3.1	-1.2	0.8
JAPAN	191	239	209	211	216	220	230	235	251	6.0	-0.8	1.2
OCEANIA	22	17	10	10	11	12	14	20	21	-1.9	-2.6	5.3
NON-MARKET	51	106	111	114	115	117	119	129	139	8.8	4.4	1.3
EASTERN EUROPE	46	100	97	99	100	102	103	111	119	8.9	4.3	1.2
GERMAN DEM. REP.	10	22	23	24	24	25	25	27	28	9.0	4.6	1.0
CZECHOSLOVAKIA	11	20	18	18	19	19	19	20	22	6.8	2.8	1.1
DEVELOPING	293	438	404	414	424	432	441	497	552	4.1	1.7	1.9
ASIA	111	192	205	209	214	222	229	251	282	6.0	4.1	2.0
KOREA, REPUBLIC OF	10	27	33	34	36	37	39	45	52	16.5	7.5	2.8
SINGAPORE	20	39	47	48	48	49	50	52	53	8.4	5.1	0.7
AFRICA	36	46	47	48	50	51	52	56	61	3.5	1.1	1.6
AMERICA	121	132	85	90	91	88	85	103	112	0.9	-2.8	1.5
BRAZIL	19	47	32	33	33	29	24	31	35	6.6	1..	0.4
SOUTHERN EUROPE	24	67	66	66	68	71	74	86	95	8.5	5.8	2.4
WORLD	1,491	1,931	1,717	1,745	1,781	1,816	1,859	2,034	2,182	4.0	-0.3	1.5

A/ LEAST SQUARES TREND FOR HISTORICAL PERIODS (1961-86); END-POINT FOR PROJECTED PERIODS (1987-2000).
B/ ESTIMATE.

SOURCES: UNITED NATIONS ENERGY STATISTICS (ACTUAL);
WORLD BANK, INTERNATIONAL ECONOMICS DEPARTMENT (PROJECTED).

PETROLEUM

(CONSTANT 1985 DOLLAR PRICES •)



——————— DEFLATED BY MANUFACTURING UNIT VALUE (MUV) INDEX

• • • • • • • • • • • DEFLATED BY U.S. GNP DEFLATOR.

• 1948 – 87 ACTUAL ; 1988 – 2000 PROJECTED .

SOURCE : WORLD BANK , INTERNATIONAL ECONOMICS DEPARTMENT .

NATURAL GAS

Summary

1. The share of natural gas in global energy demand has grown modestly over the last 16 years--from 17.2% in 1970 to 19.6% in 1986. The decline in gas demand in the United States (from 500 mtoe in 1970 to 396 mtoe in 1986) contributed to the slow growth in global gas demand. However, the declining trend in natural gas consumption in the United States appears to have been reversed since 1986 with natural gas consumption increasing for the first time in many years (by 2.5% in 1987). Although all other regions have experienced steady growth in natural gas demand, the most significant growth has occurred in the CPEs. Owing to the rapid growth in demand in the USSR, the CPEs' share of natural gas consumption has increased from 19.6% in 1973 to 32% in 1986. The region's share is likely to increase even further to reach 39% by the year 2000 as the USSR attempts to reduce the use of crude oil in Eastern Europe while seeking higher revenues from oil exports.

2. Supported by enormous natural gas reserves (estimated to be around 293 billion barrels oil equivalent and representing over 40% of proven global reserves), the CPEs have increased their share of global natural gas production from 22% in 1970 to over 42% in 1986. The developing countries, with proven gas reserves as large as the CPEs, have increased their share in global natural gas supplies from 6.5% to over 15% during the same period. The CPEs and the developing countries are expected to increase their share of global natural gas supplies to 45% and 23%, respectively, by 2000. In the industrial countries increases in natural gas supplies will be forthcoming mainly from Norway, as the growth rate of production in the United States, the United Kingdom, and other Western European countries will gradually decline in the late 1990s. In aggregate, global production of natural gas is expected to grow at 3% p.a., reaching around 2,212 mtoe by 2000, and the share of natural gas in total energy supplies should increase from 19.7% in 1986 to 22% in 2000.

3. Natural gas trade, which increased rapidly during the 1984-85 period after years of stagnation, suffered a decline in 1986 as a result of the sharp decline in the international price of oil. The most significant decline occurred in North America, where US imports from its principal exporter, Canada, declined sharply. Since 1986, however, the international movement of gas has increased due mainly to significant flows from Canada into the United States and from Norway into other Western European countries. Intra-regional trade is expected to grow faster than interregional trade over the forecast period. Lower prices of internationally traded gas and the high cost of moving natural gas over longer hauls will limit interregional trade. In North America, Canada is expected to supply increasing quantities of natural gas to the US market. Norwegian supplies to other Western European countries are expected to increase significantly. Although the CPEs and the developing countries will continue exporting natural gas to the industrial countries, it is projected that almost one-half of the increases in exports from the USSR will be to supply the growing needs of Eastern European CPEs. The large distances to the major consuming regions should prevent any significant growth

in gas exports from gas-rich Persian Gulf countries. Total trade in natural gas is expected to increase from 202 mtoe in 1986 to 378 mtoe in 2000; net imports into the industrial countries are projected to grow from 87 mtoe in 1986 to 161 mtoe in 2000.

4. Since the end of 1985, institutional changes--particularly regulatory changes affecting gas transportation and distribution--and the decontrol of natural gas prices in the industrial countries, have changed the structure of the gas market in the irdustrial countries. Such developments, accompanied by the emergence of the spot market, have introduced a large degree of flexibility into the gas market while exposing it to greater variability as more and more consumers and producers turn to the burgeoning spot market. With the growth in domestic supplies, gas prices have declined sharply, notably since the beginning of 1986. The decline in world oil has contributed to the erosion of the price of internationally traded natural gas as it has been tied to the price of crude oil and/or petroleum products.

5. In the short and medium term, natural gas prices are likely to stay weak, particularly in the United States and Europe, given current high production levels and low international oil prices. Towards the mid-1990s when the "gas bubble" in the United States is worked off and increasing quantities are consumed in the premium residential/commercial markets in most industrial countries, the price of internationally traded natural gas will gradually move in the direction of a level based on an average of heating and low-sulfur fuel oil. By the end of the projection period, the landed price of natural gas into the United States and Western European markets could approach the c.i.f. crude oil parity price.

Recent Developments

6. The international natural gas market has undergone a series of changes over the last decade. In the mid- to late-1970s, international trade in natural gas was regulated by long-term contracts with a duration of 20-25 years, mostly on a take-or-pay basis with prices indexed to the price of crude oil or petroleum products. In the United States, sales by producers to interstate pipelines were subject to a price ceiling, thereby creating a shortage of natural gas supplies.

7. The supply shortages in the United States that had been created over many years of regulation up to the late-1970s turned into a glut after enactment of the Natural Gas Policy Act (NGPA) in 1978. By setting prices for new gas higher than old gas and by providing for the gradual removal of price controls for some categories of natural gas, the NGPA resulted in encouraging exploration of new gas deposits. By 1982 it was clear that the supply shortfall had been eliminated. In fact, despite the roll-in pricing mechanism and the built-in price escalation at the wellhead--combined with the take-or-pay contracts entered into with domestic as well as foreign suppliers--the pipeline companies were buying more gas (from field producers stipulating minimum purchases at predetermined prices) than they could sell in the downstream markets (at contracted prices). Despite the excess supplies, US gas prices rose as some pipeline companies continued to take deliveries of high-priced "new gas," thereby depressing the demand for natural gas.

8. The situation of increasing prices and declining demand by the end of 1982 led to a call for legislative reforms of end-use pricing and contractual arrangements between producers and pipelines and of interstate pipeline regulation. However, due to the controversial nature of the proposed legislation, a number of nontraditional arrangements were introduced--such as direct sales contracts between producers and industrial end-users, and pipelines carrying gas on behalf of others. In addition, gas brokers between producers and end-users emerged in the market. The gradual introduction of the new mechanisms through 1983 and 1984 helped stabilize the position of natural gas in the US energy market.

9. Significant changes have occurred in the US natural gas market since 1985. The most noticeable are the following: (a) the appearance of the gas spot market and other market mechanisms, such as exchange type clearing houses along one or more pipelines, and (b) the decontrol of wellhead gas prices (on January 1, 1985, as provided for by the NGPA for much of the new gas). Such developments introduced a large degree of flexibility into the gas market while exposing it to market competition, as more and more consumers and producers turned to the burgeoning spot gas market. The natural gas market was exposed to additional uncertainty when increased availability of open access to gas transportation was allowed on a nondiscriminating basis in early October 1985.

10. As the US gas market came under increasing competitive pressure with the growth in domestic supplies, gas prices declined sharply; countries such as Mexico discontinued exports to the United States during late-1984 as they could not match the lower prices. By September 1985, the US liquified natural gas (LNG) contracts with Algeria were suspended. Only Canadian exports met the new price competition.

11. Changes are taking place elsewhere in the world in the natural gas industry. Most European countries, where major transmission companies in partnership with governments controlled the natural gas market in the 1970s, are becoming increasingly aware of the possibility of a competitive gas market developing. In response to the concerns over energy security and in light of the constraints to further improvements in energy efficiency, energy ministers from the EEC met recently to discuss proposals for creating a common market in energy. However, it is unlikely that the European gas market could achieve the degree of integration and competitiveness of the gas market in the United States where the grievances in the United States-Canadian gas trade relationship are less pronounced. The existence of major gas transmission companies in Europe such as British Gas, Gaz de France, Ruhrgas, and Gasunie, among others, are likely to limit any significant change in the European gas industry. In the United Kingdom, despite the privatization of British Gas in 1986, government control of the company is still dominant. A number of other obstacles, such as government barriers to the free flow of various fuels among the members of the EEC, domestic price controls, and a spectrum of taxes are cited as complications of a common market for energy.

12. Diverse national energy interests also restrict integration among European nations. Italy is the only major European country where natural gas dominates national energy policies. In the Federal Republic of Germany and France, domestic coal and electricity, respectively, are favored in the politics of energy policies.

Demand Outlook

13. United States. The declining trend of natural gas consumption in the United States over the last decade appears to have been reversed since 1986 mainly due to low gas prices. In 1987, consumption of natural gas increased by about 2.5%. During the first quarter of 1988 natural gas consumption increased by almost 12% on a year-on-year basis. However, after reaching a peak in January of 2.29 quadrillion btu, consumption declined to around 1.96 quadrillion btu in March 1988. The consumption of natural gas in 1988 is expected to increase by around 1%. It is projected that natural gas consumption in the United States will increase by less than 0.5% p.a. up to the early 1990s but will increase thereafter at a slightly faster rate as gas use for electricity generation increases. Still, during the 1987-2000 period, demand is projected to increase by less than 1% p.a. Up to the early 1990s there will not be any significant change in the share of the various sectors in total natural gas consumption (residential 26-26.5%, commercial 14%, industrial 34-34.5%, electric utilities 16.5-17%, pipeline fuel, lease, and plant fuel 5.6%). However, beyond the early 1990s these shares are expected to change significantly as a result of energy-saving technology. In the residential sector, gas consumption is expected to decline after the mid-1990s despite the expected sizable increase in the number of gas-heated housing units. In the commercial sector, however, gas consumption is expected to increase as the sector expands.

14. Gas consumption in the industrial sector is expected to grow between 0.7% and 0.9% in the 1987-2000 period despite continued improvements in the energy-industrial output ratio (resulting from energy-saving technology bias). The existence of dual-firing systems (oil/gas) in industrial production will make gas a more desirable substitute when oil prices begin to rise after the mid-1990s. Although natural gas use is expected to stabilize up to the mid-1990s in the US power-generation sector--as it is displaced by alternative fuels such as coal and nuclear power--demand in this sector is projected to increase significantly after that as the demand for electricity generation is expected to be met with low capital cost, combined-cycle units using natural gas.

15. Western Europe. In Western Europe, where the bulk of natural gas is consumed in six countries (namely Belgium, France, the United Kingdom, the Federal Republic of Germany, Italy, and the Netherlands), the pattern of energy demand growth is influenced by the existence of an indigenous resource base and by the promotion of a policy of a balanced energy mix. Penetration of gas in the various end-use sectors is also influenced by national energy policies. In the Netherlands and the United Kingdom, for instance, where substantial natural gas resources exist, the share of natural gas in total fuel consumption is fairly large (Table 1). Despite additional supplies from Algeria, Libya, and the USSR, natural gas has not improved its market share in most Western European countries other than Italy.

16. While natural gas demand growth has increased in the residential and commercial markets in Western Europe, the use of natural gas in the power-generation sector has been declining--with the exception of the Netherlands and Italy, where policy regarding the use of natural gas has been relaxed. The decline in natural gas use in the European power-generation sector has

TABLE 1: SHARE OF NATURAL GAS IN SECTORAL ENERGY CONSUMPTION OF SELECTED EUROPEAN COUNTRIES, 1975, 1980, 1986

	Belgium	France	Germany, F.R.	Italy	The Netherlands	United Kingdom	Western Europe
	(%)						
1975							
Residential and Commercial	17	15	13	20	66	33	21
Industrial	29	13	21	22	46	20	18
Power Generation	20	6	18	5	82	3	10
1980							
Residential and Commercial	30	23	20	30	75	45	26
Industrial	26	18	22	26	43	30	20
Power Generation	11	2	14	5	41	1	6
1986							
Residential and Commercial	32	27	23	37	74	49	28
Industrial	20	26	22	28	40	28	21
Power Generation	2	1	6	14	62	1	6

Sources: United Nations, Energy Statistics; International Energy Agency, Energy Balances.

been largely due to two factors: (a) the high growth in coal and nuclear-generated electricity that has displaced both oil and natural gas in baseload applications; and (b) the EEC's 14-year ban on gas use for electricity generation (based upon the premise that gas is a premium fuel that is in short supply). It is projected that although the residential and commercial markets of the major oil-importing countries offer the greatest potential for natural gas demand growth in the next decade or so, gas use will also grow significantly in the power-generation sector when the EEC's ban on gas use for electricity generation is abrogated in late 1988. This will also stimulate the use of natural gas in other European countries such as Norway, Sweden, Greece, Spain, and Turkey, where the current use of natural gas is limited.

17. In the industrial sector gas faces competition from coal and residual fuel oil. However, despite low fuel oil prices, natural gas may gain some market share in the short to medium run by utilizing the spare capacity in the pipeline system at off-peak periods through interruptable supplies. In the 1990s as oil prices increase, the demand for natural gas will grow--given the availability of large underutilized exporting capacities in the countries that traditionally export gas to Western Europe.

18. Given the potential for gas to penetrate these markets, a number of factors such as its price competitiveness and the large investments under implementation (notably Norway's efforts to develop its first gas-fired power station, the new pipeline system being built by Sweden to transport gas from Denmark, and Spain's proposal to construct a new pipeline system) are expected to enhance the share of natural gas in Western Europe.

19. OECD Pacific Region. In the OECD Pacific Region, the growth in the gas industry in Australia and New Zealand has been based upon indigenous resources, while around 95% of Japan's natural gas requirements have been supplied by imports. While gas consumption in Japan increased by around 60% between 1980 and 1985--as it replaced fuel oil used in the power-generation sector--the decline in the price of oil in 1986 resulted in the stagnation of natural gas demand in that year. In Japan's power-generation sector, the share of natural gas consumption declined from 21% in 1984 to 19% in 1986 (Table 2).

20. In the residential and industrial sectors of these three countries, natural gas use is hampered by the structure of gas prices relative to other energy sources and the lack of an adequate infrastructure for gas transmission and distribution. While real oil product prices in the industrial and household sectors declined by around 26% between 1985 and 1987, the decline in natural gas prices was around 14% in both sectors for the same period. These factors are expected to limit any significant penetration of natural gas in Japan. However, in order to increase the availability of natural gas, Japan is making efforts to improve its natural gas transportation network. Japan has also shown interest in providing financial support to Malaysia's 451 mile pipeline project that would link the Singapore market to gas fields in Malaysia's eastern coast across the Malay Peninsula. This project is to be completed by early 1990. With increasing supplies of natural gas, it is projected that natural gas demand in Japan will increase at a rate of nearly 3.5% p.a. during the period 1987-2000. The share of natural gas in total primary energy consumption in Japan should increase from 9% in 1986 to around 12% in 2000.

TABLE 2: SHARE OF NATURAL GAS IN SECTORAL ENERGY CONSUMPTION IN OECD PACIFIC COUNTRIES, 1975, 1980, 1986

	Japan	Australia	New Zealand
		(%)	
1975			
Residential and Commercial	15	13	4
Industrial	2	10	7
Power Generation	4	4	1
1980			
Residential and Commercial	16	18	5
Industrial	2	19	10
Power Generation	14	7	8
1986			
Residential and Commercial	17	24	7
Industrial	3	27	38
Power Generation	19	11	17

Sources: United Nations, Energy Statistics; International Energy Agency, Energy Balances.

21. The relative abundance of natural gas and the gas pricing structure in Australia and New Zealand are expected to increase the utilization of gas in these countries. Although the growth in gas consumption in Australia's power-generation sector will be limited to peaking units--as coal enjoys a dominant position in this sector--gas is expected to replace fuel oil in line with the country's move towards reducing its dependence on oil.

22. The issues affecting the development of natural gas in industrial countries continue to be availability, cost, and security of supply. Despite the availability of large resources in the region and the potential for the import of substantial volumes from both the CPEs and the developing countries, natural gas is likely to lose ground mainly because of the tight supply situation in the largest consuming region, the United States. Consequently, the share of industrial countries in global natural gas consumption will shrink to 39% in 2000--down from 48% in 1986 (Table 3).

23. Between 1970 and 1986 the European CPEs accounted for almost 66% of the incremental consumption of natural gas, and the share of natural gas in total energy consumption increased from 22% in 1970 to 40% in 1986. The enormous natural gas reserves of the USSR will ensure that natural gas will increase its share of energy markets not only in the USSR but also in other Eastern European countries. Given the heavy dependence of the Eastern European countries on energy imports from the USSR, natural gas is the one fuel which can fill the gap as oil exports from the USSR stagnate. The share of natural gas in primary energy consumption of the CPEs is therefore

TABLE 3: SHARE OF NATURAL GAS IN PRIMARY ENERGY CONSUMPTION, BY ECONOMIC CLASSIFICATION

	1961	1973	1979	1984	1985	1986
	(%)					
Industrial Countries	16.7	19.6	19.6	20.1	19.5	19.0
Centrally Planned Economies	10.5	19.6	23.5	29.2	30.1	32.0
Developing Countries	4.7	7.0	8.2	8.7	8.6	8.9
World	13.7	17.4	18.1	19.5	19.6	19.7
Memo:						
Natural Gas Consumption (mtoe)	409	999	1,228	1,380	1,412	1,457
Energy Consumption (mtoe)	2,995	5,732	6,797	7,051	7,207	7,408

Sources: United Nations, Energy Statistics; World Bank.

anticipated to grow from 32% in 1986 to 39% in 2000. The share of natural gas is expected to surpass that of coal by the end of this decade. The CPEs' share in global consumption of natural gas is expected to increase from 40% in 1986 to 43% in 2000.

24. Natural gas consumption in the developing countries increased at 6.3% p.a. over the period 1981-86. While this growth in demand is attributed mainly to rising consumption levels in the oil-exporting countries, gas consumption has also increased--though at a somewhat lower rate--in the oil-importing developing countries. The expanding network for gas transportation has contributed to this growth.

25. The pattern of natural gas demand in the developing countries is significantly different from that in the industrial countries. While in the industrial countries the residential sector is the largest user (due to its clear burning nature and outstanding flame and temperature quality), in the developing countries the power-generation sector holds the largest share [e.g., Egypt (58%), Pakistan (31%), and Thailand (74%)]. In the industrial countries the share of natural gas use is smallest in the power sector. However, gas use is increasing significantly in the residential market in the developing countries. For example, over the period 1980 to 1986 residential gas consumption in Pakistan increased by around 20% p.a.; the share of natural gas increased from a little less than 7% to around 13%. This increase has been largely due to the lower price of natural gas relative to LPG and kerosene in the housing sector.

26. Natural gas will continue to increase its share of total energy demand in the developing countries. New gas discoveries or additions to the reserves position will contribute to its increased use. In some countries such as India, future increases in the use of gas are reflected in the government's development plans. India's seventh five-year plan (1984/85 to 1989/90) estimates gas use to increase by more than five times between 1985

and 1990. Although the 1986 drop in world oil prices and the likelihood of oil prices remaining weak in the short and medium term are expected to reduce the pace of gas utilization in many oil-importing developing countries, natural gas is expected to increase its market share as oil prices increase in the mid-1990s, from 8.9% in 1986 to 12.7% in 2000. The share of developing countries in total world consumption of natural gas is expected to increase over the projection period from 11.4% to almost 18%.

27. Total world demand for natural gas is projected to grow at a rate of 3% p.a., reaching around 2,212 mtoe by 2000 (Table 4). The share of natural gas in total world energy consumption should increase from 19.7% to almost 22% over this period.

Natural Gas Reserves

28. Global proven natural gas reserves increased from 3,400 trillion cubic feet (TCF)--equivalent to 580-590 billion barrels of oil--at the end of 1984 to around 3,825 TCF in 1986. Compared to 1984 when natural gas reserves were 84% of the proven oil reserves, proven gas reserves rose to around 90% of proven oil reserves by 1986. Proven gas reserves have more than doubled since 1970. There has also been a significant change in the shares of proven reserves held by the major economic regions. The share of the European CPEs, which accounted for 26.5% of total world gas reserves in 1970, has increased significantly--reaching 44.5% in 1986. Between 1984 and 1986 alone the share of the CPEs increased by around 3.5%. Almost 97% of natural gas reserves in the CPEs (around 293 billion barrels of oil equivalent) in 1986 were located in the USSR, where recent discoveries have been concentrated in Western Siberia and the Asian Republics.

29. The share of industrial countries, which declined from 31% in 1970 to 15% in 1984, has declined further to around 13% in 1987. The developing countries have increased their share slightly from around 41-42% in 1984 to around 42-43% in 1987. Proven natural gas reserves in the developing countries are close to those in the CPEs. About 90% of these reserves are located in the oil-exporting developing countries. Iran leads this group with around 13% of total world reserves, followed by Abu Dhabi (4.8%), Qatar (4.1%), Saudi Arabia (3.7%), and Algeria (2.8%). Although the oil-exporting developing countries account for the largest share of reserves, many oil-importing developing countries have improved their reserves position over the last two decades. Among this group, Argentina, China, Pakistan, and India are most prominent.

30. The global reserves-to-production ratio has increased from around 42 years in 1970 to nearly 56 years. On the basis of 1987 production figures, the reserves-to-production ratio for the industrial countries is around 18 years. The United States, with estimated reserves of 186.7 TCF and production at around 17 TCF (roughly 25% of world production) in 1987, has the lowest reserves-to-production ratio (11 years), followed by around 13.5 years for the United Kingdom. The reserves-to-production ratio is considerably higher in several other industrial countries such as Canada (28 years), Norway (106 years), the Netherlands (23.5 years) and Australia (35 years). Among the oil-exporting developing countries, the reserves-to-production ratio in Indonesia,

TABLE 4: NATURAL GAS CONSUMPTION BY ECONOMIC CLASSIFICATION, 1961-86 (ACTUAL) AND 1990-2000 (PROJECTED)

Countries/Economies	1961 MTOE	1961 %	1970 MTOE	1970 %	1986 MTOE	1986 %	1990 MTOE	1990 %	2000 MTOE	2000 %
Industrial	322.1	78.6	612.1	71.9	705.1	48.4	758.6	46.5	864.9	39.1
Centrally Planned	68.2	16.7	188.8	22.1	586.5	40.2	659.8	40.5	951.7	43.0
Developing	19.2	4.7	50.9	6.0	165.7	11.4	212.1	13.0	395.1	17.9
World	409.5	100.0	851.7	100.0	1,457.4	100.0	1,630.5	100.0	2,211.8	100.0

Note: Details may not add to total due to rounding.

Sources: United Nations, Energy Statistics (actual); World Bank, (projected).

Mexico, and Algeria is 59 years, 60 years and 72 years, respectively, while in Saudi Arabia and Venezuela the ratio is 189 years and 140 years, respectively. Supported by the reserves discovered over the last two decades, the reserves-to-production ratio in other major gas-producing developing countries such as China and Pakistan is 42 years and 53 years, respectively.

Supply Outlook

31. In the United States, natural gas production declined by around 7.8% between 1984 and 1986 but increased by 2% in 1987 despite the decline in proven natural gas reserves. The higher production in part reflects the optimistic opinion that there exists a significantly larger natural gas resource base than the present level of proven reserves. The controversy over the extent of the natural gas reserves in the United States was at the heart of a recent International Natural Gas Conference and the American Gas Association (AGA) meeting held in Washington D.C. It has been suggested by AGA that the potential supply of natural gas in the lower-48 states could be as high as 66.7 TCF. If so, at current production levels the resource would last for at least another 50 years. However, there is a widespread belief that the current production of natural gas in the United States can only be maintained up to the mid-1990s, beyond which the production rate will likely decline. Based upon our assessment of the production potential of the lower-48 states, natural gas supplies in the United States are expected to increase by around 0.5% p.a. over the period 1987-2000. However, beyond 1995 the decline in natural gas reserves will begin to reduce the growth rate of supply.

32. In Western Europe, at the current level of production and proven reserves in Norway, the Netherlands, and the United Kingdom, supplies will last for 36 years. Over the last few years, there has been a significant increase in the proven reserves of gas in the North Sea region. Despite the fact that Norway's natural gas reserves are more substantial than its oil reserves, its oil production is almost twice as large as its gas production. This is due mainly to the lack of adequate gas transmission systems. At current production levels Norway's oil reserves will be exhausted in 30 years. However, it has the potential to supply natural gas at current rates for over a century. It is likely, therefore, that Norway will supply a significant portion of Western European natural gas needs in the future.

33. Indigenous supplies in the other Western European countries are concentrated mainly in the Federal Republic of Germany, Italy, and France. Since 1984, the most significant decline in natural gas production has taken place in France (almost 40% between 1984 and 1987), while gas production in Italy has increased by 16% over the same period. Given the size of the reserves in these countries, it is anticipated that current production levels can only be maintained until 1990. Beyond the 1990s a decline in production appears to be very likely. In the United Kingdom, natural gas production increased by 2.5% over the two-year period between 1984 to 1986, but increased significantly in 1987. It now appears likely that domestic gas supplies in the United Kingdom can increase further by the mid-1990s. Thereafter, the rate of growth of production will decline gradually unless additional large deposits are discovered.

34. Production of gas in the USSR grew by around 7.4% p.a. during the 1981-87 period. Production in 1987 was nearly 2% higher than the planned target. Most of the natural gas production in the USSR takes place in its four major deposits at Urengoi, Yamburg, Medvyezhe, and Vyngapur, of which the Urengoi deposits are the largest with proven reserves around 282 TCF (around 19% of the total proven reserves in the USSR). The production rate from the Urengoi deposits has accelerated over the last few years due mainly to delays in bringing on-stream the Yamburg deposits. However, work on the supply of gas from the Yamburg field, located 130 km to the north of the Urengoi, is already in progress. Higher production from the Urengoi deposits has also been facilitated by the construction of the 56-inch diameter trunkline that links the Urengoi fields to central regions and over 3,000 km to the western regions of the USSR. Plans for the development of at least 11 gas and condensate deposits newly discovered on the Yemal Peninsula inside the Arctic Circle will shift gas production to this area after the 1990s. A number of other discoveries in Turkmenia, mainly in Sovetabad and in the Pre Caspian Basin, are expected to enable production to reach 646 mtoe in 1990 and to move above 952 mtoe/year by 2000.

35. The rapid development of the USSR natural gas industry has been due partly to its ability to lay long-distance pipelines rapidly to link the major fields to the industrialized regions across the country. Currently, the supply grid covers over 1.5 000 km. This elaborate network has also facilitated deliveries to other Eastern European countries, as well as to Western Europe.

36. As oil is the most important source of foreign exchange earnings for the USSR, Eastern European countries have been encouraged to substitute gas for oil. Romania remains the second largest producer of natural gas among the CPEs, currently producing around 11 mtoe/year. However, Romanian production appears to have peaked. The CPEs' share of natural gas in total primary energy production is projected to increase from 3% in 1986 to around 39.3% in 2000. The region's share in total global natural gas production is anticipated to increase from 42.4% in 1986 to 45.2% in 2000 (Table 5).

37. Despite the slowdown in natural gas consumption following the decline in oil prices in 1986, natural gas production in a few oil-importing countries with large reserves has increased significantly over the recent years. Natural gas is expected to continue to play an important role in developing countries with large gas reserves such as Argentina (24 TCF), Pakistan (22.4 TCF), India (17.6 TCF), Egypt (9.36 TCF), and Thailand (3.72 TCF).

38. Natural gas production in the oil-exporting developing countries increased by around 4.5% p.a. between 1984 and 1986. Algeria is the largest producer of natural gas in the Middle East area. However, its proven reserves are only around 22% of Iran's, which has proven reserves estimated to be around 490 TCF. Given the magnitude of natural gas reserves in the oil-exporting developing countries and the large extent of domestic use expected around the turn of the century, the continuation of gas exports by these countries at the present levels beyond 2000 appears unlikely unless there are large discoveries. Only a few countries, such as Iran and Qatar, with significant gas reserves and reserves-to-production ratios over 700 years will be able to fill the gap which is likely to develop as existing exporters leave

the scene. It is projected that natural gas production in oil-exporting developing countries will increase from 160 mtoe in 1986 to 350 mtoe in 2000. In aggregate, the production of natural gas in developing countries is anticipated to grow at a rate of nearly 6% p.a. during the projection period, reaching 507.5 mtoe in 2000 (up from 221.8 mtoe in 1986). The share of developing countries in total supply is projected to rise from 15% in 1986 to 23% in 2000 (Table 5).

Trade Outlook

39. In general, international movements of natural gas are limited due to the lack of adequate gas transport and transmission networks. The volume of internationally traded natural gas increased rapidly in 1984 (by 8%) and 1985 (by 5%) after many years of stagnation. However, in 1986 trade in natural gas suffered as a result of the sharp decline in the international price of oil. With the exception of exports from the USSR to Western Europe, which increased from around 28 mtoe in 1985 (Table 6) to over 40 mtoe in 1986, movement of gas from other parts of the world declined in 1986. The higher exports from the USSR were due to significant increases in the import of USSR gas by Italy (up by 114%), the Federal Republic of Germany (by 18%), and France (by 31%). While imports from the USSR increased in 1986, European imports from Norway, Algeria, and the Netherlands declined by about 6.5%, 0.3%, and 17%, respectively. The increase in Japanese imports from Malaysia (by 13%) and Brunei (by 3.4%) contributed to the 2.2% increase in its total imports in the 1984–86 period. Japan imports mainly in the form of LNG from five countries--Indonesia, Brunei, Malaysia, the United Arab Emirates, and the United States.

40. The most significant decline in gas trade was in North America, where US imports from its principal exporter, Canada, declined by around 17.5% in 1986. Since 1986, however, the international movement of gas has increased. This increase was mainly due to the increase of over 30% in Canadian exports to the United States and an approximate 12% increase in exports from Norway--particularly to the Federal Republic of Germany (22%) and France (37%). Interregional trade still accounts for around 60% of the natural gas traded.

41. The intraregional trade among the Western European countries is projected to grow as the EEC's 14-year ban prohibiting the construction of gas-fired power plants and the use of gas for electricity generation will be abrogated this year. It is projected that Norway will significantly increase its exports in the 1990s. While Norwegian gas is currently supplied to Scotland and the Federal Republic of Germany through its two pipelines, it is expected that Norwegian gas supplies to Belgium will increase after the completion of another pipeline in the 1990s. The Netherlands, Belgium, Spain, and Austria are also expected to become significant natural gas markets. Norway is expected to supply gas as a result of Sweden's plans to close its nuclear reactors and to replace them by gas-fired power plants. In North America, Canada is expected to supply increasing quantities of natural gas to the US market. The expected gap in US gas supply in the late 1990s will need to be filled by imports and/or the construction of the Alaskan Natural Gas Transportation System.

TABLE 5: NATURAL GAS PRODUCTION BY ECONOMIC CLASSIFICATION, 1961-86 (ACTUAL) AND 1990-2000 (PROJECTED)

Countries/Economies	1961		1970		1986		1990		200	
	MTOE	%	MTOE	%	MTOE	%	MTOE	%	MTOE	%
Industrial	325.3	78.7	620.1	71.7	618.0	42.4	654.2	40.1	704.0	81.8
Centrally Planned	67.8	16.4	188.4	21.8	617.6	42.4	693.9	42.6	1,000.3	45.2
Developing	20.4	4.9	56.0	6.5	221.8	15.2	282.4	17.3	507.5	23.0
World	413.5	100.0	864.5	100.0	1,457.4	100.0	1,630.5	100.0	2,211.8	100.0

Note: Details may not add to total due to rounding.

Sources: United Nations, Energy Statistics (actual); World Bank (projected).

TABLE 6: ESTIMATES OF INTERNATIONAL TRADE IN NATURAL GAS IN 1985

	Importers					
	North America	Western Europe	Japan	Eastern Europe	Developing	Total
	(MTOE)					
Exporters						
Industrial Countries	23.4	57.5	1.4	-	-	82.3
Canada	23.4	-	-	-	-	23.4
The Netherlands	-	30.1	-	-	-	30.1
Norway	-	26.2	-	-	-	26.2
Others	-	1.2	1.4	-	-	2.6
Centrally Planned Economies	-	28.1	-	29.3	3.1	60.5
USSR	-	28.1	-	29.3	3.1	60.5
Developing Countries	0.8	19.6	33.0	2.3	1.8	57.5
Algeria	0.8	18.4	-	-	-	19.2
Indonesia	-	-	18.4	-	-	18.4
Brunei	-	-	7.2	-	-	7.2
Malaysia	-	-	4.7	-	-	4.7
United Arab Emirates	-	-	2.7	-	-	2.7
Libya	-	1.2	-	-	-	1.2
Bolivia	-	-	-	-	1.8	1.8
Afghanistan	-	-	-	2.3	-23.3	
Total	24.2	105.2	34.4	31.6	4.9	200.3

Sources: International Energy Agency, Oil and Gas Statistics; Trade Journals; various energy publications.

42. Exports of natural gas from the USSR are projected to increase sharply from 63 mtoe in 1986 to over 122 mtoe in 2000. USSR gas exports tow the Eastern European countries have increased steadily over the 1981-87 period. It is expected that almost one-half of the increase in exports from the USSR will be to supply the growing needs of Eastern European CPEs. The spare capacity in its existing export pipelines will also allow the USSR to move larger volumes of gas to Western Europe. However, while exports from the USSR to Turkey, Greece, and Finland are expected to increase, new suppliers entering the European market and competition from Norway are expected to prevent the USSR from improving its share of international gas trade significantly. However, the USSR is projected to maintain its predominant position in the world gas trade over the forecast period.

Price Outlook

43. Since the end of 1985, the existence of excess natural gas supplies in the United States and the emergence of the spot market have weakened the price of natural gas. The contractual environment that had been changed materially as a result of both sellers and buyers reneging on their obligations resulted in a decline in natural gas prices (most notably since the beginning of 1986). The decline in world oil prices contributed further to the decline in the price of internationally traded natural gas, as it had been tied to the price of crude oil and/or petroleum product prices.

44. Although there now appears to be some deviation in the price of internationally traded natural gas from its traditional linkages with the price of residual fuel and heating oil and towards parity with the price of steam coal, the pricing of natural gas still remains predominantly tied to oil prices. Due to the volatility of spot gas prices, coal parity gas pricing is being favored over spot gas pricing in the United States and in the European market, which is dominated by coal. European suppliers such as Norway, which are seeking bigger markets in the United States and in Western Europe, have also begun to devise gas contracts which would link gas prices to coal prices. This trend is influenced largely by the increase in gas use in the power-generation sectors in the industrial countries. However, because of its desirable characteristics, gas enjoys a premium over high sulfur coal in its two biggest markets, namely the residential and industrial sectors. Due to the high cost of coal desulfurization, natural gas should trade above coal prices and approach the price of fuel oil. In the United States, however, natural gas import prices are projected to be depressed until the "gas bubble" is worked off (towards the early 1990s), after which, as increasing quantities are consumed in the premium residential/commercial markets in most industrial countries, the price of internationally traded natural gas on a heat content basis will gradually move in the direction of a level based on an average of heating and low-sulfur fuel oil prices. By the end of the projection period, the landed price of natural gas into the US and Western European markets could approach the c.i.f. crude oil parity price.

TABLE A1: NATURAL GAS - PRODUCTION BY MAIN COUNTRIES AND ECONOMIC REGIONS

COUNTRIES/ ECONOMIES	ACTUAL				PROJECTED					GROWTH RATES A/		
	1969-71	1979-81	1986	1987/B	1988	1989	1990	1995	2000	1961-86	1970-86	1987 - 2000
	(MILLION TONS OF OIL EQUIVALENT)									(% PER ANNUM)		
INDUSTRIAL	611	699	618	632	639	648	654	684	704	2.6	-0.3	0.7
NORTH AMERICA	541	522	445	454	460	466	470	487	499	1.2	-1.5	0.6
UNITED STATES	492	455	373	379	382	388	389	390	387	0.8	-1.9	0.1
CANADA	49	68	72	76	78	79	80	97	112	5.3	1.5	2.7
EEC-10	65	140	129	133	133	135	135	136	136	11.9	2.6	0.1
NETHERLANDS	26	71	58	59	59	59	59	57	55	23.0	3.0	-0.5
UNITED KINGDOM	11	33	39	40	41	42	42	45	48	31.4	5.1	1.2
OTHER WESTERN EUROPE	2	25	26	27	27	27	27	30	33	15.9	25.2	1.5
NORWAY	0	24	25	26	26	26	26	29	32	...	...	1.6
JAPAN	3	2	2	2	3	3	3	3	4	1.7	-1.8	4.1
OCEANIA	1	9	16	16	17	18	20	29	32	56.5	14.9	4.7
NON-MARKET	198	408	618	642	658	670	694	837	1,000	8.2	7.7	3.0
USSR	166	360	569	592	609	621	646	790	953	8.5	8.5	3.2
EASTERN EUROPE	32	48	49	49	49	48	48	48	48	5.6	2.6	-0.2
ROMANIA	23	35	36	36	36	35	35	34	34	5.0	3.0	-0.5
DEVELOPING	57	154	222	235	247	263	282	368	508	10.2	8.5	5.3
ASIA	25	72	109	116	123	131	140	183	256	12.4	8.6	5.4
IRAN	9	10	8	8	9	9	11	17	30	10.7	-5.7	9.0
INDONESIA	2	14	27	30	32	34	35	40	52	11.3	26.8	3.7
AFRICA	3	23	43	47	50	53	57	75	97	22.0	18.3	4.9
ALGERIA	2	16	32	35	37	39	41	52	63	20.4	19.5	3.9
NIGERIA	0	1	3	3	3	3	3	5	7	...	...	5.8
AMERICA	28	57	67	69	71	76	81	105	147	6.5	6.0	5.2
MEXICO	10	23	23	23	24	26	29	40	61	6.0	6.5	6.6
ARGENTINA	5	8	13	14	14	15	16	19	27	6.7	6.4	4.5
VENEZUELA	9	15	18	18	19	19	19	22	25	5.5	4.7	2.1
SOUTHERN EUROPE	1	2	3	3	4	4	4	5	7	10.9	3.6	6.0
WORLD	866	1,261	1,457	1,509	1,543	1,581	1,631	1,889	2,212	4.9	3.0	2.6

A/ LEAST SQUARES TREND FOR HISTORICAL PERIODS (1961-86); END-POINT FOR PROJECTED PERIODS (1987-2000).
B/ ESTIMATE.

SOURCES: UNITED NATIONS ENERGY STATISTICS (ACTUAL);
WORLD BANK, INTERNATIONAL ECONOMICS DEPARTMENT (PROJECTED).

TABLE A2: NATURAL GAS - APPARENT CONSUMPTION BY MAIN COUNTRIES AND ECONOMIC REGIONS

COUNTRIES/ ECONOMIES	ACTUAL				PROJECTED					GROWTH RATES A/		
	1969-71	1979-81	1986	1987/B	1988	1989	1990	1995	2000	1961-86	1970-86	1987 - 2000
	(MILLION TONS OF OIL EQUIVALENT)									(% PER ANNUM)		
INDUSTRIAL	606	746	705	723	736	748	759	810	865	3.2	0.6	1.2
NORTH AMERICA	534	524	448	455	460	466	471	491	510	1.3	-1.3	0.8
UNITED STATES	504	478	397	403	407	412	415	429	442	0.9	-1.7	0.6
CANADA	30	46	51	51	53	54	55	62	68	6.3	2.9	1.9
EEC-10	65	184	199	204	207	211	216	233	251	13.9	5.5	1.4
GERMANY, FED. REP.	14	48	45	46	47	48	50	55	60	18.3	5.9	1.7
UNITED KINGDOM	12	43	51	53	54	54	55	59	62	29.7	7.2	1.1
ITALY	17	24	29	30	30	30	30	32	33	7.3	5.6	0.6
OTHER WESTERN EUROPE	3	7	8	9	9	9	10	12	16	8.7	6.7	4.3
JAPAN	3	22	35	40	44	45	46	53	64	16.6	17.1	3.1
OCEANIA	1	9	16	16	17	17	17	20	24	56.5	14.9	2.6
NON-MARKET	200	386	587	611	624	636	660	795	952	7.8	7.1	3.0
USSR	166	318	508	530	541	551	574	699	844	7.8	7.4	3.1
EASTERN EUROPE	34	69	79	81	83	84	86	96	107	7.8	5.7	1.9
ROMANIA	23	36	38	39	39	40	40	42	44	5.3	3.5	0.9
DEVELOPING	50	120	166	174	184	197	212	284	395	8.9	7.6	5.6
ASIA	21	49	69	74	79	85	93	130	186	10.0	7.1	6.3
SAUDI ARABIA	1	1	4	4	4	5	5	7	10	20.0	45.5	5.8
IRAN	8	8	9	8	9	9	10	14	20	10.2	-2.1	6.2
AFRICA	1	13	24	25	26	28	31	42	56	20.6	25.1	5.5
ALGERIA	1	8	13	14	14	15	16	21	26	18.7	27.5	4.5
AMERICA	27	55	67	69	71	76	80	100	136	6.7	5.9	4.7
MEXICO	10	21	23	23	24	26	28	38	55	6.6	6.2	5.9
ARGENTINA	5	9	15	16	16	17	18	20	25	7.7	6.8	3.4
SOUTHERN EUROPE	1	3	6	7	7	8	9	12	17	15.0	11.0	6.5
WORLD	856	1,253	1,457	1,509	1,543	1,581	1,631	1,889	2,212	4.9	3.1	2.6

A/ LEAST SQUARES TREND FOR HISTORICAL PERIODS (1961-86); END-POINT FOR PROJECTED PERIODS (1987-2000).
B/ ESTIMATE.

SOURCES: UNITED NATIONS ENERGY STATISTICS (ACTUAL);
WORLD BANK, INTERNATIONAL ECONOMICS DEPARTMENT (PROJECTED).

TABLE A3: NATURAL GAS - GROSS EXPORTS BY MAIN COUNTRIES AND ECONOMIC REGIONS

COUNTRIES/ ECONOMIES	ACTUAL				PROJECTED					GROWTH RATES A/		
	1969-71	1979-81	1986	1987/B	1988	1989	1990	1995	2000	1961-86	1970-86	1987 - 2000
	(MILLION TONS OF OIL EQUIVALENT)									(% PER ANNUM)		
INDUSTRIAL	32	89	75	82	83	83	86	103	113	11.7	5.2	2.2
NORTH AMERICA	21	23	23	26	27	26	26	36	45	4.4	-1.0	3.8
CANADA	20	21	21	24	25	25	25	35	44	4.4	-0.9	4.0
EEC-10	11	44	29	31	32	32	32	31	29	...	5.2	-0.6
NETHERLANDS	11	42	27	27	27	27	27	26	25	...	4.7	-0.7
OTHER WESTERN EUROPE	0	23	24	24	24	25	25	27	31	...	...	1.5
NORWAY	0	23	24	24	24	24	25	27	31	...	...	1.5
NON-MARKET	3	46	64	65	71	73	77	98	124	26.8	22.3	4.4
USSR	3	46	63	64	70	72	76	97	123	29.4	22.7	4.4
DEVELOPING	6	37	63	68	71	75	81	101	142	19.1	12.8	5.0
ASIA	4	24	41	43	46	48	51	61	87	34.6	13.0	4.7
INDONESIA	0	11	21	23	24	26	27	28	36	...	...	3.0
AFRICA	2	10	20	23	24	25	27	34	42	...	13.5	4.1
ALGERIA	2	8	19	22	23	24	25	31	37	...	17.0	3.5
AMERICA	1	4	2	2	2	2	3	6	13	4.8	9.1	14.0
WORLD	42	172	202	214	225	231	243	302	378	15.4	9.9	3.9

A/ LEAST SQUARES TREND FOR HISTORICAL PERIODS (1961-86); END-POINT FOR PROJECTED PERIODS (1987-2000).
B/ ESTIMATE.

SOURCES: UNITED NATIONS ENERGY STATISTICS (ACTUAL);
WORLD BANK, INTERNATIONAL ECONOMICS DEPARTMENT (PROJECTED).

TABLE A4: NATURAL GAS - GROSS IMPORTS BY MAIN COUNTRIES AND ECONOMIC REGIONS

COUNTRIES/ ECONOMIES	ACTUAL				PROJECTED					GROWTH RATES A/		
	1969-71	1979-81	1986	1987/B	1988	1989	1990	1995	2000	1961-86	1970-86	1987 - 2000
	(MILLION TONS OF OIL EQUIVALENT)									(% PER ANNUM)		
INDUSTRIAL	35	140	163	173	181	184	190	228	274	14.5	9.4	3.1
NORTH AMERICA	22	27	26	26	27	26	27	41	57	4.2	0.0	5.3
UNITED STATES	21	27	25	26	27	26	27	41	57	4.5	0.1	5.3
EEC-10	12	89	98	102	106	108	112	128	144	...	12.6	2.3
GERMANY, FED. REP.	4	34	34	34	35	36	38	44	50	...	12.5	2.5
FRANCE	3	18	23	24	24	25	26	31	36	...	11.6	2.8
BELGIUM-LUXEMBOURG	4	11	8	8	9	9	9	10	12	...	2.8	2.3
ITALY	0	13	17	19	19	20	20	23	24	...	0.0	1.6
UNITED KINGDOM	1	10	12	13	13	13	13	14	14	...	26.5	0.6
OTHER WESTERN EUROPE	1	5	6	6	7	7	7	9	13	...	10.9	5.1
JAPAN	1	20	33	38	42	43	43	50	60	...	26.0	3.0
NON-MARKET	6	26	33	35	37	39	42	56	75	22.5	9.3	5.3
USSR	4	4	2	2	2	2	3	7	15	...	-9.5	13.0
EASTERN EUROPE	2	22	31	32	34	37	39	50	61	22.8	19.2	4.3
DEVELOPING	0	3	7	7	7	8	10	18	29	16.0	17.2	9.9
ASIA	0	0	1	1	2	2	4	9	16	...	...	17.5
AMERICA	0	2	2	2	2	2	2	2	3	12.5	7.9	3.0
SOUTHERN EUROPE	0	1	3	4	4	4	5	7	10	...	...	6.9
WORLD	41	169	202	214	225	231	243	302	378	15.2	9.5	3.9

A/ LEAST SQUARES TREND FOR HISTORICAL PERIODS (1961-86); END-POINT FOR PROJECTED PERIODS (1987-2000).
B/ ESTIMATE.

SOURCES: UNITED NATIONS ENERGY STATISTICS (ACTUAL);
WORLD BANK, INTERNATIONAL ECONOMICS DEPARTMENT (PROJECTED).

COAL

Summary

1. International export prices of thermal coal in US dollar terms have shown some signs of recovery lately, helped by unexpectedly strong economic growth in parts of the industrial and developing world, restructuring of capacities, and appreciation of the Australian and South African currencies vis-a-vis the US dollar. However, this upturn is not likely to persist. Over the short- to medium-term horizon, thermal coal prices are projected to remain near current low levels because of an impending slowdown of consumption growth. For the remainder of the 1990s, improving market balance through steady demand growth will support slight price increases in real terms.

2. The world demand for coal of all types is projected to increase at 2.1% p.a. over the 1987-2000 period. With petroleum prices projected to increase faster than coal prices in the long term, the share of coal in its main end-use markets (thermal electricity and industrial boiler markets) is expected to increase further. However, its share of world primary energy consumption will remain more or less constant, at approximately 28%.

3. Recent appreciation of the Australian and South African currencies vis-a-vis the US dollar and increases in rail freight rates have resulted in a considerable erosion of the profitability of coal mining companies in these countries. The US coal industry continues to be the marginal supplier to world markets, but its competitive position relative to Australia and South Africa has improved considerably because of the US dollar depreciation and continued productivity improvements. Investments in new coal mining ventures have slowed appreciably in the past several years. This lack of capacity expansion could lead to a period of tight market conditions in the event of any large unexpected demand increases, as would happen if the price of petroleum suddenly increased.

4. There has been little change in the structure of the international coal trade. Despite its political problems and increased costs, South Africa has managed to increase exports but by less than would have been possible otherwise. Australia continued to gain market share--up to 27% in 1986 from 16.8% in 1980. China has shown the potential to become a large exporter but has experienced problems in securing exportable surpluses and suitable coal qualities.

Demand Outlook

5. In the wake of the sharp declines in petroleum prices and weak economic growth, world coal consumption increased by only 1.6% in 1986 and by an estimated 1.8% in 1987--down from 2.6% p.a. growth in the 1975-85 period. In the OECD, coal consumption increased by 1.7% in 1987, compared with 2% p.a. growth in the preceding 1978-86 period. OECD consumption of thermal coal increased 2.7% in 1987, slower than the 3.4% p.a. growth during the 1978-86 period. Early estimates point to a slight recovery of coal consumption, both

thermal and metallurgical, in late 1987 and early 1988, as a result of brisk economic expansion in the industrial countries and in some of the industrializing economies.

6. The share of coal in total primary energy consumption was increasing steadily until 1986 when petroleum prices declined sharply. In 1986, coal's share in world primary energy consumption fell to 28.6% from 29% in 1985. Over the 1975-86 period, the share of coal increased most in the industrial economies, followed by the non-market economies.

7. The increases in coal consumption mostly took place in the sectors that use coal as a boiler fuel. Table 1 shows that the shares of coal in OECD thermal power and industrial sectors continued to increase in 1986, but their growth rates slowed significantly because of lower petroleum prices. Subsequent increases in petroleum prices in 1987 and continued weakness in coal prices have restored coal's cost competitiveness over heavy fuel oil. At the latest international market prices, coal imported into Western Europe and Japan now holds a slight cost advantage over imported heavy fuel oil. However, as shown in Table 2, the high coal prices paid by the electric utilities in these countries often put coal at a disadvantage. The main reason for the high prices is the high cost of indigenously produced coal. In the Federal Republic of Germany, for example, the price paid in 1986 by electric utilities for thermal coal was more than 100% higher than that of imported coal and 45-50% higher than that of heavy fuel oil for the equivalent heat value.

TABLE 1: OECD COAL CONSUMPTION AND FUEL SHARES

	1973	1978	1985	1986
Coal Consumption (MTCE)				
Thermal power	532	615	820	815
Industry	285	241	242	227
Thermal power fuel shares (%)				
Coal	50.9	54.0	70.6	71.4
Oil	32.9	31.0	13.6	14.2
Gas	16.2	15.0	15.9	14.4
Industry fuel shares (%)				
Coal	17.5	15.3	17.2	16.5
Oil	44.8	44.7	35.9	37.2
Gas	21.6	20.5	22.6	21.0

Source: IEA, Coal Information, 1987 and 1988.

TABLE 2: FUEL PRICES AND COSTS OF ELECTRICITY GENERATION IN SELECTED OECD COUNTRIES, 1986

	Fuel Prices (US$/TCE)		Fuel Costs (Mills/KWh) c/		Total Costs (Mills/KWh) d/	
	Coal a/	HFO b/	Coal	HFO	Coal	HFO
United States	46.2	68.6	16.8	25.7	31.0 - 36.6	36.2 - 37.1
Japan (average)	86.5	131.6	31.4	49.3	45.6 - 51.2	59.8 - 60.7
Imported	44.9		16.3		30.5 - 36.1	
Indigenous	118.5		43.0		57.2 - 62.8	
Germany, F.R. (average)	111.8	74.2	40.6	27.8	54.8 - 60.4	38.3 - 39.2
Imported	48.6		17.6		31.8 - 37.4	
Indigenous	128.6		46.6		60.8 - 66.4	
United Kingdom (average)	73.7	81.7	26.7	30.6	40.9 - 46.5	41.1 - 42.0
Imported	54.7		19.8		34.0 - 39.6	
Indigenous	96.8		35.1		49.3 - 54.9	
Italy	56.5	77.3	20.5	28.9	34.7 - 40.3	39.4 - 40.3

a/ The average prices are delivered prices to the utilities, while those of imported coal and indigenous production are c.i.f. prices and mine-mouth prices, respectively.
b/ Heavy fuel oil.
c/ Assuming conversion efficiency of 36% for coal and 37% for heavy fuel oil.
d/ Assuming operating costs of 5.3 mills/KWh for coal-fired units and 2.6 mills/KWh for oil-fired plants for all countries. Capital costs are assumed to range from 14.2 to 19.8 mills/KWh for coal and from 10.5 to 11.4 mills/KWh for oil-burning power plants.

Source: Compiled from IEA, Coal Information, 1987, World Energy Outlook 1982, and Costs of Coal Pollution Abatement, 1983.

8. Recently, some of the countries with high-cost domestic coal have started to implement programs and policies to gradually phase out the subsidizing of inefficient coal mining. Japan, for example, plans to close all but three of its most efficient mines by 1992, while expanding imported coal use in industrial sectors as well as for power generation. With appreciation of the yen and mounting pressure to cut costs to maintain international competitiveness of exports, it has become increasingly difficult to pass on the high cost of domestic coal to Japanese industries. Japan had shunned coal for environmental reasons but lately has come to accept it because of the new coal-burning technologies (see para. 15).

9. In the Federal Republic of Germany, with its long tradition of coal mining and still sizable production, changes in coal policy have proven to be more difficult. The high cost of German coal is paid by electricity consumers in the form of surcharges (Kohlepfenning), currently amounting to 7.5% of their electricity bills. Faced with the prospect of increased domestic coal production under the current system, the pressure to reduce subsidies and to cut capacities is mounting. To date, however, a compromise acceptable to the miners, industry, and consumers has not emerged. Other European countries also have the same problem to varying degrees. We have assumed that over the long term, economic efficiency considerations will dictate the policies of these countries, as is the case in Japan. 1/

10. It appears the above changes in energy policies are anticipated by the policymakers of these countries. The electric utility programs of the OECD countries submitted in 1986 to the International Energy Agency (IEA) foresee that the share of coal-fired power capacity will increase from 52.8% of total thermal power capacity in 1985 to 62% in the year 2000. In terms of total electric power capacity, coal's share is projected only to increase from 34% in 1985 to 35% in 2000 because of the faster increase expected in nuclear capacity than in coal capacity. However, if the uncertainties surrounding nuclear programs are taken into consideration, one may have to allow for an even greater share for coal in power generation.

11. The share of coal in total primary energy consumption of the developing countries is projected to decline from 39.1% in 1986 to 36.5% by 2000. Although coal consumption in the developing countries is projected to grow faster than petroleum consumption--3.2% p.a. for coal and 2.8% p.a. for petroleum between 1986 and 2000--coal's share is expected to decline because of rapid increases in consumption of natural gas and primary electricity.

12. Developing economies with significant coal-fired power programs include China, Greece, Hong Kong, India, Indonesia, Republic of Korea, Malaysia, Pakistan, Philippines, Portugal, Singapore, Thailand, Turkey, Yugoslavia, and Zimbabwe. Some of these economies have gone through a

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1/ Japan, the Federal Republic of Germany, and the United Kingdom accounted for about 18% of OECD coal production in 1986. If these three countries rationalize their policies and substitute imports for, let us say, 30% of domestic production, 60 million tons of new import demand would be generated--equivalent to 25% of the OECD's 1986 imports.

substantial revision of their power programs in recent years, mostly involving greater reliance on coal at the expense of nuclear power (e.g., Republic of Korea and Taiwan, China) or hydrocarbon fuels (e.g., Indonesia and Malaysia). The total coal-fired power capacity in various stages of planning in the developing countries (excluding China) amounts to 103.7 gigawatts (GW), which is more than double the existing capacity of 50.2 GW. 2/ (It is close to the planned total of 113.9 GW in the industrial countries.)

13. Continued expansion of coal capacity in the electric power sector in both the industrial and developing countries is an indication of the utilities' expectation that petroleum prices will increase much faster than coal prices over the long term. As noted above, the most recent price differentials favor imported coal in major markets, and the differential is projected to widen. In the event that these expectations do not materialize and petroleum prices remain near or below recent levels over an extended period, demand for thermal coal could be significantly affected. It is estimated that a 10% decline in petroleum prices would reduce long-term demand for thermal coal by about 5%. The impact could be much sharper at the prices that make coal and petroleum equal in terms of total power-generating costs. If we take $45/ton as the long-term price of coal, c.i.f. Europe or Japan, the international price of crude oil could be no less than $16/barrel in order for coal to be cost competitive. However, the likelihood of crude oil prices falling below $16/barrel for an extended length of time over our long-term projection period is considered remote.

14. The demand for metallurgical coal is closely related to production of iron and steel. World production of steel is projected to grow only slowly--at 1.6% p.a. during 1987-2000. Most of the increase in production is expected to take place in the developing countries of Asia and Latin America, while the industrial countries' production is expected to increase only slightly. The projections of coal demand have taken these expected developments into account.

15. Recent progress in coal-burning technologies has been remarkable. It has enabled greater coal utilization even in countries highly concerned about pollution. Two refinements to the fluidized-bed combustion (FBC) process--circulating bed-FBC (CFBC) and bubbling-bed FBC (BFBC), which are the dominant technologies today--have eliminated the problems of the earlier versions to such an extent that sulfur and nitrogen oxide emissions have been reduced to minimal levels. Further improvements may be forthcoming. Interesting progress also has been made in coal gasification which may significantly alter the way coal is utilized in the future.

2/ Planned capacities include those only under consideration that may not be realized before 2000. See IEA's power station survey in Coal Information 1988, Annex II.

Supply Outlook

16. During the 1980-86 period, world production of solid fuels increased steadily at 2.6% p.a., compared with 2.9% p.a. growth during the period 1975-80. Almost 70% of the net increase in production between 1980 and 1986 took place in the developing countries, while the industrial countries contributed 21% and the non-market economies the remaining 9%. The rapid increase in production in developing countries (at 6% p.a. during the 1980-86 period) is mostly accounted for by a few countries. China and India increased production to meet rising domestic demand, while Colombia and South Africa expanded as major exporters. Among the industrial countries, production increases in Australia and the United States were offset by declines in Western Europe and Japan. Both Poland and the USSR failed to achieve their full potential as sources of supply to other Eastern European countries and the West.

17. World coal resources are ample to meet all perceived needs. Reserves available in the major coal-producing countries--Australia, China, Colombia. India, South Africa, Poland, the United States, and the USSR--are large enough to sustain continued expansion. Production from Western Europe, Japan, and Republic of Korea will continue to trend downward, sometimes very sharply, because of resource depletion and high costs. There are, however, only a few potential entrants into the league of large coal producers and exporters. Indonesia is developing the Kalimantan coal resource to supply its coal-fired power plants and for export to the East Asian market. Botswana and Mozambique have sizable coal resources but so far have been unable to exploit them. Venezuela has begun to export coal and may have the potential to become a large exporter. It would not be surprising if large coal resources were found in other parts of Latin America.

18. In the absence of sharp petroleum price increases such as those experienced in the 1970s, the coal industry is likely to remain demand-constrained for much of the 1990s. The major coal producers and exporters will continue to compete intensely. Market shares will be determined largely by costs. Several factors affect supply costs. The most important include reserve characteristics, mining methods, wage rates, interest rates, rail and ocean freights, and exchange rates. In the last several years, significant changes have taken place in many of these variables, partly because of low coal prices. The net effect of these changes has been drastic reductions in delivered costs of coal.

19. One of the more significant developments in the 1980s has been the steady improvement in labor productivity in coal mining. As shown in Table 3, output per man-day in US coal mining increased by 57% between 1980 and 1986, while the real mining wage rate increased by 4% over the same period. Improvements in other countries are less pronounced but still impressive. It is estimated that the increases in labor productivity contributed to about $5-7 in cost savings in the United States and $3-4 in Australia. Not enough information is available to make estimates for South Africa. US labor productivity has suffered greatly during the 1970-78 period in the wake of the 1969 Mine Health and Safety Act and the substitution of nonunion for union labor. Since 1979, US labor productivity has continued to improve as the industry learned to adjust to the new rules and the labor force became more skilled. Closures of inefficient mines have also helped raise average productivity.

TABLE 3: LABOR PRODUCTIVITY AND REAL WAGES IN COAL MINING, 1970-86 (1980=100)

	United States		Labor Productivity		
	Labor Productivity	Real Wages d/	Australia a/	Germany, F.R.	United Kingdom
1970	122	83	84 b/	122 c/	
1981	109	98	103	99	103
1982	110	101	101	102	104
1983	130	103	106	102	108
1984	137	106	120	105	96
1985	142	105	133	113	97
1986	157	104	144		

a/ 1979-80=100. Years are for the fiscal year starting July 1.
b/ For 1972-73.
c/ For 1975.
d/ Wages and salaries of full-time equivalent employees of the coal mining industry, deflated by the consumer price index.

Sources: US Department of Energy, Coal Production, 1976; Joint Coal Board, Black Coal in Australia, various issues; US National Coal Association, International Coal, various issues.

20. No doubt, labor productivity will continue to improve but probably at a lower rate than in the past, primarily because the easier gains to be made under the new rules have already been achieved. The immediate benefits of mine restructuring have also been gained. Against this backdrop, the labor unions have become more active in Australia, South Africa, and parts of Europe. Low coal prices have been the main depressant of real wage increases. Once profitability improves, demands for higher wages could become difficult to resist. These considerations suggest that only minor reductions of costs will result from labor productivity improvements.

21. Compared to 1986, it is estimated that in 1987 Australian costs in real US dollar terms increased by 8.4% due to exchange rate adjustments, while in South Africa costs increased by about 20% (see Table 4). Since the exchange rates of these currencies had depreciated in earlier years, the latest changes must be looked at from a longer perspective. In comparison to 1980, exchange rate changes have enhanced cost competitiveness of Australian and South African coals relative to US coal. The Colombian peso has been steadily depreciating since 1980. The depreciation helped improve Colombian coal's competitive position vis-a-vis US coal by 76% from 1980 to 1987.

22. Recently, increases in rail freight rates in both Australia and South Africa further eroded the competitive position of the two countries. South Africa's rail freight rate was increased by 80% in 1987. Ocean freight rates also increased by an average of US$1.75/ton in 1987, which put Australia and

TABLE 4: REAL EFFECTIVE EXCHANGE RATE INDEXES OF MAJOR COAL EXPORTERS (1980=100)

	Australia	South Africa	Colombia
1981	108.4	107.6	105.2
1982	108.7	114.7	99.7
1983	106.5	114.2	109.7
1984	109.6	104.6	96.9
1985	92.3	91.3	73.5
1986	80.7	68.1	67.9
1987	80.6	60.7	76.6

Source: IMF, International Financial Statistics, various issues.

South Africa at a further disadvantage in the European and East Asian markets, respectively. More details of developments in the key producing countries are given below.

23. United States. Despite worsening competitiveness in international markets and consequent declines in market shares until very recently, US coal production has been increasing steadily throughout the 1980s. The increases were supported by growing domestic consumption. However, the United States remains the high-cost swing producer. Renewed interest in US coal from European and other buyers may be an indication of improved prospects for US coal exports. Despite transportation problems, western open-cast production will continue to expand faster than that from the eastern Appalachian region, thus holding down average US costs.

24. Canada. Canada's coal export industry has faced serious problems recently. Its inability to match the low international prices has resulted in loss of markets.

25. Australia. With increasing market share, Australia has rapidly expanded mine capacity and related infrastructure. Almost all of the net increase in production in the 1980s came from open-cast mines in Queensland and New South Wales. In underground production, most of which is located in New South Wales, the share of production from longwall faces increased from less than 5% in 1980 to more than 25% in 1986. Largely because of these changes, labor productivity improved by 40% between 1981 and 1986. Despite these changes, the Australian coal industry has been only marginally profitable lately because of high mining wages, increases in rail freight rates, royalties and taxes, and appreciation of the Australian dollar. Australia, however, has room for further cost savings, by increasing open-cast and longwall production, reducing royalties, and controlling freight and port charges.

26. South Africa. Despite rapid increases in mining wages and recent escalation of rail charges and its currency exchange rates, South Africa still remains the lowest-cost supplier of thermal coal. However, the margin has shrunk considerably and may soon disappear unless measures are taken to reduce

costs. There were some reported cases of restructuring in 1987. Continuing political problems probably will hinder this effort as well as the marketing of its coal.

27. Colombia. With successful marketing of El Cerrejon North coal to the European markets, Colombia appears to be poised for further expansion of the same deposit formation or of newly discovered areas. The key factor in these decisions will be capital costs and its financing.

28. China. Although China has great potential to become a major coal exporter, a number of uncertainties cloud its future. Recently, China failed to deliver on its contractual volume, highlighting its problem of securing exportable surplus in the face of high and rapidly growing domestic consumption. To become a major exporter, China has to make large investments in mining and infrastructure, which may not be high priority programs at this time.

Trade Outlook

29. World coal imports increased by 4.9% p.a. between 1980 and 1986, down somewhat from the 5.5% annual growth of the 1973-80 period. The growth rate for 1980-86 would have been much higher had petroleum prices not declined drastically in 1986 leading to a slight downturn in coal imports in that year. Over the 1987-2000 period, world coal imports are projected to increase at 3.0% p.a., compared with the projected growth rate of 2% p.a. for world coal consumption. This differential in growth rates arises because production in the coal-importing countries is not expected to grow as fast as demand. Most of the net increase in demand will be for thermal coal.

30. Major exporters of coal will continue to dominate the market. However, export markets are expected to become increasingly more competitive, not only between countries but also among different companies in the same country. Recent industry restructuring has not resulted in greater concentration in the United States. 3/ Furthermore, government policies on coal mining have been moving toward relaxation of controls (e.g., Australia's lifting of price controls) and removal of subsidies. Increases recently in ocean freight rates will favor Australia, China, and Indonesia in the Asian market, while the United States, South Africa, and Colombia will be in a better position in the European market.

Price Outlook

31. In the wake of the 1985/86 collapse of petroleum prices, export prices of thermal coal have steadily declined through early 1988 (see Table A5). The subsequent partial recovery of petroleum prices has had no apparent impact on coal prices until very recently. US export prices declined

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3/ US Department of Energy, The Changing Structure of the US Coal Industry, 1976-86, June 1988.

$10.40/ton between 1985 and 1987, while Australian and South African prices declined $6.30/ton and $9.60/ton, respectively. However, in percentage terms, coal prices have declined much less than petroleum prices. US export prices have declined more than the Australian prices, narrowing the quality-adjusted price differential from $12/ton in 1985 to $8/ton in 1987.

32. Coal prices tended to firm up in early 1988--by $2-3/ton in the spot market and in 1988 contracts. There has been unexpectedly strong demand growth for both thermal and metallurgical coals. Cost increases in Australia and South Africa also could have been a factor. It is, however, too early to tell whether coal prices have finally bottomed out.

33. While many of them were losing money at last year's prices, at current export prices the major exporters reportedly have returned to profitability. If that is true, today's price structure may be close to the cost conditions of the currently operating marginal producers.

34. Over the short term, economic growth rates in the industrial and developing economies will largely dictate the level of international coal prices. It is estimated that closures of inefficient mines in the United States have substantially reduced excess capacity; the average US capacity utilization rate in 1986 stood at 93.3%--up significantly from 88% in 1982. Excess capacity available for exports is believed to be small, with all the major exporters reportedly fully committed. Thus, the market balance could tip either way depending on demand growth. With economic growth expected to slow down in 1989 and 1990, the world coal market should operate with some excess capacity through 1990. Therefore, coal export prices should remain weak, but not so as to fall below 1986-87 lows in real terms. In the event that coal demand continues to grow at about 2% p.a. over the short term, there is a strong likelihood that a tight supply-demand balance will be reached by 1990. Prices then could easily recover by $3-4/ton.

35. Another factor that could boost Australian and South African export prices in the short term is further appreciation of their currencies. Compared to 1980 levels, the inflation-adjusted exchange rate of the Australian dollar vis-a-vis the US dollar was still 10% lower as of May 1988. The South African rand was 31% lower than its 1980 level. Given the recent strength of their primary export prices, the possibility of further real appreciation of these currencies is fairly high. Appreciation would act as a cost push to prices, further narrowing the gap between them and US export prices.

36. With the healthy growth forecast for the market economies from 1992, the international coal market is expected to return to much improved balance. The low prices of the last several years have discouraged investment. Any capacity expansions would be likely to proceed at a lower rate than consumption growth. Export prices then may be expected to recover to levels that allow profits for the majority of the exporters, or roughly the prices currently prevailing.

37. The medium- to long-term prospects for thermal coal prices appear moderately encouraging. There are several reasons for this. First, petroleum prices are expected to increase much faster than coal prices, making coal ever

more economical than petroleum. Second, the market economies are expected to grow at a fairly rapid pace by recent standards. Third, the relatively low energy prices expected to prevail in the 1990s may revive investments in capital goods that heavily use energy, particularly electricity. Fourth, safety concerns are likely to lead to further scaling down of nuclear energy programs. Fifth, rationalization and restructuring of inefficient coal mines in Europe and Japan will be unavoidable in the long run. Against these positives must be weighed the industry's tendency to overinvest in mine capacity expansions. The coal industry has operated for much of the time with excess capacity. There is little reason to expect that it will behave differently in the future, which implies that the coal industry will operate for most of the time in the 1990s along the long-run marginal cost curve.

38. Various studies have indicated that the cost of coal mining will increase only very slowly over the long term due to resource depletion. In the United States, the average rate of increase should not exceed 1% p.a. Increases in mining wages in real terms could be largely offset by improvements in labor productivity. The f.o.b. export price of US thermal coal, therefore, is projected to increase at 0.5% p.a. in real terms (deflated by the US GDP deflator, see Table A5), reflecting an assumed 1% p.a. increase in mining costs and a 1.5% p.a. decline in rail freight rates. In South Africa, however, real mining wage rates could increase faster than productivity, resulting in faster increases in total mining costs than for its competitors. Despite a significant number of new mines coming into production in Australia, its cost structure has remained remarkably stable. We expect this situation to continue. Mining costs in Australia are projected to increase at 0.5% p.a. while its rail freight rate is assumed to remain constant in real terms. The need to invest in the rail network in Australia could prevent freight rates from falling.

39. Several important uncertainties face the thermal coal market. One is the possibility of another petroleum price shock. The short-term impact on coal prices of such a shock during the 1990s could be substantial, given the more balanced supply and demand conditions expected to prevail during that time. The continuing abundance of coal, however, will minimize the long-term impact of such a shock. Another important uncertainty is the likelihood of continuing political turmoil in South Africa that could result in serious supply disruptions. With much of the excess capacity eliminated, a supply interruption in South Africa or in any other important coal exporter could substantially drive up the prices in the short term.

TABLE A1: SOLID FUELS - PRODUCTION BY MAIN COUNTRIES AND ECONOMIC REGIONS

COUNTRIES/ ECONOMIES	ACTUAL				PROJECTED					GROWTH RATES A/		
	1969-71	1979-81	1986	1987/B	1988	1989	1990	1995	2000	1961-86	1970-86	1987 - 2000
	(MILLION TONS OF OIL EQUIVALENT)									(% PER ANNUM)		
INDUSTRIAL	666	717	780	793	807	821	835	911	986	0 5	1 3	1.5
NORTH AMERICA	371	455	508	522	531	542	551	603	657	2 2	2 4	1 5
UNITED STATES	363	431	469	479	487	497	504	549	593	1 9	2 0	1 4
EEC-10	235	191	171	164	168	171	174	178	181	-2 7	-1 8	0 7
GERMANY, FED REP	99	87	78	75	77	79	81	83	86	-1 7	-1 3	0 9
UNITED KINGDOM	89	73	62	59	60	61	62	63	64	-3 3	-2 8	0 5
OTHER WESTERN EUROPE	2	1	2	2	3	3	3	3	3	-1 0	1 8	2 0
JAPAN	24	11	10	10	10	9	9	8	7	-6 0	-4 3	-2 7
OCEANIA	33	59	90	95	96	97	99	120	138	6 7	5 6	2 6
AUSTRALIA	32	58	89	93	94	95	97	118	137	7 0	5 7	2 6
NON-MARKET	317	588	618	629	635	643	649	673	707	1 4	1 0	0 8
USSR	309	348	351	355	359	362	364	371	389	1 2	0 6	0 6
EASTERN EUROPE	208	240	268	274	276	280	285	303	318	1 7	1 5	1 0
POLAND	85	111	123	127	128	131	133	143	151	2 8	1 9	1 1
DEVELOPING	293	520	724	740	764	793	823	962	1,122	5 9	5 7	2 8
ASIA	235	417	578	589	609	632	655	768	886	6 3	5 5	2 8
CHINA	169	307	430	437	452	469	488	571	649	6 7	5 6	2 7
INDIA	36	65	94	98	102	106	110	132	159	5 0	6 6	3 3
AFRICA	37	70	97	99	100	102	104	112	132	5 3	6 9	1 9
SOUTH AFRICA	34	66	93	95	96	98	100	107	125	5 7	7 4	1 8
AMERICA	6	11	17	18	21	23	27	35	47	4 9	6 4	6 5
SOUTHERN EUROPE	16	23	33	34	35	36	37	47	57	3 5	4 6	3 6
WORLD	1,476	1,825	2,123	2,162	2,206	2,257	2,307	2,546	2,814	2 0	2 3	1 8

A/ LEAST SQUARES TREND FOR HISTORICAL PERIODS (1961-86); END-POINT FOR PROJECTED PERIODS (1987-2000)
B/ ESTIMATE

SOURCES: UNITED NATIONS ENERGY STATISTICS (ACTUAL);
WORLD BANK, INTERNATIONAL ECONOMICS DEPARTMENT (PROJECTED)

TABLE A2: SOLID FUELS - APPARENT CONSUMPTION BY MAIN COUNTRIES AND ECONOMIC REGIONS

COUNTRIES/ ECONOMIES	ACTUAL				PROJECTED					GROWTH RATES A/		
	1969-71	1979-81	1986	1987/B	1988	1989	1990	1995	2000	1961-86	1970-86	1987 - 2000
	(MILLION TONS OF OIL EQUIVALENT)									(% PER ANNUM)		
INDUSTRIAL	692	727	798	813	825	839	854	924	1,000	0.6	1.3	1.4
NORTH AMERICA	341	394	447	456	464	471	479	522	567	1.9	2.1	1.5
UNITED STATES	325	371	418	425	433	441	448	490	532	1.8	1.9	1.5
EEC-10	262	233	228	232	234	237	241	255	270	-1.7	-0.4	1.0
UNITED KINGDOM	91	72	66	68	68	68	68	69	71	-2.9	-2.1	0.3
GERMANY, FED. REP.	91	81	79	80	80	81	83	86	90	-1.4	-0.5	0.8
OTHER WESTERN EUROPE	10	10	14	14	14	15	15	18	22	0.1	2.2	3.0
JAPAN	57	58	74	76	76	78	79	83	90	2.1	1.8	1.2
OCEANIA	22	31	35	36	37	38	39	45	52	3.5	2.9	2.6
NON-MARKET	501	570	594	603	609	617	623	650	683	1.4	1.0	0.8
USSR	297	334	339	343	346	349	350	356	369	1.2	0.6	0.5
EASTERN EUROPE	203	236	255	260	263	269	273	294	315	1.6	1.4	1.3
POLAND	67	92	97	99	100	102	104	114	121	2.8	2.3	1.4
DEVELOPING	296	517	731	746	772	801	831	973	1,131	5.9	5.6	2.8
ASIA	234	424	600	612	634	658	682	800	921	6.4	5.8	2.8
CHINA	168	308	434	440	455	473	492	574	650	6.8	5.7	2.6
INDIA	36	65	96	100	104	108	111	134	161	5.1	6.8	3.2
AFRICA	37	53	69	70	71	72	73	78	91	3.7	4.1	1.8
SOUTH AFRICA	33	48	63	64	64	65	66	68	78	3.9	4.3	1.4
AMERICA	9	15	20	21	22	24	25	35	48	4.8	5.9	5.8
SOUTHERN EUROPE	18	25	42	44	45	48	50	61	70	3.9	5.5	3.2
WORLD	1,489	1,814	2,123	2,162	2,206	2,257	2,307	2,546	2,814	2.0	2.3	1.8

A/ LEAST SQUARES TREND FOR HISTORICAL PERIODS (1961-86); END-POINT FOR PROJECTED PERIODS (1987-2000).
B/ ESTIMATE.

SOURCES: UNITED NATIONS ENERGY STATISTICS (ACTUAL);
WORLD BANK, INTERNATIONAL ECONOMICS DEPARTMENT (PROJECTED).

TABLE A3: SOLID FUELS - GROSS EXPORTS BY MAIN COUNTRIES AND ECONOMIC REGIONS

COUNTRIES/ ECONOMIES	ACTUAL				PROJECTED					GROWTH RATES a/		
	1969-71	1979-81	1986	1987/b	1988	1989	1990	1995	2000	1961-86	1970-86	1987 - 2000
	(MILLION TONS OF OIL EQUIVALENT)									(% PER ANNUM)		
INDUSTRIAL	76	112	141	153	156	159	161	185	208	3.6	4.1	2.1
NORTH AMERICA	40	60	71	77	79	82	83	91	100	3.9	4.0	1.8
UNITED STATES	37	50	53	55	56	58	58	61	62	2.6	2.8	0.8
CANADA	3	11	18	22	23	24	25	31	38	16.6	9.3	3.8
EEC-10	25	23	14	16	17	17	17	17	18	-2.3	-2.0	1.0
OTHER WESTERN EUROPE	0	0	0	0	0	0	0	0	1	3.5	5.3	1.4
JAPAN	0	1	2	2	2	2	2	2	2	18.8	17.9	1.7
OCEANIA	11	27	55	59	59	59	60	75	87	14.5	9.0	2.6
AUSTRALIA	11	27	55	59	59	59	60	75	87	14.4	9.0	2.6
NON-MARKET	40	41	51	55	55	56	57	60	65	1.6	0.3	1.1
USSR	17	18	18	20	20	21	22	23	28	1.1	0.0	2.3
EASTERN EUROPE	24	23	33	35	35	35	35	36	37	1.8	0.5	0.3
POLAND	18	18	27	29	29	29	29	30	30	2.6	0.4	0.3
DEVELOPING	4	23	40	43	44	47	51	61	78	10.7	19.8	4.1
ASIA	2	4	6	6	7	7	7	9	13	3.7	7.8	4.7
AFRICA	2	19	30	32	32	33	34	39	47	14.7	27.1	2.7
SOUTH AFRICA	1	18	30	32	32	33	34	39	47	19.7	29.6	2.7
AMERICA	0	0	4	4	6	8	10	13	18	27.8	31.6	9.8
COLOMBIA	0	0	4	4	6	8	10	13	18	...	39.2	9.8
SOUTHERN EUROPE	0	0	0	0	0	0	0	0	0	7.3	7.1	2.3
WORLD	120	175	233	251	256	263	270	306	350	3.6	4.2	2.2

a/ LEAST SQUARES TREND FOR HISTORICAL PERIODS (1961-86); END-POINT FOR PROJECTED PERIODS (1987-2000).
b/ ESTIMATE.

SOURCES: UNITED NATIONS ENERGY STATISTICS (ACTUAL);
WORLD BANK, INTERNATIONAL ECONOMICS DEPARTMENT (PROJECTED).

TABLE A4: SOLID FUELS - GROSS IMPORTS BY MAIN COUNTRIES AND ECONOMIC REGIONS

COUNTRIES/ ECONOMIES	ACTUAL				PROJECTED					GROWTH RATES A/		
	1969-71	1979-81	1986	1987/B	1988	1989	1990	1995	2000	1961-86	1970-86	1987 - 2000
	(MILLION TONS OF OIL EQUIVALENT)									(% PER ANNUM)		
INDUSTRIAL	97	138	159	173	175	177	180	198	223	3.5	3.4	1.7
NORTH AMERICA	12	12	10	11	11	11	11	11	11	0.7	-1.2	-0.1
CANADA	12	10	9	9	9	9	9	9	9	0.0	-1.6	-0.5
EEC-10	44	67	72	83	84	83	84	94	107	2.3	4.1	1.7
FRANCE	11	20	12	13	13	14	14	16	20	1.9	2.4	2.7
ITALY	8	11	14	14	15	15	16	20	23	2.7	4.3	3.3
GERMANY, FED. REP.	7	8	9	14	14	13	12	13	15	0.3	2.1	0.3
BELGIUM-LUXEMBOURG	8	9	9	9	9	9	10	11	12	0.8	0.8	2.4
OTHER WESTERN EUROPE	8	10	12	12	12	13	13	16	19	0.8	2.6	3.2
JAPAN	33	49	66	68	68	70	72	78	86	8.7	3.9	1.6
OCEANIA	0	0	0	0	0	0	0	0	1	0.0	0.0	102.1
NON-MARKET	24	26	27	28	29	31	31	36	42	1.2	0.2	2.6
USSR	5	4	7	8	8	8	8	8	8	2.5	0.9	0.3
EASTERN EUROPE	19	22	19	21	22	23	23	28	34	0.8	-0.1	3.3
DEVELOPING	7	21	47	49	52	55	58	72	86	8.5	14.6	3.8
ASIA	1	11	28	30	31	32	34	41	48	14.3	28.2	3.2
AFRICA	2	2	2	2	3	3	3	4	6	1.0	4.2	6.5
AMERICA	3	5	7	7	7	8	9	13	18	6.1	6.7	6.8
SOUTHERN EUROPE	2	3	10	10	11	12	13	14	14	6.5	10.4	2.0
WORLD	128	184	233	251	256	263	270	306	350	3.7	4.0	2.2

A/ LEAST SQUARES TREND FOR HISTORICAL PERIODS (1961-86); END-POINT FOR PROJECTED PERIODS (1987-2000).
B/ ESTIMATE.

SOURCES: UNITED NATIONS ENERGY STATISTICS (ACTUAL);
WORLD BANK, INTERNATIONAL ECONOMICS DEPARTMENT (PROJECTED).

TABLE A5: SPOT EXPORT PRICES OF THERMAL COAL

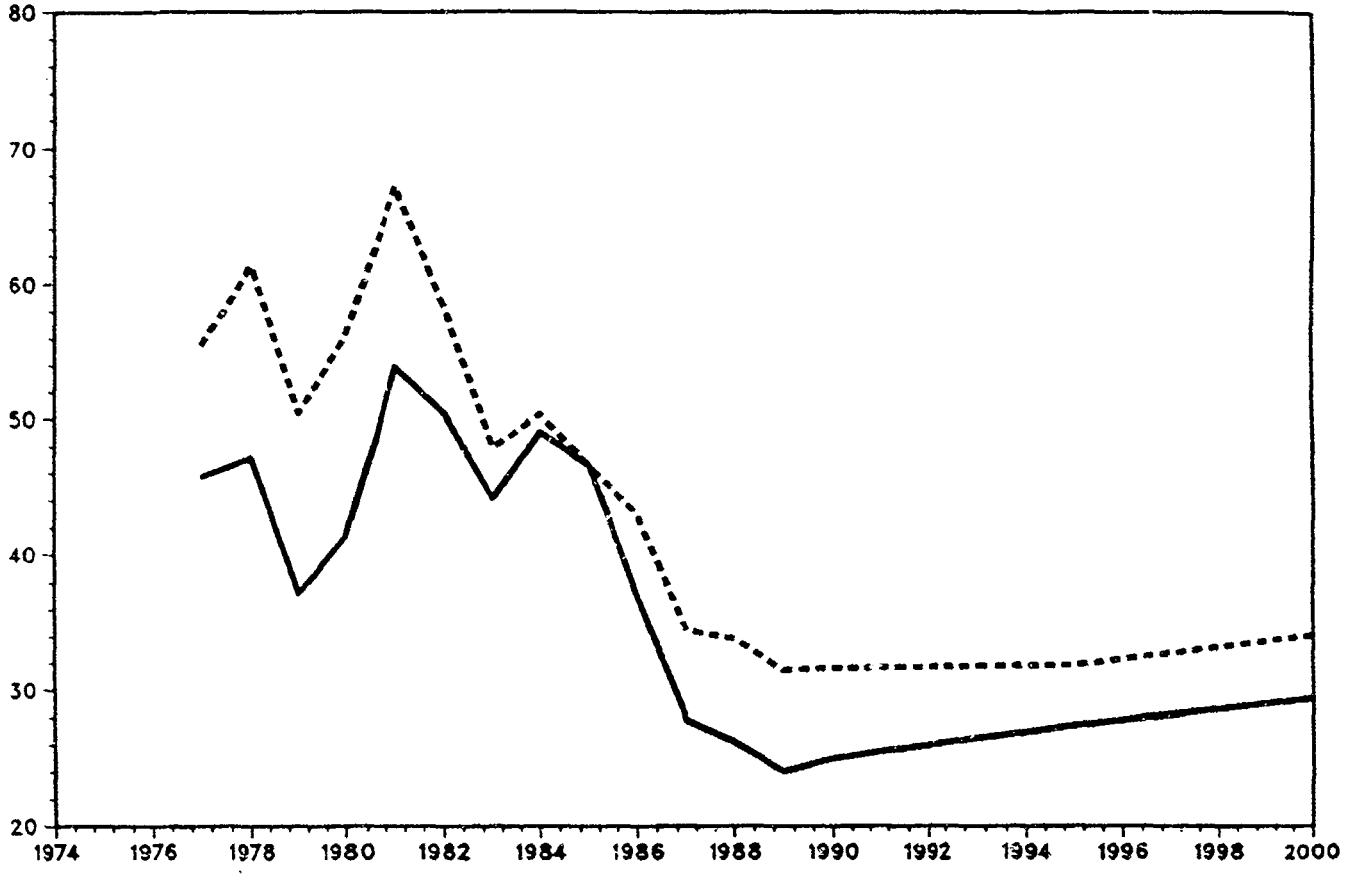
	United States a/			South Africa b/			Australia c/		
	Current $	1985 Constant $ MUV d/	1985 Constant $ US GNP e/	Current $	1985 Constant $ MUV d/	1985 Constant $ US GNP e/	Current $	1985 Constant $ MUV d/	1985 Constant $ US GNP e/
Actual									
1977 f/	33.4	45.8	55.5	19.6	26.9	32.6	29.0	39.7	48.2
1978	39.6	47.2	61.3	20.1	23.9	31.1	28.6	34.1	44.3
1979	35.4	37.2	50.4	21.2	22.3	30.2	29.7	31.2	42.3
1980	43.1	41.3	56.2	30.5	29.2	39.8	39.4	37.8	51.4
1981	56.5	53.9	67.3	40.9	39.0	48.7	52.8	50.4	62.9
1982	52.2	50.5	58.4	42.7	41.3	47.8	54.8	53.0	61.3
1983	44.5	44.2	47.9	31.6 (37.4)	31.4	34.0	38.2 (39.1)	37.9	41.1
1984	48.6	49.1	50.4	32.1 (37.9)	32.4	33.3	31.0 (31.7)	31.3	32.1
1985	46.6	46.6	46.6	33.5 (39.4)	33.5	33.5	33.8 (34.6)	33.8	33.8
1986	43.9	37.1	43.0	26.8 (32.6)	22.7	27.8	31.1 (31.8)	26.3	32.2
1987	36.2	27.9	34.5	23.9 (32.6)	18.4	22.8	27.5 (28.2)	21.2	26.2
May 1988	37.0			26.8 (29.7)			33.0 (33.7)		
Projected									
1988	37.0	26.3	33.6	28.0	19.9	25.4	34.0	24.2	30.8
1989	36.0	24.1	31.0	27.0	18.1	23.2	33.0	22.1	28.4
1990	38.0	25.0	30.8	28.0	18.5	22.7	34.0	22.4	27.6
1995	49.7	27.5	31.6	37.1	20.5	23.6	44.5	24.6	28.3
2000	66.7	29.4	34.2	50.6	22.3	25.9	59.7	26.3	30.6

Note: The figures in parentheses show the US quality equivalent prices of South African and Australian coals.
a/ 12,000 btu/lb, <1% sulfur, 12% ash, f.o.b. piers, Hampton Roads, Norfolk, United States.
b/ 11,300 btu/lb, <1% sulfur, 15% ash, f.o.b. piers, Richards Bay, South Africa.
c/ 12,000 btu/lb, <1% sulfur, 14% ash, f.o.b. piers, Newcastle/Port Kembla
d/ Deflated by Manufacturing Unit Value (MUV) Index.
e/ Deflated by US GNP deflator.
f/ May-December 1977.

Sources: Coal Week and Coal Week International, various issues (actual); World Bank, (projected).

COAL

(CONSTANT 1985 DOLLAR PRICES *)



DEFLATED BY MANUFACTURING UNIT VALUE (MUV) INDEX

DEFLATED BY U.S. GNP DEFLATOR.

* 1948 – 87 ACTUAL ; 1988 – 2000 PROJECTED .

SOURCE : WORLD BANK , INTERNATIONAL ECONOMICS DEPARTMENT .

METALS AND MINERALS

COPPER

Summary

1. After a prolonged period of low prices, international copper prices staged a dramatic run-up in 1987 and, buoyed by strong demand increases and reduced capacities in the wake of the industry's restructuring, remained at high levels through the first half of 1988. Copper prices are expected to decline sharply from 1989 and remain at low levels through the early 1990s--most of the time below US$0.70/lb. This price behavior will be determined by a combination of slower industrial growth and large production units coming on-stream in the near future. Over the long term, prices are expected to reflect the costs of the marginal producer, likely to be represented by large-scale mines necessary to meet the demand increases to the year 2000.

2. World demand for refined copper is projected to increase at only 1.5% p.a. over the 1987-2000 period. This demand forecast is slightly higher than that made two years ago. The main reason for the higher forecast is the possibility that in the 1990s the copper-intensive capital goods sector may grow faster than previously thought likely because of lower petroleum prices and pent-up demand for investment. Over the medium term, the main competition for copper will come from such conventional substitutes as aluminum and plastics. Rapid development of superconducting materials pose the greatest long-term threat to copper. Recent consumption increases have raised doubts about the pessimism behind a long-term demand forecast of 1.5% p.a. However, we can find no justification for changing our forecast in a significant way.

3. Unusually large production units are expected to come on-stream during the 1988-91 period. These projects were initiated in the 1970s and early 1980s when copper prices were relatively high. Few new greenfield mining projects have been studied in recent years; the 1990s are likely to witness the implementation of only a few large-scale copper mining projects. Industry restructuring, the increasing share of the solvent extraction/electrowinning (SxEw) process, and exchange rate adjustments have sharply reduced the costs of copper production in the 1980s. Developing countries will probably be able to offset the increasing capital costs resulting from declining ore grades by productivity improvements.

4. The copper mining industry in the industrial countries, particularly the United States, has undergone considerable restructuring and reorganization in recent years. The multinational oil companies have virtually divested their interests in the copper industry. Mergers and acquisitions have allowed the major mining companies to streamline and consolidate their holdings to improve operational efficiency. Severe international competition has also forced the developing countries to improve the efficiency of their state-owned mining companies. In fact, in an abrupt departure from past policies, Mexico decided to privatize Cananea and La Caridad, the country's two main copper operations.

Demand Outlook

5. After a sharp decline in 1985, the market economies' consumption of refined copper experienced two years of strong increases--by 4.7% in 1986 and by an estimated 3.7% in 1987. This turnaround, responsible in large part for the copper price boom in 1987-88, had been totally unexpected. Although long-term implications should not be drawn from a two-year upturn, it nevertheless provides reason for reassessing the post-1973 trend of sharply declining metals intensity of output. Some of the causes of the recent increases in copper consumption are only beginning to be understood. The most fundamental of these causes--increased production of metal-intensive capital goods--may point to a future for copper demand that is not altogether as bleak as previously expected, at least for the medium term.

6. Most of the major copper-consuming countries participated in the 1985-87 demand increases. Moreover, the increases applied to almost all lines of copper products. The net increase in consumption between 1985 and 1987 was about equally divided between industrial countries and developing countries (including China); the non-market economies had virtually no change. Growth was particularly strong in the United States; Japan; the Federal Republic of Germany; France; Italy; Republic of Korea; Taiwan, China; Chile; Mexico; and Brazil.

7. The most unusual aspect of the 1985-87 increase in consumption was that the market economies' growth, measured in terms of GDP, has not been particularly strong, except for a few developing countries. The industrial countries' consumption of copper increased almost at the same rate as that of GDP in both 1986 and 1987, even when the GDP growth rate was slightly below average. In developing countries, copper consumption grew at more than twice the growth rate of GDP in 1986 and 1987. This behavior represents a significant departure from past relationships. The main reason appears to be that the copper-intensive industrial and capital goods sectors have done better than the rest of the economy in the United States, Japan, Italy, and several other industrial countries. For the industrial countries as a whole, the growth rate of industrial production in 1987 is estimated at 5.1%, compared with GDP growth of 2.7%. In the United States, depreciation of the dollar finally started to generate export demand for US manufactures while higher capacity utilization and pent-up demand for investments spurred production of capital goods. Particularly impressive has been machine tools production, which has achieved a record level since the 1982 recession. Japan's industrial production increased briskly in 1987, stimulated by expansion of domestic expenditure which was reflected most sharply in a boom in domestic car sales. While the industrial sector was lackluster in the Federal Republic of Germany and other parts of north Europe, copper consumption received a major boost from the construction industry, which benefited from low interest rates and mild weather throughout the region. Exchange rate adjustments are considered the main reason for the phenomenal growth of manufactured exports and hence copper consumption in Republic of Korea and Taiwan, China.

8. There have been some indications that changes in technology and taste may be working in favor of copper. For example, after years of decline, copper intensity in automobiles has started to move upward with an increasing

degree of electronic sophistication. The proliferation of computers and other electronic products through all sectors of the economy has provided the main growth market for copper. The pleasing colors and textures of copper and copper alloys also appear to have regained preference among consumers.

9. Against this backdrop, we consider the following as the main factors that will determine the future demand for copper:

(a) growth of industrial production, particularly the capital goods sector, in relation to GDP;

(b) competition between copper and other conventional substitute materials such as aluminum and plastics; and

(c) technological innovations in material science, particularly in superconducting materials.

10. The forecasts of copper consumption for the major copper-consuming countries are based on historical relationships between copper consumption and gross domestic capital formation (or industrial production), and the prices of copper and other factors of production. It is thought that the capital goods sector is more representative of copper-intensive manufacturing than the industry as a whole. The conventional approach to copper demand analysis has been to focus only on the prices of copper and its important substitutes, particularly aluminum. In most manufactured products, however, copper is a minor input and the decision to use copper may be determined more by considerations of other factors than by its price. The sharp increases in energy prices may have had a significant role in the decline in the copper intensity of GDP, through energy-capital and energy-material complementarity in the production process. In a significant departure from the conventional approach, we have included the price of energy (represented by the price of crude oil) in our copper demand equations. For the majority of countries, its inclusion substantially improve the results. Copper and energy are generally found to be complements.

11. Over the short to medium term, the demand for copper is largely contingent on economic activity in the industrial and developing market economies. The implications of the US fiscal and balance-of-payments imbalances cloud the medium-term economic prospects. Given that the imbalances cannot be perpetuated, subsequent adjustments to eliminate them will certainly involve economic costs in terms of reduced output and employment. This report assumes that the adjustments will be only moderately costly and relatively short-lived. Therefore, unlike in previous recessions, the market economies' copper consumption is projected to decline only by 0.9% between 1988 and 1990. If the adjustments turn out to be more costly and protracted, copper consumption could decline sharply during this period and even beyond.

12. The world consumption of refined copper is projected to grow at 1.9% p.a. over the 1990-2000 period, somewhat higher than the 1.6% p.a. growth we projected two years ago. The upward revision is based upon the view that the 1990s will include a period of substantial investment activity.

13. The main competition for copper in the various end-use markets is likely to come from the already-known substitutes, i.e., aluminum, plastics and optical fibers. In the longer term, the development of superconducting materials could jeopardize copper's commercial future. Copper's share in the electrical transmission cable market has been stable for some time at about 75%. However, continued improvements in aluminum wires pose a renewed threat to copper in that market. The shift from copper to aluminum in heat exchange equipment, particularly in automobile radiators, is expected to continue unless relative prices change decidedly in favor of copper. Plastics enjoy a large cost advantage over copper so it is expected that they will eventually take over most of the water distribution tubing market. Fiber optics technology will continue to displace copper in the telecommunications market--reducing copper use in telecommunications by approximately 50% by the end of 1990s.

14. Development of commercially-viable, superconducting material could spell disaster for copper, unless copper turns out to be a major ingredient of the material. The rapid progress recently made in this area has heightened the prospect of developing such a material in the not so distant future. The use of copper as an electrical conductor roughly accounts for more than 50% of the industrial economies' copper consumption.

15. On the positive side, the trend toward computerization and automation will continue to give a strong boost to copper consumption. In the past ten years growth in copper demand for electronics uses resulted from rapid increases in the volume of such products that more than made up for the reductions due to miniaturization. Another positive factor is the prospect of continued demand growth in developing countries. The countries that have been rapidly industrializing will continue to do so, although probably at slower rates. Structural adjustment efforts made by the heavily-indebted developing countries may be expected to bring them back on the growth path in the 1990s. Large developing countries such as Brazil, India, and China have great potential for growth in consumption of raw materials such as copper, but this potential is often smothered by government restrictions which raise their prices.

Supply Outlook

16. The 1980s witnessed surprising changes in the structure and economics of copper production. The changes may be grouped under the following four headings: (a) mine restructuring, leading to closure or modernization of inefficient units; (b) the emerging importance of the solvent extraction and electrowinning (SxEw) process; (c) exchange rate adjustments by major copper-exporting countries; and (d) consolidation of ownership through mergers and acquisitions. Forced largely by low prices during this period, these changes eventually resulted in cost savings of different degrees to different producers and hence changes in their competitive position in the world market. In large measure, these changes have completely reshaped the industry.

17. Between 1980 and 1986, about 760,000 tons of copper mine capacity (equivalent to 11% of the market economies' total capacity in 1986) was closed

permanently or idled indefinitely. In addition, as of 1986 about 240,000 tons of capacity were temporarily out of commission for modernization purposes or because of market conditions. Table 1 summarizes changes in the market economies' copper production capacity in the 1980s. There was a net decline in capacity between 1980 and 1986 because of what appears to be unusually large closures in the industrial countries. Closures were heavily concentrated in the United States and Canada where the industry experienced large-scale restructuring of inefficient mines. The developing countries, however, managed to increase their total capacity over the period; capacity closures were largely limited to normal retirement of old mines. The table conceals the fact that capacity additions could have been much larger had the projects planned to come on-stream by 1986 been realized as scheduled. A large part of these new investments will come on-stream in the next two to three years.

TABLE 1: CHANGES IN MARKET ECONOMIES' COPPER CAPACITY, 1980-86

	Net Change	Closures	Reduction of Existing Capacities	New Capacity Additions	Expansion of Existing Capacities
	('000 Tons CU)				
Developing Countries	217	-162	-435	329	485
Industrial Countries	-595	-500	-377	115	266
Total Market Economies	-378	-761	-812	444	751

Source: World Bank.

18. The painful adjustment period the copper mining industry experienced in the 1980s has had a profound impact on the industry's cost structure and its investment decisions. Already, investments in new mines and expansions of existing ones have been taking place at a substantially reduced pace. This will affect capacity availability in the 1990s. The criteria for new investments have become much more stringent than in the 1970s. The fact that the industry refused to reactivate idled capacity during the price boom of 1987-88 reflects the industry's restrained outlook for the future.

19. SxEw is a method of producing copper cathodes directly from the tailings accumulated from past production or from the ore (in-situ leaching). As such, it does not require smelting and refining; neither does it require mining when tailings are used. Since the SxEw process bypasses these steps, the direct cash cost of SxEw production is substantially lower than that of the conventional mining and refining. Throughout the 1980s, the SxEw technology has been simplified and improved to overcome quality problems; in the process the industry has succeeded in reducing direct cash costs by 30%. In the United States, where the technology was pioneered, the direct cash cost of SxEw averages about $0.30/lb compared with about $0.60/lb for conventional production methods. As a result, the share of SxEw has been

rapidly increasing in the last 10 years, reaching 13% of total US production in 1987 and going up to 23% in 1988. It is estimated that the increased share of SxEw reduced the average US cash cost by about $0.05/lb in 1988. Because of the large cost advantage, it is clear that SxEw will play an increasingly important role not only in the United States but also in other major copper-producing countries.

20. Exchange rate changes between the major copper-producing countries had a major impact on their international competitiveness. Table 2 shows the changes in exchange rates of the major producers adjusted for their domestic inflation. It is seen that practically all of the developing country producers have had their real exchange rates vis-a-vis the US dollar depreciate by 50-300% between 1980 and 1987. Depreciation of the US dollar since 1986 vis-a-vis the major industrial country producers helped to improve the US competitive position.

21. The net result of the adjustments discussed above has been sharp reductions in the costs of producing copper. For the market economy producers as a whole, the average direct cash cost is estimated to have declined from the high of $0.63/lb in 1981 to $0.45/lb in 1986, and average total costs from $0.82/lb to $0.66/lb. Among the components of total cost, indirect production costs have declined substantially while depreciation and interest charges have increased slightly. Thus, most of the savings in total costs resulted from reductions in the direct cash costs of mining and refining.

TABLE 2: REAL EFFECTIVE EXCHANGE RATE INDICES a/ OF MAJOR COPPER PRODUCERS (1980=100)

	Australia	Canada	Chile	Mexico	Peru	Philippines	Zambia	Zaire
1981	108.4	106.5	118.0	108.6	109.8	103.2	102.2	92.6
1982	108.7	109.7	106.7	70.6	102.0	107.1	113.9	97.7
1983	106.5	113.9	86.8	64.9	89.6	90.1	105.6	114.3
1984	109.6	111.6	85.3	73.6	84.9	89.2	90.8	45.6
1985	92.3	106.4	68.8	73.3	68.3	97.6	84.0	41.3
1986	80.7	98.2	58.2	56.2	93.7	76.2	40.5	41.2
1987	80.6	99.7	53.9	55.8	98.9	70.1	42.7	35.6

Source: IMF, International Financial Statistics, various issues.

a/ Those rates not provided by the International Financial Statistics were estimated as follows: national currencies per US dollar, deflated by the consumer price indices of the respective countries.

22. The countries with the largest declines in costs were Zambia, South Africa, Australia, the United States, and Chile. The industrial country producers' cost savings came mostly from "real" adjustments (productivity improvements, etc.), while exchange rate adjustments dominated the changes among the developing countries. This general picture is somewhat misleading,

however. Productivity gains in Chile, for example, were largely wiped out by the deterioration in the ore grade (by almost 20%) and the increase in the stripping ratio. Zambia moved from the position of highest-cost producer to the lowest-cost producer through a combination of exchange rate adjustments and productivity improvements, despite small declines in ore grade. Cost savings in the United States were attained by closures of high-cost mines, productivity improvements through modernization of equipment and mining techniques, enhancement of ore grades through exploitation of better deposits, and lowering of wage rates. The collapse of by-product cobalt prices was the main contributor to the increase in Zaire's costs.

23. It is important to emphasize that the developing countries' competitive position has been maintained in large part by exchange rate adjustments which may or may not be sustainable in the long run. In any case, as a long-term strategy, it would be highly desirable for these countries to achieve cost-saving productivity improvements comparable to those attained in industrial countries in the recent past. This task will require infusion of capital and efficient management, among other things.

24. A tally of known copper mine projects--new projects under construction or firmly committed, extensions of existing facilities, and attritions or planned closures due to resource depletion or deterioration of ore grade--indicate that the market economies' effective mine capacity will rise substantially over the medium term to slightly more than 8 million tons by 1995, or 13% above the 1987 level. This increase will be the result of a number of large-scale projects that have been planned and implemented for some time and already have come close to start of operation. Country-by-country mine capacity projections are shown in Table 3.

25. Capacities in 1995 and beyond will be determined by investment decisions yet to be made. Although there is no lack of potential areas that could be developed, the decision to do so may be severely constrained by the adverse market conditions expected to prevail through the early 1990s. It is therefore expected that capacity expansions will be significantly slowed down in the second half of the 1990s to return to a more balanced supply and demand condition by 2000 (see Table 4). Recent developments and prospects for the major copper-producing countries are summarized below.

26. Australia. The Olympic Dam project, due to come on-stream in 1988 and gradually to expand capacity throughout the 1990s, has made some progress in marketing by-product uranium as well as copper. Future expansions may be constrained by highly uncertain market conditions for uranium. This project and a few other projects based on known reserves are expected to more than offset declines in existing Australian mines.

27. Chile. Continued deterioration in ore grade at Chuquicamata has necessitated large investments to increase mill throughput in recent years. Although financial constraints within Chile have delayed part of these investments in recent years, CODELCO has largely been successful in carrying out the necessary investments. However, increasing arsenic content and declining grade of ore are posing an element of uncertainty to future expansions at Chuquicamata, the world's largest copper mine. Not subject to these problems is SxEw production; practically all of future production increases from Chuquicamata are expected to come from SxEw. The huge

TABLE 3: PROJECTED MINE CAPACITIES OF THE MAJOR COPPER PRODUCING COUNTRIES, 1988-2000

	1988	1989	1990	1995	2000
	('000 Tons CU in Concentrates and Leach Output)				
Zambia	510	500	490	420	300
Zaire	500	500	490	530	600
South Africa	198	186	180	186	181
Other Africa	107	99	89	48	40
Australia	270	300	310	330	350
Papua New Guinea	250	300	300	320	350
Philippines	220	190	190	200	200
Indonesia	107	115	150	150	150
Other Asia and Middle East	243	244	247	260	278
United States	1,590	1,620	1,680	1,500	1,450
Canada	800	800	780	710	650
Chile	1,510	1,630	1,700	2,100	2,350
Peru	400	380	370	390	420
Mexico	280	290	290	320	350
Brazil	54	60	85	130	150
Other Latin America	3	5	10	19	19
Portugal	20	85	110	130	130
Yugoslavia	128	130	140	150	150
Other Western Europe	142	140	138	130	120
Total Market Economies	7,332	7,574	7,749	8,023	8,238

Source: World Bank (projected).

Escondida mining project has been under investigation for a long time and may finally come to realization by the early 1990s. The contribution of small mines will increase through recently opened Los Pelambres mine.

28. Papua New Guinea. Upgrades of facilities at the Bougainville mine--preconcentration screening, tailings pipeline, etc.--will increase its production over the next several years. However, the mine faces a significant increase in stripping ratio in the 1990s which will increase its costs and reduce production. An SxEw facility now under study could partly compensate for this decline; the proposal, however, is not firm enough to be counted as a

TABLE 4: MARKET ECONOMIES' a/ REFINED COPPER BALANCE, 1987-2000

		1987	1988	1989	1990	1995	2000
		('000 Tons CU)					
(1)	Concentrate Production	6,303	6,550	6,677	6,810	7,106	7,512
(2)	Concentrate Net Imports b/	13	13	13	12	10	10
(3)	Smelter Output ((1+2) x.965)	6,095	6,333	6,456	6,583	6,867	7,263
(4)	Blister Net Imports b/	-8	-8	-8	-8	-7	-7
(5)	Scrap	1,200	1,320	1,150	1,150	1,300	1,600
(6)	Electro & Fire Refined Output (3+4+5)	7,287	7,645	7,598	7,725	8,160	8,857
(7)	SxEw Production	727	874	1,005	1,045	1,230	1,400
(8)	Total Refined Production (6+7)	8,014	8,519	8,603	8,770	9,390	10,257
(9)	Refined Net Imports b/	140	110	100	100	50	50
(10)	Refined Availability (8+9)	8,154	8,629	8,703	8,870	9,440	10,307
(11)	Refined Demand	8,455	8,690	8,372	8,511	9,412	10,405
(12)	Stock Changes (10-11)	-301	-63	331	359	28	-98
(13)	Reported Stocks	462	399	730	1,089	1,747	1,397
(14)	Months Consumption	0.66	0.55	1.05	1.54	2.23	1.61

a/ World excluding USSR and Eastern Europe.
b/ Net imports vis-a-vis USSR and Eastern Europe.

Source: World Bank.

future supply source. The large Ok Tedi project, despite its great potential, is beset with a number of problems that probably will prevent it from becoming a truly large-scale operation.

29. United States. After drastic restructuring and consolidation, the United States emerged as a competitive supplier of copper. Capacity expansions planned through 1995 consist almost exclusively of SxEw projects, based on accumulated leach dumps. Opening a new mine has become a rare event. Although SxEw will increase US production through 1995 or even beyond, its future is limited by the size of the existing leach dump. US production, therefore, is likely to decline in the long term, unless new ore bodies are developed.

30. Zambia. World Bank assistance to the Zambian copper industry at least temporarily arrested the sharp decline in production. The large investment in the Tailings Leach III (SxEw) project will contribute only marginally to Zambia's production over the short term because of technical problems. Over the long term Zambia faces declining ore reserves and ore grades, as well as more difficult mining conditions, all of which require

large investments to overcome. Without such investments and appropriate policies regarding exchange rates and other measures to improve efficiency, Zambia's production will continue to decline, maybe even faster than projected.

31. Zaire. Blessed with particularly high-grade but difficult-to-concentrate ore reserves, Zaire is expected to increase production primarily through opening up of new mines. An example is the Tenke Fungurume deposit which should be exploited towards the end of the 1990s. With no significant deterioration of ore grade expected in the near future, the existing mines should be able to maintain current production levels with moderate investments and upkeep of equipment.

32. Other Countries. Canada faces the prospect of sharp reductions in production because of resource depletion. Peru's production is expected to suffer greatly if investments are not made at its two large mines. Despite the financial and other problems the Philippines copper industry has been experiencing, its production level is expected to be roughly maintained through 1990s, thanks to reserve additions and expansions at several mines. Significant production increases are expected to come from Indonesia, Portugal, Mexico, and Brazil.

33. Production of refined copper from secondary sources (scrap) depends on the stock of scrap and the price of refined copper. Over the long term, the proportion of secondary copper in total refined copper supplies has been increasing (from 14.4% in 1976 to 15.2% in 1986 for the market economies) and will continue to do so in the future (to 16.2% by 2000) as the stock of scrap increases.

34. An evaluation of the existing and expected new smelter capacities indicates that there will be more than enough smelter capacity available through 2000. The smelter capacity utilization rate as a whole is expected to reach only about 70-80%; refined copper supplies, therefore, will not be constrained by smelter capacity.

Price Outlook

35. Preliminary 1987 data indicate that world demand for refined copper exceeded supplies by 283,000 tons, while the market economies' reported stocks declined by 397,000 tons. By the end of 1987, steady declines (which have been going on since 1982) reduced reported stocks to the lowest level in 17 years. These market fundamentals explain most of the dramatic increases in copper prices in 1987, which peaked at over $1.40/lb on both the LME and COMEX markets in late December 1987.

36. During the first half of 1988, copper prices have shown extreme volatility with respect to changes in exchange stocks and demand indicators. For the first 8 months of 1988, the LME price averaged $1.08/lb, slightly above our forecasts made in January. After a summer lull in demand, the price strongly rebounded in September, reaching $1.20/lb. The main reason for the unexpected rise in copper prices in the second half is the strong growth of industrial economies and hence copper consumption. Despite reactivation of

the large Bingham Canyon mine, increased production of secondary copper, and coming on-stream of several new units, the surge in consumption all but wiped out excess supplies expected to occur in the second half. As a result, copper prices are likely to average out the year at well over $1/lb.

37. The supply and demand balance expected over the short to medium term (see Table 4) points to the likelihood of large excess supply over demand during the 1989-92 period. This excess will be due on the one hand to the big surge in production from new mine capacities to come on-stream in 1988-91 and low demand growth expected over this period because of economic slowdown. The size of this imbalance is estimated to peak at 359,000 tons in 1990 even under the mild recession scenario of this report. If the economic downturn is severe enough to result in declines in world copper consumption during 1989-90, the excess supply availability will be even larger--perhaps as much as 500,000 tons. Even if the expected economic slowdown does not materialize and the market economies grow strongly, the excess supply is not likely to disappear. The expected supply increases are too large to be absorbed by even moderate increases in demand.

38. It is not clear at this time what net impact the expected changes in key financial variables--exchange rates, inflation, and interest rates--will have on copper prices. With higher inflation and interest rates expected over the short term and with the US dollar exchange rate vis-a-vis other major currencies remaining more or less stable, the net effect of these variables on copper prices may be negative as long as investors do not consider copper a good inflation hedge. In any case the impact, if any, will probably be small compared to that of the market fundamentals.

39. Considering these factors, we forecast that copper prices will fall sharply in 1988-89 and remain within the $0.60-0.70/lb range over the medium term--probably through most of the early 1990s. In the event of a sharp downturn in economic activity, prices could fall to extremely low levels, even lower than the 1986 level in nominal terms. Low prices could result in project delays that would smooth out the market imbalance to a certain extent and force further restructuring of the industry, particularly among the inefficient mines in developing countries. Such adjustments would to some extent moderate the price decline.

40. The excess capacity and low prices over the medium term will probably be followed by a period of low investment, improving market balance and hence higher prices. Lately, new mining ventures, particularly large-scale projects, have become a rarity. The only large-scale copper project under preparation is Chile's Escondida project. It is doubtful that there will be more than 2-3 large-scale mining projects coming on-stream throughout the 1990s. It is widely recognized that the long-term demand for copper will not increase sufficiently to justify a continuation of mine investments at the rate experienced in the 1960s and 1970s. Therefore, demand growth to 2000 is likely to be met by expansions of existing mines, additional SxEw facilities, and only a few new mines.

41. Over the long run copper prices in real terms may be expected to gravitate towards the cost of production of the marginal supplier. Among the major producers, the United States currently is close to being the marginal

producer on a cash cost basis, while in terms of total costs Mexico and the Philippines are near the top because of their high interest charges. Among the possible new mining projects, Escondida's cash operating cost is estimated at $0.37/lb while the total cost peaks at about $0.76/lb because of the huge investment required for the project.

42. Cost conditions will change in the future in directions difficult to predict. However, a few trends have emerged which may be expected to continue. First, ore grades in some of the key producing countries have been deteriorating persistently, requiring investment to maintain production capacities. Depreciation and interest costs, therefore, are expected to increase relative to operating costs. Second, developing country governments have begun to take measures to improve the efficiency of their state-owned enterprises. Privatization of Mexico's Cananea and La Caridad is an example in this direction, as well as measures taken by Zambia and Zaire. Recapitalization through privatization could result in large reductions in capital costs, particularly interest charges. Third, the recent declines in costs in the industrial countries may have bottomed out on a mine-by-mine basis, although the overall costs may still come down because of the increasing share of SxEw.

43. Given these trends, the marginal supplier by 2000 may be represented by the US mines or the new mines yet to be developed, such as the Escondida project, because of its high capital costs. Escondida probably is the most cost-competitive among the potential new mining projects. The long-term price projections here are based on the assumption that projects like Escondida will be needed by 2000 and the long-term prices will have to be high enough to justify an investment in such a project. This view is also consistent with the market balance projections (Table 4) that suggest a tight supply/demand balance during 1995-2000, even with the Escondida project and a few other new projects contributing to supply.

TABLE A1: COPPER ORE - PRODUCTION BY MAIN COUNTRIES AND ECONOMIC REGIONS

COUNTRIES/ ECONOMIES	ACTUAL				PROJECTED					GROWTH RATES A/		
	1969-71	1979-81	1986	1987/B	1988	1989	1990	1995	2000	1961-86	1970-86	1987 - 2000
	('000 TONS)									(% PER ANNUM)		
INDUSTRIAL	2,435	2,528	2,361	2,390	2,495	2,330	2,340	2,210	2,020	1.2	-1.0	-1.3
NORTH AMERICA	2,042	2,069	1,891	1,995	2,090	1,930	1,930	1,850	1,600	0.9	-1.4	-1.7
UNITED STATES	1,447	1,388	1,147	1,275	1,350	1,230	1,230	1,330	1,150	0.2	-2.1	-0.8
CANADA	595	681	743	720	740	700	700	520	450	2.3	-0.1	-3.6
OCEANIA	155	237	245	223	260	270	280	270	350	4.7	2.2	3.5
AUSTRALIA	155	237	245	223	260	270	280	270	350	4.7	2.2	3.5
NON-MARKET	1,095	1,486	1,609	1,630	1,650	1,670	1,690	1,820	2,050	3.9	1.9	1.8
USSR	930	1,037	1,030	1,040	1,050	1,050	1,060	1,130	1,270	2.2	0.0	1.5
EASTERN EUROPE	165	450	579	590	600	620	630	690	780	11.0	7.3	2.2
DEVELOPING	2,712	3,916	4,488	4,521	4,597	4,548	4,660	5,560	6,210	3.6	3.0	2.5
ASIA	298	641	817	835	840	845	865	1,050	1,320	8.3	6.3	3.6
CHINA	110	166	200	210	210	215	230	380	530	4.0	3.4	7.4
PHILIPPINES	163	302	217	214	205	200	190	210	250	7.4	1.8	1.2
AFRICA	1,281	1,348	1,327	1,289	1,295	1,235	1,210	1,170	1,100	1.4	-0.1	-1.2
ZAMBIA	685	591	513	509	520	490	470	420	300	-0.6	-2.0	-4.0
ZAIRE	386	455	503	499	480	480	490	530	560	2.7	1.1	0.9
AMERICA	984	1,619	2,018	2,027	2,047	1,998	2,045	2,720	3,040	4.1	5.1	3.2
CHILE	694	1,071	1,400	1,375	1,400	1,370	1,420	2,000	2,200	4.0	4.7	3.7
MEXICO	63	171	182	206	220	220	220	230	270	6.6	8.9	2.1
PERU	204	364	397	406	385	360	330	370	400	3.8	5.0	-0.1
OCEANIA	0	161	179	218	250	270	290	300	400	...	...	4.8
PAPUA NEW GUINEA	0	161	179	218	250	270	290	300	400	...	...	4.8
SOUTHERN EUROPE	150	147	149	152	165	200	250	320	350	1.0	-0.5	6.6
WORLD	6,242	7,931	8,459	8,541	8,742	8,548	8,690	9,590	10,280	2.8	1.5	1.4

A/ LEAST SQUARES TREND FOR HISTORICAL PERIODS (1961-86); END-POINT FOR PROJECTED PERIODS (1987-2000).
B/ ESTIMATE.

SOURCES: WORLD BUREAU OF METAL STATISTICS, METAL STATISTICS (ACTUAL);
WORLD BANK, INTERNATIONAL ECONOMICS DEPARTMENT (PROJECTED).

TABLE A2: COPPER ORE - GROSS EXPORTS BY MAIN COUNTRIES AND ECONOMIC REGIONS

COUNTRIES/ ECONOMIES	ACTUAL				PROJECTED					GROWTH RATES A/		
	1969-71	1979-81	1986	1987/B	1988	1989	1990	1995	2000	1961-86	1970-86	1987 - 2000
	('000 TONS)									(% PER ANNUM)		
INDUSTRIAL	240	550	651	587	581	521	481	211	121	8.4	4.5	-11.4
NORTH AMERICA	191	394	516	506	500	440	400	130	40	8.5	4.1	-17.7
CANADA	170	294	341	381	390	370	370	30	10	7.4	2.1	-24.4
UNITED STATES	21	101	174	125	110	70	30	100	30	17.6	17.3	-10.4
EEC-10	20	81	15	0	0	0	0	0	0	4.6	1.6	0.0
NON-MARKET	3	0	39	17	20	20	20	20	20	0.0	0.0	1.3
DEVELOPING	313	864	910	871	890	875	890	1,300	1,450	9.0	5.7	4.0
ASIA	151	386	229	179	160	165	160	180	230	8.6	2.5	1.9
PHILIPPINES	149	296	93	89	70	75	60	50	70	5.6	-2.3	-1.8
AFRICA	22	82	83	73	60	60	60	60	60	9.0	9.3	-1.5
ZAMBIA	13	0	0	0	0	0	0	0	0	0.0	0.0	0.0
ZAIRE	0	33	30	23	10	10	10	10	10	0.0	0.0	-6.2
AMERICA	108	225	416	424	430	390	390	750	820	8.3	8.9	5.2
CHILE	52	112	271	260	250	220	240	600	650	10.1	8.3	7.3
PERU	39	25	46	55	60	40	10	0	0	1.9	0.6	...
OCEANIA	0	161	179	195	240	260	280	310	340	0.0	0.0	4.4
PAPUA NEW GUINEA	0	161	179	195	240	260	280	310	340	0.0	0.0	4.4
WORLD	558	1,414	1,560	1,475	1,491	1,416	1,391	1,531	1,591	8.7	5.2	0.6

A/ LEAST SQUARES TREND FOR HISTORICAL PERIODS (1961-86); END-POINT FOR PROJECTED PERIODS (1987-2000).
B/ ESTIMATE.

SOURCES: WORLD BUREAU OF METAL STATISTICS, METAL STATISTICS (ACTUAL);
WORLD BANK, INTERNATIONAL ECONOMICS DEPARTMENT (PROJECTED).

TABLE A3: COPPER ORE - GROSS IMPORTS BY MAIN COUNTRIES AND ECONOMIC REGIONS

COUNTRIES/ ECONOMIES	ACTUAL				PROJECTED					GROWTH RATES A/		
	1969-71	1979-81	1986	1987/B	1988	1989	1990	1995	2000	1961-86	1970-86	1987 - 2000
	('000 TONS)									(% PER ANNUM)		
INDUSTRIAL	517	1,131	1,250	1,209	1,172	1,110	1,085	1,180	1,200	8.8	4.2	-0.1
NORTH AMERICA	34	51	76	68	65	60	65	80	80	4.0	4.9	1.3
UNITED STATES	31	39	5	12	10	10	10	15	15	-0.8	-3.3	1.7
EEC-10	81	187	223	231	220	200	190	170	130	8.5	4.1	-4.3
OTHER WESTERN EUROPE	16	48	99	105	107	100	110	200	290	9.4	13.6	8.1
JAPAN	387	843	852	805	780	750	720	730	700	9.6	3.7	-1.1
NON-MARKET	17	37	1	4	4	5	5	6	8	4.0	-7.9	5.5
EASTERN EUROPE	17	7	0	3	3	4	4	5	7	0.0	0.0	6.7
DEVELOPING	9	140	327	275	315	301	301	345	383	21.8	24.3	2.6
ASIA	4	129	252	250	250	235	245	273	295	0.0	34.8	1.3
KOREA, REPUBLIC OF	3	72	117	166	155	145	150	160	160	0.0	31.1	-0.3
AMERICA	0	1	67	0	40	40	30	45	60	0.0	0.0	---
SOUTHERN EUROPE	2	9	8	2	2	3	3	4	5	0.0	0.0	7.3
WORLD	542	1,308	1,578	1,488	1,491	1,416	1,391	1,531	1,591	9.5	5.5	0.5

A/ LEAST SQUARES TREND FOR HISTORICAL PERIODS (1961-86); END-POINT FOR PROJECTED PERIODS (1987-2000).
B/ ESTIMATE.

SOURCES: WORLD BUREAU OF METAL STATISTICS, METAL STATISTICS (ACTUAL);
WORLD BANK, INTERNATIONAL ECONOMICS DEPARTMENT (PROJECTED).

TABLE A4: COPPER BLISTER - PRODUCTION BY MAIN COUNTRIES AND ECONOMIC REGIONS

COUNTRIES/ ECONOMIES	ACTUAL				PROJECTED					GROWTH RATES A/		
	1969-71	1979-81	1986	1987/B	1988	1989	1990	1995	2000	1961-86	1970-86	1987 - 2000
	('000 TONS)									(% PER ANNUM)		
INDUSTRIAL	3,076	3,939	3,542	3,640	3,710	3,560	3,590	3,620	3,540	2.0	0.0	-0.2
NORTH AMERICA	1,935	1,705	1,669	1,752	1,830	1,720	1,740	1,720	1,640	0.0	-1.9	-0.5
UNITED STATES	1,497	1,261	1,196	1,249	1,320	1,220	1,240	1,220	1,170	-0.3	-2.4	-0.5
CANADA	439	445	478	503	510	500	500	500	470	0.9	-0.6	-0.5
EEC-10	290	371	486	448	440	430	420	390	350	4.1	2.3	-1.9
OTHER WESTERN EUROPE	130	161	248	273	290	290	310	370	400	3.4	4.0	3.0
JAPAN	589	930	962	980	960	930	920	890	850	5.8	2.0	-1.1
OCEANIA	132	173	170	187	190	190	200	250	300	4.0	1.4	3.7
AUSTRALIA	132	173	170	187	190	190	200	250	300	4.0	1.4	3.7
NON-MARKET	1,085	1,625	1,670	1,680	1,690	1,700	1,730	1,900	2,090	4.2	2.2	1.7
USSR	930	1,157	1,155	1,160	1,170	1,180	1,200	1,300	1,440	2.8	0.8	1.7
EASTERN EUROPE	155	468	515	520	520	520	530	600	650	10.3	6.9	1.7
DEVELOPING	2,390	3,088	3,782	3,834	3,900	3,870	3,920	4,350	4,740	2.9	2.9	1.6
ASIA	130	327	750	774	795	795	815	960	1,140	9.0	11.5	3.0
CHINA	102	206	364	370	380	380	390	480	600	6.1	7.4	3.8
PHILIPPINES	0	0	124	126	130	125	130	160	180	...	...	2.8
KOREA, REPUBLIC OF	5	74	123	144	145	145	145	150	150	22.4	24.1	0.3
AFRICA	1,270	1,269	1,246	1,250	1,245	1,215	1,205	1,210	1,140	1.1	-0.4	-0.7
ZAMBIA	677	592	514	523	520	490	470	420	300	-0.4	-1.9	-4.2
ZAIRE	385	421	473	472	470	470	480	520	550	2.2	0.8	1.2
AMERICA	878	1,363	1,619	1,646	1,695	1,695	1,735	1,980	2,200	3.5	4.6	2.3
CHILE	640	932	1,124	1,100	1,150	1,150	1,180	1,350	1,500	3.3	4.3	2.4
PERU	171	333	335	311	310	310	320	360	400	3.9	5.6	2.0
SOUTHERN EUROPE	111	129	167	164	165	165	165	200	260	3.5	1.4	3.6
WORLD	6,551	8,052	8,994	9,154	9,300	9,130	9,240	9,870	10,370	2.7	1.5	1.0

A/ LEAST SQUARES TREND FOR HISTORICAL PERIODS (1961-86); END-POINT FOR PROJECTED PERIODS (1987-2000).
B/ ESTIMATE.

SOURCES: WORLD BUREAU OF METAL STATISTICS, METAL STATISTICS (ACTUAL);
WORLD BANK, INTERNATIONAL ECONOMICS DEPARTMENT (PROJECTED).

TABLE A5: COPPER BLISTER - GROSS EXPORTS BY MAIN COUNTRIES AND ECONOMIC REGIONS

COUNTRIES/ ECONOMIES	ACTUAL				PROJECTED					GROWTH RATES A/		
	1969-71	1979-81	1986	1987/B	1988	1989	1990	1995	2000	1961-86	1970-86	1987 - 2000
	('000 TONS)									(% PER ANNUM)		
INDUSTRIAL	44	90	70	64	65	70	80	100	150	8.1	3.3	6.8
NORTH AMERICA	12	7	16	12	15	20	30	50	100	4.2	2.3	17.7
UNITED STATES	12	7	16	12	15	20	30	40	80	4.2	2.3	15.7
EEC-10	15	34	22	14	15	15	15	15	15	5.6	-0.1	0.5
NON-MARKET	1	1	4	3	3	3	3	3	3	...	...	0.0
DEVELOPING	735	662	681	565	570	568	567	520	480	-0.9	-0.6	-1.2
ASIA	1	0	0	0	0	0	0	0	0	...	...	0.0
AFRICA	409	371	366	324	320	318	307	215	160	-0.1	-1.0	-5.3
ZAMBIA	103	8	0	0	0	0	0	0	0	0.0	0.0	0.0
ZAIRE	193	272	276	254	250	250	240	150	100	3.3	1.7	-6.9
AMERICA	320	291	313	241	250	250	260	305	320	-1.5	-0.1	2.2
CHILE	183	163	199	134	150	150	150	200	250	-1.7	0.8	4.9
PERU	130	123	95	87	80	80	90	85	50	-1.0	-1.3	-4.2
WORLD	779	753	751	632	638	641	650	623	633	-0.3	-0.3	0.0

A/ LEAST SQUARES TREND FOR HISTORICAL PERIODS (1961-86); END-POINT FOR PROJECTED PERIODS (1987-2000).
B/ ESTIMATE.

SOURCES: WORLD BUREAU OF METAL STATISTICS, METAL STATISTICS (ACTUAL);
WORLD BANK, INTERNATIONAL ECONOMICS DEPARTMENT (PROJECTED).

TABLE A6: COPPER BLISTER - GROSS IMPORTS BY MAIN COUNTRIES AND ECONOMIC REGIONS

COUNTRIES/ ECONOMIES	ACTUAL				PROJECTED					GROWTH RATES A/		
	1969-71	1979-81	1986	1987/B	1988	1989	1990	1995	2000	1961-86	1970-86	1987 - 2000
	('000 TONS)									(% PER ANNUM)		
INDUSTRIAL	735	531	516	408	518	516	515	443	386	-1.6	-2.1	-0.4
NORTH AMERICA	187	65	50	45	43	41	41	36	31	-8.5	-7.2	-2.8
UNITED STATES	187	64	49	44	42	40	40	35	30	-8.7	-7.5	-2.9
EEC-10	401	376	433	330	440	430	430	360	310	0.4	-0.3	-0.5
OTHER WESTERN EUROPE	11	9	5	5	6	6	7	10	15	0.6	-1.0	8.8
JAPAN	136	80	28	28	29	39	37	37	30	0.0	-5.2	0.5
NON-MARKET	2	3	13	25	20	20	20	30	40	5.6	4.5	3.7
EASTERN EUROPE	2	3	13	25	20	20	20	30	40	6.3	5.2	3.7
DEVELOPING	27	91	159	81	100	105	115	150	207	15.9	8.8	7.5
ASIA	10	47	63	31	30	35	40	70	110	21.1	9.9	10.2
AMERICA	1	4	22	20	20	20	20	20	20	...	...	0.0
SOUTHERN EUROPE	15	41	74	30	50	50	55	60	77	10.0	7.4	7.5
WORLD	764	625	688	514	638	641	650	623	633	-0.5	-0.8	1.6

A/ LEAST SQUARES TREND FOR HISTORICAL PERIODS (1961-86); END-POINT FOR PROJECTED PERIODS (1987-2000).
B/ ESTIMATE.

SOURCES: WORLD BUREAU OF METAL STATISTICS, METAL STATISTICS (ACTUAL);
WORLD BANK, INTERNATIONAL ECONOMICS DEPARTMENT (PROJECTED).

TABLE A7: COPPER REFINED - PRODUCTION BY MAIN COUNTRIES AND ECONOMIC REGIONS

COUNTRIES/ ECONOMIES	ACTUAL				PROJECTED					GROWTH RATES A/		
	1969-71	1979-81	1986	1987/B	1988	1989	1990	1995	2000	1961-86	1970-86	1987 - 2000
	('000 TONS)									(% PER ANNUM)		
INDUSTRIAL	4,398	4,840	4,537	4,649	5,018	4,670	4,675	4,672	4,775	1.3	0.0	0.2
NORTH AMERICA	2,401	2,356	1,973	2,052	2,383	2,100	2,125	2,122	2,095	-0.1	-1.5	0.2
UNITED STATES	1,941	1,896	1,479	1,561	1,853	1,610	1,635	1,632	1,605	-0.4	-1.7	0.2
CANADA	459	460	493	491	530	490	490	490	490	1.0	-0.6	0.0
EEC-10	1,036	1,123	1,224	1,185	1,210	1,170	1,140	1,120	1,120	1.4	0.9	-0.4
OTHER WESTERN EUROPE	130	162	212	224	240	230	230	280	320	2.5	2.4	2.8
JAPAN	683	1,016	943	980	960	960	960	870	870	5.7	1.8	-0.9
OCEANIA	149	182	185	208	225	210	220	280	370	3.5	1.0	4.5
AUSTRALIA	149	182	185	208	225	210	220	280	370	3.5	1.0	4.5
NON-MARKET	1,293	1,941	2,036	2,050	2,100	2,150	2,210	2,340	2,540	4.3	2.4	1.7
USSR	1,082	1,367	1,400	1,410	1,430	1,460	1,490	1,550	1,690	3.1	1.0	1.4
EASTERN EUROPE	211	574	636	640	670	690	720	790	850	8.9	6.7	2.2
DEVELOPING	1,712	2,622	3,269	3,363	3,477	3,482	3,601	4,495	5,380	4.8	4.1	3.7
ASIA	166	460	775	787	820	845	880	1,085	1,360	9.0	9.8	4.3
CHINA	130	324	370	370	400	420	440	550	710	6.7	6.3	5.1
PHILIPPINES	0	0	137	132	130	130	140	170	200	0.0	0.0	3.2
KOREA, REPUBLIC OF	6	89	165	163	165	170	170	175	180	0.0	26.4	0.8
AFRICA	871	872	877	883	862	852	861	1,020	1,120	1.7	-0.2	1.8
ZAMBIA	573	578	487	506	495	480	470	410	300	0.8	-1.1	-3.9
ZAIRE	194	133	218	210	195	200	220	370	500	0.7	0.2	6.9
AMERICA	569	1,131	1,397	1,473	1,575	1,560	1,635	2,150	2,590	6.7	6.6	4.4
CHILE	462	789	943	958	1,090	1,030	1,080	1,360	1,560	5.9	5.3	3.8
PERU	34	218	226	218	205	230	225	270	350	10.5	15.5	3.7
SOUTHERN EUROPE	105	159	221	220	220	225	225	240	310	5.3	3.0	2.7
YUGOSLAVIA	88	134	140	139	140	140	140	150	160	5.3	1.2	1.1
WORLD	7,402	9,403	9,842	10,062	10,595	10,302	10,486	11,507	12,695	2.8	1.6	1.8

A/ LEAST SQUARES TREND FOR HISTORICAL PERIODS (1961-86); END-POINT FOR PROJECTED PERIODS (1987-2000).
B/ ESTIMATE.

SOURCES: WORLD BUREAU OF METAL STATISTICS, METAL STATISTICS (ACTUAL);
WORLD BANK, INTERNATIONAL ECONOMICS DEPARTMENT (PROJECTED).

TABLE A8: COPPER REFINED - APPARENT CONSUMPTION BY MAIN COUNTRIES AND ECONOMIC REGIONS

COUNTRIES/ ECONOMIES	ACTUAL				PROJECTED							
	1969-71	1979-81	1986	1987/B	1988	1989	1990	1995	2000	1961-86	1970-86	1987 - 2000
	('000 TONS)									(% PER ANNUM)		
INDUSTRIAL	5,319	6,235	6,044	6,429	6,592	6,275	6,339	6,812	7,295	1.8	0.8	1.0
NORTH AMERICA	2,105	2,252	2,321	2,405	2,420	2,298	2,315	2,530	2,760	0.9	0.2	1.1
UNITED STATES	1,881	2,021	2,095	2,173	2,180	2,080	2,100	2,280	2,480	0.9	0.3	1.0
EEC-10	2,089	2,396	2,363	2,392	2,460	2,327	2,346	2,442	2,520	1.5	0.5	0.4
JAPAN	811	1,248	1,219	1,284	1,350	1,300	1,320	1,450	1,580	5.8	2.8	1.6
OCEANIA	107	134	119	125	127	125	128	140	160	2.2	1.6	1.9
NON-MARKET	1,278	1,906	1,885	1,890	1,905	1,930	1,975	2,095	2,290	3.4	2.3	1.5
USSR	949	1,327	1,300	1,300	1,310	1,330	1,370	1,460	1,620	2.9	1.9	1.7
EASTERN EUROPE	328	579	585	590	595	600	605	635	670	4.8	3.4	1.0
DEVELOPING	634	1,446	1,925	2,026	2,098	2,097	2,172	2,600	3,110	7.0	6.6	3.4
ASIA	274	670	1,095	1,173	1,217	1,238	1,285	1,555	1,890	7.8	8.3	3.7
CHINA	188	449	608	660	670	690	720	850	1,030	7.4	6.4	3.5
INDIA	54	73	110	115	120	118	125	145	170	2.0	4.6	3.1
AFRICA	51	110	106	91	97	99	105	120	140	3.0	3.6	3.4
AMERICA	196	463	467	471	494	500	512	625	750	6.8	4.8	3.6
BRAZIL	75	215	255	259	260	260	265	320	390	9.5	5.6	3.2
MEXICO	60	123	75	73	90	100	104	125	150	6.2	3.6	5.7
SOUTHERN EUROPE	113	203	257	291	290	260	270	300	330	5.5	4.1	1.0
WORLD	7,231	9,587	10,053	10,345	10,595	10,302	10,486	11,507	12,695	2.7	1.8	1.6

A/ LEAST SQUARES TREND FOR HISTORICAL PERIODS (1961-86); END-POINT FOR PROJECTED PERIODS (1987-2000).
B/ ESTIMATE.

SOURCES: WORLD BUREAU OF METAL STATISTICS, METAL STATISTICS (ACTUAL);
WORLD BANK, INTERNATIONAL ECONOMICS DEPARTMENT (PROJECTED).

TABLE A9: COPPER REFINED - GROSS EXPORTS BY MAIN COUNTRIES AND ECONOMIC REGIONS

COUNTRIES/ ECONOMIES	ACTUAL				PROJECTED							
	1969-71	1979-81	1986	1987/B	1988	1989	1990	1995	2000	1961-86	1970-86	1987 - 2000
	('000 TONS)									(% PER ANNUM)		
INDUSTRIAL	1,022	1,004	934	947	950	911	920	954	1,040	-0.1	-0.9	0.7
NORTH AMERICA	435	313	317	307	300	292	295	270	240	-2.0	-2.4	-1.9
CANADA	246	263	305	289	285	282	285	260	230	1.6	0.1	-1.7
UNITED STATES	189	50	13	18	15	10	10	10	10	-9.5	-11.3	-4.4
EEC-10	457	473	398	409	405	380	370	360	360	-0.1	-0.8	-1.0
JAPAN	24	97	61	52	50	50	50	40	30	18.7	4.9	-4.1
OCEANIA	41	52	67	82	90	90	99	149	250	6.8	1.6	9.0
AUSTRALIA	38	51	67	82	90	90	99	149	250	7.3	1.9	9.0
NON-MARKET	174	392	283	320	315	320	325	305	320	6.6	1.0	0.0
DEVELOPING	1,324	1,785	2,024	2,070	2,196	2,181	2,274	2,810	3,305	3.8	2.9	3.7
ASIA	2	3	137	157	150	153	170	200	240	0.0	0.0	3.3
PHILIPPINES	0	0	125	119	115	115	125	150	175	0.0	0.0	3.0
AFRICA	826	789	762	775	791	753	769	870	900	1.1	-0.6	1.2
ZAMBIA	573	599	466	499	495	475	465	410	300	0.8	-1.1	-3.8
ZAIRE	187	125	223	205	220	200	220	370	500	0.5	0.2	7.1
SOUTH AFRICA	62	65	72	69	73	75	80	85	90	7.1	1.6	2.1
AMERICA	465	950	1,089	1,120	1,220	1,230	1,285	1,650	1,995	6.8	6.8	4.5
CHILE	434	756	896	940	1,000	1,000	1,050	1,330	1,540	6.3	5.7	3.9
PERU	30	205	193	180	200	200	195	240	315	10.1	16.1	4.4
WORLD	2,520	3,180	3,242	3,337	3,461	3,412	3,509	4,069	4,665	2.4	1.4	2.6

A/ LEAST SQUARES TREND FOR HISTORICAL PERIODS (1961-86); END-POINT FOR PROJECTED PERIODS (1987-2000).
B/ ESTIMATE.

SOURCES: WORLD BUREAU OF METAL STATISTICS, METAL STATISTICS (ACTUAL);
WORLD BANK, INTERNATIONAL ECONOMICS DEPARTMENT (PROJECTED).

TABLE A10: COPPER REFINED - GROSS IMPORTS BY MAIN COUNTRIES AND ECONOMIC REGIONS

COUNTRIES/ ECONOMIES	ACTUAL				PROJECTED					GROWTH RATES A/		
	1969-71	1979-81	1986	1987/B	1988	1989	1990	1995	2000	1961-86	1970-86	1987 - 2000
	('000 TONS)									(% PER ANNUM)		
INDUSTRIAL	2,070	2,512	2,545	2,562	2,504	2,457	2,509	3,042	3,472	1.8	0.9	2.4
NORTH AMERICA	146	366	513	521	480	505	470	678	865	6.9	7.8	4.0
UNITED STATES	129	343	492	505	460	495	460	658	845	6.8	8.2	4.0
EEC-10	1,612	1,784	1,665	1,606	1,558	1,495	1,555	1,640	1,765	0.9	-0.4	0.7
OTHER WESTERN EUROPE	142	102	93	84	87	84	91	105	124	-1.8	-2.9	3.0
JAPAN	171	258	272	348	376	370	390	615	710	6.2	4.1	5.6
NON-MARKET	177	217	140	138	121	101	111	93	91	-0.1	-2.2	-3.2
EASTERN EUROPE	174	212	140	137	120	100	110	92	90	1.2	-2.0	-3.2
DEVELOPING	253	560	716	674	836	854	889	934	1,102	7.2	7.2	3.9
ASIA	116	265	480	417	649	674	698	765	930	9.9	11.3	6.4
AMERICA	90	231	172	190	133	120	128	95	85	5.7	2.2	-6.0
SOUTHERN EUROPE	41	60	62	64	50	55	57	65	72	6.4	2.8	0.9
WORLD	2,500	3,290	3,401	3,374	3,461	3,412	3,509	4,069	4,665	2.4	1.7	2.5

A/ LEAST SQUARES TREND FOR HISTORICAL PERIODS (1961-86); END-POINT FOR PROJECTED PERIODS (1987-2000).
B/ ESTIMATE.

SOURCES: WORLD BUREAU OF METAL STATISTICS, METAL STATISTICS (ACTUAL);
WORLD BANK, INTERNATIONAL ECONOMICS DEPARTMENT (PROJECTED).

TABLE A11: COPPER - PRICES, a/ 1950-87 (ACTUAL) AND 1988-2000 (PROJECTED)

	($/Ton)		
	Current $	1985 Constant $	
		MUV b/	US GNP c/
Actual			
1950	493	2,083	2,303
1951	607	2,224	2,705
1952	715	2,500	3,139
1953	664	2,388	2,869
1954	686	2,523	2,918
1955	968	3,495	3,987
1956	906	3,157	3,611
1957	605	2,065	2,328
1958	545	1,829	2,054
1959	655	2,229	2,407
1960	677	2,257	2,447
1961	633	2,057	2,266
1962	644	2,069	2,256
1963	646	2,116	2,231
1964	968	3,117	3,288
1965	1,290	4,123	4,272
1966	1,530	4,724	4,896
1967	1,138	3,474	3,536
1968	1,241	3,824	3,679
1969	1,466	4,287	4,123
1970	1,413	3,833	3,761
1971	1,080	2,819	2,722
1972	1,071	2,565	2,577
1973	1,786	3,692	4,033
1974	2,059	3,494	4,268
1975	1,237	1,885	2,333
1976	1,401	2,109	2,485
1977	1,310	1,795	2,178
1978	1,367	1,628	2,117
1979	1,985	2,087	2,826
1980	2,182	2,092	2,846
1981	1,742	1,661	2,074
1982	1,480	1,431	1,655
1983	1,592	1,581	1,715
1984	1,377	1,391	1,428
1985	1,417	1,417	1,417
1986	1,374	1,161	1,347
1987	1,783	1,371	1,698
Projected			
1988	2,420	1,720	2,217
1989	1,870	1,251	1,638
1990	1,650	1,087	1,376
1995	2,450	1,354	1,573
2000	2,900	1,280	1,485

a/ London Metal Exchange, cash, wirebars up to the end of August 1981; from September 1981 to June 1986, high-grade cathodes replaced wirebars; from July 1986 onward, "Grade A" (which includes high-grade cathodes and high-grade wirebars) replaced "high-grade cathodes".

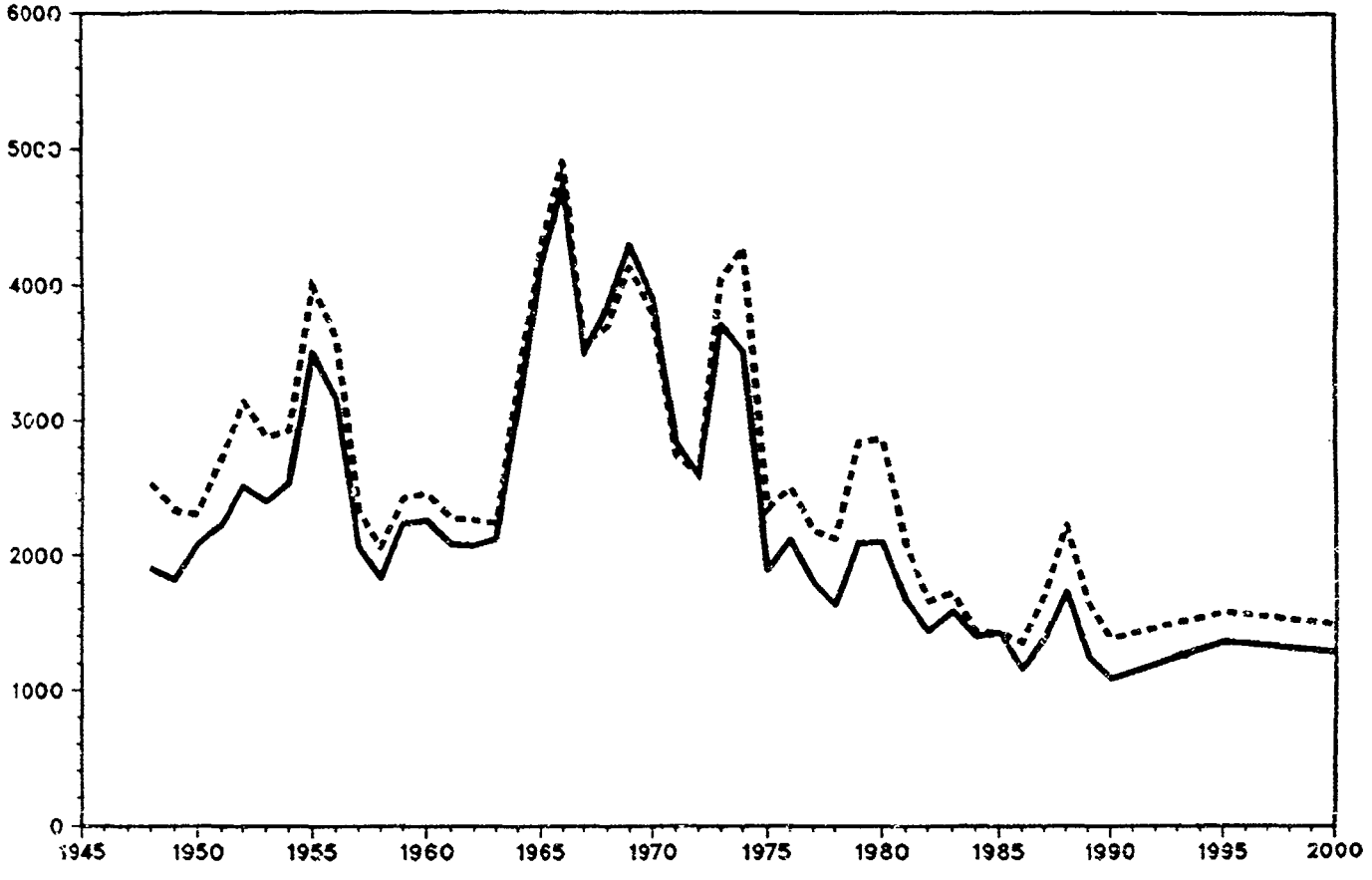
b/ Deflated by Manufacturing Unit Value (MUV) Index.

c/ Deflated by US GNP Deflator.

Sources: Engineering and Mining Journal (actual); World Bank, International Economics Department (projected).

COPPER

(CONSTANT 1985 DOLLAR PRICES *)



——— DEFLATED BY MANUFACTURING UNIT VALUE (MUV) INDEX

- - - - - - - - - - DEFLATED BY U.S. GNP DEFLATOR.

* 1948 – 87 ACTUAL ; 1988 – 2000 PROJECTED .

SOURCE : WORLD BANK .

TIN

Summary

1. World tin consumption declined from 1970 through the mid-1980s, leading to speculation that the metal was in secular decline. High tin prices in real terms during this period and the introduction of new technology led to the less intensive use of tin--a trend illustrated in the use of thinner tin coatings for tinplate. The substitution of aluminum cans for steel (tinplate cans) in the beverage sector also contributed to the decline in tin consumption. Additional pressure on demand resulted from the introduction of new packaging systems which have eroded the traditional market for steel cans in the food processing industry. The large decline in tin prices late in 1985 and the relatively strong growth in tin-consuming sectors since then led to marginally higher world tin demand during 1986-87. Material substitution in major markets such as tinplate and solder is expected to continue as real tin prices gradually increase through the mid-1990s. Consequently, world tin consumption is expected to decrease 0.9% p.a. during the 1987-2000 period.

2. World output of tin-in-concentrates has declined markedly since 1985. The termination of the ITC's program and lower prices have led to the cessation of smuggling which was a major source of tin during the early and mid-1980s. Tin output also has been constrained by the precipitous decline of the Bolivian industry and only modest recent increases of Brazilian production after several years of rapid expansion. Tin mine production should gradually increase to about 193,000 tons by 1989 as stocks are reduced to normal commercial levels. During the 1990s, production should gradually decline, paralleling trends in consumption. Only Brazil is expected to increase output during that period and by the year 2000 should account for approximately 25% of world production.

3. The reduction in tin production and the increase in consumption experienced during the past several years should eliminate the current tin surplus by 1990. Consequently, prices are expected to increase to US¢925/kg in 1990 (US¢610/kg in 1985 constant dollars). Prices are expected to reach US¢1,700/kg in 2000 (US¢750/kg in 1985 constant dollars). Tin prices in real terms through the 1990s will remain below levels typical during the pre-ITC collapse period, largely due to cost containment and ample supplies.

Introduction

4. The collapse of the International Tin Council (ITC) in October 1985 was marked by a precipitous price decline and, after decades of managed markets and buffer stock activities, a general concern that the emerging competitive environment would result in highly volatile markets. After the initial price decline, there was increased uncertainty regarding future price trends. Some analysts expected continued declines through 1986 while other observers anticipated generally constant prices for several years. In assessing short-term prospects, a major concern involved the length of time required to eliminate the inventory surplus which had emerged when ITC buffer stock operations ceased. In addition, the existence of pre-collapse

subsidies, royalties, and export controls distorted operating costs and raised questions concerning the extent of likely cost reductions and their impact on long-term equilibrium prices.

5. Experience over the recent past indicates that the more dire predictions of late-1985 and early-1986 were exaggerated. Tin prices have increased modestly since early 1986, but prices have not been volatile--particularly when compared to the experience of other major metals such as aluminum, copper, lead, zinc, and nickel. (This is probably a matter of regret for producers since tin has not participated in the run-up in metal prices in 1987-88). Surplus stocks still remain, but the large inventory overhang at the end of 1985 has been substantially reduced. The much lower prices have led to reduced tin production and, at least temporarily, appear to have reversed the dramatic decline in tin consumption. Finally, production quotas introduced by the Association of Tin Producing Countries (ATPC) appear to have supported and stabilized prices.

Demand Outlook

6. As Table 1 shows, in the industrial countries tin is used in a variety of applications including tinplate, solder, bronze, and brass. 1/ Until recently the largest market for tin was tinplate, accounting for approximately 40% of all tin consumed. However, by 1986 tinplate comprised only 28% of tin use in industrial countries. Solder is now the largest individual application--accounting for approximately 30% of tin consumption. Brass/bronze comprises about 5% of tin use while the "other" (miscellaneous) sector includes a wide variety of applications such as chemicals, babbitt, and white metal.

7. World tin consumption declined from 218,000 tons in 1970 to 201,000 tons in 1985. Industrial country performance during this period was particularly poor with consumption declining 1.7% p.a. Tin consumption in developing countries fared somewhat better: consumption increased a modest 1.2% p.a. The decline in world demand during this period had much to do with the fact that tin prices were held well above free market levels through ITC buffer stock activities and export controls. Sluggish economic growth and technological changes during the period also contributed to lower demand. Prices were particularly distorted during the late 1970s and early 1980s--a period when tin prices increased in real terms while real prices of most substitutes declined. Technological changes (such as the development of entirely new packaging systems and the elimination of soldered joints in the automobile sector) also have had a deleterious impact on consumption during this period.

8. Trends in tin consumption by major product for the 1970-85 period are illustrated in Table 2. With the exception of the "other" category (which contains the vibrant chemical sector), all industrial country applications of tin declined. Tin-in-tinplate demand recorded the most serious deterioration,

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1/ Comparable end-use data for developing countries are not available.

TABLE 1: TIN METAL CONSUMPTION BY MAJOR USE, SELECTED COUNTRIES, 1986

	United States a/	United Kingdom b/	France a/	Germany, F.R. a/	Italy b/	Japan a/	Total
	(Tons)						
Tinplate	8,660	3,322	3,496	2,297	2,480	9,061	29,316
Solder	11,125	868	1,626	3,003	1,250	13,722	31,594
Brass/Bronze	1,781	1,435	400	257	1,400	NA	5,273 d/
Other c/	10,982	4,070	1,939	11,327	1,570	8,738	38,626
Total	32,548	9,695	7,461	16,884	6,700	31,521	104,809
	% of total						
Tinplate	27	34	47	14	37	29	28
Solder	34	9	22	18	19	44	30
Brass/Bronze	5	15	5	2	21	NA	5 d/
Other c/	34	42	26	66	23	27	37
Total	100	100	100	100	100	100	100

a/ Primary tin only.
b/ Primary and recycled tin.
c/ Includes chemicals, babbitt, white metal, and other miscellaneous uses.
d/ Excludes Japan.

NA = Not available.

Source: International Tin Council, Tin Statistics, various issues.

averaging -4.4% p.a. Most of this fall was the result of the development of thinner tin coatings and the popularity of aluminum cans in the large US soft drink and beer markets. The concurrent decline of the solder market indicates the extent to which the development of new electronic applications was overshadowed by the decline of the traditional construction and automotive market.

TABLE 2: GROWTH IN SELECTED TIN USES BY INDUSTRIAL COUNTRIES

Period: 1970-85	United States	United Kingdom	France	Germany, F.R.	Japan	Total
	(% Change p.a) a/					
Tinplate	-6.5	-5.4	-3.0	-5.2	-0.8	-4.4
Solder	-0.4	-3.9	-3.9	-1.8	3.0	0.7
Brass/Bronze	-4.6	-3.1	-2.5	-0.4	NA	-3.7
Other	1.2	-3.9	-1.1	2.6	3.1	1.0
Total	-2.4	-4.4	-2.8	0.7	1.6	-1.2
Period: 1985-87						
Tinplate	0.9	2.5	-0.3	11.0	2.7	2.4
Solder	-1.9	2.2	29.8	-6.4	-2.4	-1.8
Brass/Bronze	-2.1	2.1	-13.0	-16.8	NA	NA
Other	4.6	0.8	15.3	7.7	-2.1	-2.0
Total	1.1	1.7	8.1	5.2	0.8	1.4

NA = Not available.
a/ End-point growth rates.

Note: 1987 consumption for the United States, the Federal Republic of Germany, and Japan are estimated using annualized data for Jan.-June. United Kingdom data based upon Jan.-Aug. information. 1987 tin consumption for France and Italy not available, hence 1986 data are used.

Source: International Tin Council, Tin Statistics, various issues.

9. The dramatic decrease in tin prices following the collapse of the ITC raised an interesting question could the decline of consumption be slowed or reversed through more intensive tin use or the substitution of tin for competing products? Although it is premature to assess the impact of the price decline from this perspective, preliminary data appear encouraging.

World tin consumption during 1987 is estimated to be 208,000 tons--a 1.7% p.a. increase from 1985 levels. Table 2 also contains preliminary data by major market for the 1985-87 period. The results vary with application and country, but the general increase of tin consumption in the manufacture of tinplate is in marked contrast to the systematic declines recorded previously. The "other" category also has exhibited higher demand growth over the last several years, but it is not possible to isolate specific markets. Brass/bronze continues to exhibit negative growth rates, but the decline since 1985 is not as great as previously. In contrast, the decline in solder appears to have accelerated since 1985, despite the lower prices.

10. This interpretation of post-1985 consumption data is subject to several strong caveats. First, much of the data is preliminary and some estimated; revisions could change the final data considerably. Second, isolating the impact of price and income effects over such a limited period is difficult. Strong, but probably temporary, income factors are concurrently affecting tin consumption: five consecutive years of world economic growth, consumer restocking, and a surge in metal-intensive products such as capital goods and consumer durables have contributed to the apparent improvement of tin demand. The impact of these influences is illustrated by the fact that many other metals which have not experienced the massive price decline of tin (e.g., copper, aluminum, lead, and zinc) have also experienced strong demand over the past several years. Finally, short-term price elasticities of demand for tin are low--in the -0.1 to -0.3 range.

11. The impact of price on demand through the 1990s will depend on long-term price elasticities, price expectations, and the extent to which tin applications in some markets are affected by technology and consumer trends not directly influenced by shifts in real tin prices. Our current assessment of world tin demand is more encouraging than several years ago, but a dramatic reversal of the downward spiral experienced by tin markets during the past several decades is not expected.

12. World tin consumption is projected to decline by 0.9% p.a. during the 1987-2000 period. Given the low level of projected real tin prices when compared to prices typical prior to 1985, the decline in tin consumption appears relatively large. This reflects low long-term price elasticities of demand as well as several technological trends which should continue to negatively impact tin demand. However, a marked difference exists between the expected performance of the industrial and developing countries.

13. Tin consumption in the industrial countries is expected to decline by approximately 2% p.a. during the 1987-2000 period. However, the decline now expected is less severe than the 2.3% p.a. drop experienced during the 1970-86 period (Table A2). The analysis of industrial country demand is particularly relevant. Data permit the disaggregation of consumption into tin-in-tinplate and "other" uses for some of the larger industrial countries. The evaluation of tin-in-tinplate consumption requires an analysis of both the intensity of tin use--as measured by kilogram of tin per ton of tinplate produced and actual tinplate production. The product of tin intensity and tinplate production yields tin-in-tinplate consumption for the industrial countries.

14. The declining trend during the 1970-85 period in industrial country tin intensity (see Table 3) was a primary factor in the general weakness of the tinplate market. Tin intensity was initially reduced during the 1970s as producers completed the switch to electrolytic tinplating--a process which permitted tin coating thicknesses to be reduced. The transition was virtually complete by 1980. High real tin prices during this period led to improvements in the electrolytic process and the development of lacquer substitutes which further reduced tin requirements. In contrast to these trends, tin intensity is expected to decline only marginally through the 1990s. Several factors lead to this conclusion. The technical efforts and costs involved in reducing tin thicknesses have increased while the achieved reductions in tin thickness are less pronounced. Hence, the benefits of further improvements to the electrolytic process are now considerably less. The lower real tin prices that are now expected through 2000, compared to those typical in the early 1980s, provide a further disincentive to major reductions in tin coatings.

TABLE 3: UNIT CONSUMPTION OF TIN METAL IN TINPLATE

Countries	1971-73	1986-87
	(Kg of Tin Metal per Ton of Tinplate)	
United States	5.2	4.2
EEC	6.6	4.4
Japan	8.4	5.9
Developing	6.1	5.4

Source: Computed from International Tin Council, Tin Statistics, various issues.

15. Tinplate production is likely to decline slightly through 2000. The primary market for tinplate now consists of various food containers. The moderate levels of economic expansion now anticipated for the industrial countries should inhibit tin market growth, as will the increasing use of alternative packaging technologies such as asceptic and retort packaging. Moreover, consumer preferences and health concerns are resulting in a shift away from the traditional canning technique of food preservation to frozen and fresh foods. While these factors should restrain growth, a large decline is unlikely, particularly since the aluminum can is not expected to replace tinplate in the critical food can market.

16. The "other" market in the industrial countries consists of a wide spectrum of applications including solder, brass/bronze, and chemicals. This sector is expected to weaken during the 1987-2000 period, for several reasons.

First, most final consuming sectors are not expected to expand rapidly. For example, US construction activity is projected to increase only by 0.6% p.a. over the 1987-2000 period. A similar situation exists in Japan and Europe where construction is generally expected to increase by less than 1% p.a. over the same period. These rates are well below the level of general industrial activity. Moreover, the growth of another important tin market--automobiles--is likely to be lower than experienced during the past several decades. Some applications also will be reduced for reasons largely unrelated to tin prices. Solder use in the auto industry, for example, has been negatively influenced by the high cost of the skilled labor required to solder joints. In the process of reducing labor costs, new manufacturing techniques have been developed which reduced the need for soldered joints. This trend is likely to continue through the 1990s and will be reinforced by the gradual replacement of soldered copper radiators by welded aluminum units. Only the chemical market is expected to show reasonably strong growth through 2000, but sufficient data do not exist to analyze this market in detail.

17. Tin consumption in the developing countries is expected to increase, by 1.2% p.a. through 2000. This relatively sanguine outlook is the result of relatively rapid economic growth--developing country industrial production is expected to increase by 6.3% p.a. during the forecast period. In addition, markets in the developing countries are less mature and will not experience the same degree of material substitution as has been typical in the industrial countries. Although data limitations preclude disaggregation into specific products, tinplate and solder are expected to be the major markets in developing countries through the 1990s. Asia is expected to register a 2.3% p.a. increase during the 1987-2000 period, and should be the strongest regional market. Rapid consumption growth is expected to occur in China (4.1% p.a. through 2000), largely reflecting strong industrial growth. The further development of a domestic food can market will provide an additional boost to China's tin consumption.

Supply Outlook

18. World production of tin-in-concentrates has undergone a number of major shocks during the past decade. Output reached approximately 236,000 tons in 1981--a period of rapidly declining consumption. The efforts of the ITC through its Buffer Stock Manager (BSM) to maintain prices, despite rising stocks, proved inadequate and resulted in the imposition of export controls in 1982. Although all major ITC-producing countries reduced output during this period, tin remained in surplus and this eventually led to the 1985 termination of BSM activities and collapse of the ITC.

19. A contributory factor to the ITC's demise was smuggling activity which increased from 6,000 tons in 1981 to an estimated peak of approximately 17,000 tons in 1983 (Table 4). In addition, the development of high grade deposits permitted Brazil to emerge as a major world producer during the 1982-85 period. The artificially high prices which were maintained by the ITC exacerbated the smuggling problem and appear to have accelerated the development of the Brazilian tin industry.

TABLE 4: TIN ORE PRODUCTION, SELECTED COUNTRIES

	World	Bolivia	Thailand	Indonesia	Malaysia	Brazil	"Smuggled"
	(Tin Content, '000 Tons)						
1980	234	27	34	32	61	7	7
1981	236	28	32	35	60	8	6
1982	224	27	26	34	52	8	10
1983	209	26	20	27	41	13	17
1984	205	20	22	23	41	20	11
1985	195	16	17	22	37	26	11
1986	179	10	17	25	29	25	2
1987	182	8	15	26	30	29	0

Source: Computed from International Tin Council, Tin Statistics, various issues.

20. Following the price collapse in late 1985, world tin production declined and has averaged approximately 180,000 tons during the 1986-87 period (Table 4). However, marked differences exist in the pattern of individual producer responses The three large, traditional producers of Southeast Asia--Thailand, Malaysia, and Indonesia--together accounted for 76,000 tons in 1985 and 71,000 tons in 1987. This rather small decrease reflects the fact that only Malaysian output contracted significantly while Indonesian production increased. In contrast, high-cost Bolivian production declined and tin smuggling essentially ceased with the elimination of export controls and the price decline of late 1985. The rapid expansion of Brazilian production also slowed, thus minimizing the impact of marginal cutbacks in other countries/regions.

21. Export restraints were implemented by members of the ATCP for the period March 1987-March 1988. Although price declines appear to be the major cause of output reductions, the export restraint scheme apparently contributed to the adjustment process. Moreover, although Brazil and China were not members of the ATCP, they agreed unofficially to nominal quotas of 21,000 and 10,000 tons, respectively. The export quota scheme has been extended for 1988/89. The new quotas, in tons, are as follows (1987/88 quotas are in parentheses): Australia 7,700 (7,000); Bolivia 12,500 (13,761); Indonesia 29,000 (24,516); Malaysia 31,650 (28,520); Thailand 19,000 (19,000); Nigeria 550 (1,461); and Zaire 1,500 (1,736). The declines in Bolivian and Nigerian quotas reflect continuing production problems while Indonesian and Malaysian levels have been increased. The unofficial quota for Brazil increased to 26,500 tons while China's unofficial quota was unchanged at 10,000 tons.

22. Our analysis indicates that mine production should reach approximately 185,000 tons in 1988, a slight increase from 1987. Mine

production should gradually increase for several years thereafter as commercial inventories approach "normal" levels. By 1990, world mine production is expected to be 203,000 tons and to be in balance with world consumption. During the 1990s, however, tin output should gradually decline, paralleling trends in consumption. By 2000, mine output is expected to be 185,000 tons.

23. The gradual increase in world production through 1990 will result from output expansion in several countries. Indonesian output should increase as relatively low-cost offshore dredging is emphasized. Chinese production also will increase to satisfy expanding domestic consumption. Bolivian mine output is expected to increase modestly in the short run, reflecting the gains attained with the restructuring of Comibol--the state mining company.

24. Brazil remains a key factor in world supply. The increase in Brazilian output since the early 1980s resulted from the discovery and exploitation of low-cost deposits in Amazonas State. The continued exploitation of these deposits, the expected increase of world tin prices, recent announcements of additional tin reserves, and the resurgence of small-scale tin operations (by individuals commonly termed "garimperios") all indicate that Brazilian output should expand to 39,000 tons in 1990 and 48,000 tons in 2000--at that time Brazil is expected to account for slightly over one-fourth of world mine production.

25. In contrast to the situation in Brazil, over the long-term in most other countries/regions output is expected to decline. Industrial country output should be 10,000 tons in 2000--a decline of 3.1% p.a. for the 1987-2000 period. Similarly, Bolivia and the traditional producers of Southeast Asia are likely to exhibit declines in both volume and market share through the 1990s as ore grades and reserves decline.

26. The emergence of a more competitive tin market led to considerable speculation concerning the level of long-term production costs. Efficiency improvements in mining, lower energy costs, and the closure of high-cost facilities were expected to reduce costs substantially during 1986. Table 5 indicates that average costs did decline for all major producers except the already-efficient Brazilian operations. Since the Kuala Lumpur (KL) price averaged US¢616/kg in 1986, it appears that only Brazilian producers operated profitably, on average, during 1986. Continued production efficiencies occurred through mid-1988, but the benefits were limited by an increase in energy prices and the decline in the US dollar.

Trade Outlook

27. The developing countries have historically accounted for the majority of tin metal exports (83% in 1986) while the large metal importers have been Japan, the United States, and the industrial economies of Europe. This general trend will remain unchanged through the 1990s. However, several shifts in the pattern of trade are expected during the next decade. The position of the traditional Southeast Asian producers will diminish as Brazil increases both tin output and exports. Brazilian exports are expected to total 41,000 tons by 2000, or 25% of the world total. Also, the value of

TABLE 5: TIN PRODUCTION COSTS, SELECTED COUNTRIES

Country	1984	1986
	----------USc/kg----------	
Australia	11.55	8.30
Bolivia	14.44 a/	11.60
Brazil	4.50	4.75
Indonesia	9.70	7.15
Malaysia	9.31	6.60
Thailand	8.36	7.05
United Kingdom	NA	10.15

a/ 1981 costs.

NA = Not available.

Note: Data are average costs and exclude royalties and export duties.

Sources: International Tin Council (1984 data) and Elizabeth Mayo "Prices-the Way Ahead" in Tin--A Shining Future?, Proceedings of the 3rd International Tin Symposium, 1987.

trade in real terms is expected to decline substantially due to the decrease in consumption and production. During the 1987-2000 period, tin metal exports are expected to decline by 0.8 % p.a. and reach 159,000 tons by 2000.

Price Outlook

28. The termination of the ITC's buffer stock activities and mandatory export controls resulted in the most competitive tin market of this century. The commercialization of the BSM's inventories led to a massive stock surplus and a sharp decline in prices. An additional feature of the ITC collapse was the termination of the LME tin contract--the KL price is currently the only world quote determined through a terminal market.

29. The KL tin price averaged US¢616/kg in 1986 compared to US¢1,192/kg during 1985. The large decline was expected, given market conditions. However, the subsequent price pattern did not mirror the expectations of many observers who anticipated a continued price decline in 1987, followed by a rapid increase as the market moved to balance. The absence of BSM operations also raised the prospect of severe price volatility. In fact, the KL price increased moderately to US¢669/kg in 1987 and short-term price volatility was negligible, particularly when compared to the experience of other base metals during the last several years.

30. The outlook for tin prices is subject to several major caveats. Over the next several years, the rate of stock reductions will determine the point when the inventory surplus has been eliminated. Perhaps more fundamental is the eventual level of long-run competitive costs. Cost savings (primarily in labor and energy) at existing operations appear to be continuing, but the bulk of such reductions were probably attained by mid-1988. In addition, the continued depletion of known deposits will result in upward cost pressure over the long run. A major unknown remains Brazil, which has large low-cost tin deposits and the potential to develop additional reserves. Exploration activity for new tin deposits appears limited to Brazil. The alluvial tin deposits of Southeast Asia are well known and discovery of new low-cost reserves appears unlikely--a fact illustrated by the steady decline in ore grade mined in the region during the past several decades.

31. Short-term prices will be determined largely by the world supply-demand balance. Table 6 indicates that metal inventories should reach "normal" commercial levels by 1990. Consequently, tin prices should continue to increase slowly, averaging US¢690/kg in 1988 (US¢490/kg in 1985 constant dollars) and US¢925/kg by 1990 (US¢610/kg in 1985 constant dollars).

32. Tin prices are expected to reach US¢1,700/kg by the year 2000 (or US¢750/kg in constant 1985 dollars). Although current dollar prices should experience sizable increases through the 1990s because of the higher level of inflation expected in the latter part of the period, constant dollar prices

TABLE 6: TIN SUPPLY/DEMAND BALANCE

	Actual		Forecast	
	1987	1988	1989	1990
	('000)			
Mine Production	182	185	193	203
+ Reduction in mine stocks	+7	0	0	0
= Metal production	189	185	193	203
+ GSA sales a/	4	5	5	5
= Metal available (A)	193	190	198	208
Metal Consumption (B)	208	212	210	208
Metal stocks, beginning of period	74	59	37	25
Change in stocks (A-B)	15	22	12	-
Metal stocks, end of period	59	37	25	25
Mine stocks, beginning of period	15	12	12	12
Change in stocks	3	-	-	-
Mine stocks, end of period	12	12	12	12

a/ GSA = General Services Administration.

Sources: International Tin Council, Tin Statistics; World Bank estimates and forecasts.

should remain well below the levels attained during the two decades preceding the collapse of the ITC. The competitive environment now typical of the tin market will encourage continued cost containment and make it highly unlikely that real costs approach those which typified 1984. The increasing contribution of Brazil to world supply should also keep marginal costs low. Finally, the gradual decline in tin demand, which is expected through the 1990s, argues for ample tin supplies, keeping downward pressure on prices.

Policy Issues and Investment Climate

33. Unsettled legal issues and a general lack of support preclude the emergence of a new tin commodity agreement. However, the role of the ATCP appears to have expanded over the past several years. This is reflected in the ATCP-sponsored research of the International Tin Research Institute (ITRI), as well as the voluntary export quotas adopted by ATCP members. The primary challenge to the industry and to the ATCP appears to be the likelihood that prices will remain near present levels, which however should both minimize the decline of traditional markets and encourage the commercialization of new applications (e.g., those developed by the ITRI).

34. The elimination of the LME tin contract, following the termination of activities by the BSM and the generally chaotic market conditions which followed, resulted in changes to the traditional commercial relationships in which brokers/traders played a prominent role in tin marketing. The absence of an LME contract reduced the attractiveness of using brokers and led to increased direct links between mine producers and consumers. The experience of Renison Goldfields Consolidated Ltd., Australia, is illustrative: "Following the collapse, we exercised the toll smelting option in our contracts with the smelters, and took delivery of the metal. We elected not to sell during the initial period of uncertainty and depressed prices, and production was stockpiled." 2/ The shift in commercial practices may not prove permanent. However, its development could aid in explaining the lack of price volatility during the past several years since direct sales on a contract basis with a volume commitment are generally perceived to have a stabilizing influence on prices. 3/

35. Although the world tin market appears to have adapted quite well to the absence of an LME contract, a lively debate has emerged over whether tin trading on the LME should be resumed. It is believed by some observers that the currently published prices for tin may not fully reflect world conditions or may be determined on a terminal market with insufficient trading volume (a "thin" market).

2/ William Murphy, "New Trading Relationships Following the ITC Collapse" in Tin--A Shining Future?, Proceedings of the 3rd International Tin Symposium, P. 53.

3/ Op. cit., p. 57.

36. Given the prospective market conditions, limited investment activity can be expected in the world tin industry. Brazil is likely to be the only tin mining country to experience a major expansion of output through 2000. Disinvestment and closures are apt to typify other producing regions. Nominal world smelter capacity has been estimated by the ITC at nearly 400,000 tons and is far in excess of estimated requirements. Hence, further consolidation is expected: it is the larger, more efficient smelters that will survive.

TABLE A1: TIN METAL - PRODUCTION BY MAIN COUNTRIES AND ECONOMIC REGIONS

COUNTRIES/ ECONOMIES	ACTUAL 1969-71	1979-81	1986	1987/B	PROJECTED 1988	1989	1990	1995	2000	GROWTH RATES A/ 1961-86	1970-86	1987 - 2000
	('000 TONS)									(% PER ANNUM)		
INDUSTRIAL	47	25	22	21	17	17	15	10	5	-3.6	-5.4	-10.5
OCEANIA	5	5	1	1	1	1	1	1	1	-0.2	-7.2	0.0
NON-MARKET	12	19	22	22	18	18	20	20	20	3.2	3.5	-0.7
DEVELOPING	159	190	147	146	150	158	168	166	160	1.2	-0.2	0.7
ASIA	140	156	108	108	108	110	118	112	102	0.4	-1.4	-0.4
MALAYSIA	89	72	44	44	42	40	41	39	35	-2.0	-4.4	-1.7
CHINA	22	16	20	20	20	25	27	26	22	-2.2	-1.8	0.7
INDONESIA	7	30	22	24	26	27	30	29	26	15.3	7.5	0.6
THAILAND	22	33	20	15	15	16	18	18	17	1.8 C/	0.1	1.0
AFRICA	12	6	3	2	2	2	2	1	1	-3.1	-5.6	-5.2
AMERICA	6	27	35	35	39	45	47	51	56	10.8	11.1	3.7
BOLIVIA	2	18	8	4	6	8	8	8	8	13.8	12.5	5.5
BRAZIL	3	9	25	28	32	35	38	42	48	12.0	13.1	4.2
WORLD	217	233	191	189	185	193	203	196	185	0.5	-0.7	-0.2

A/ LEAST SQUARES TREND FOR HISTORICAL PERIODS (1961-86); END-POINT FOR PROJECTED PERIODS (1987-2000).
B/ ESTIMATE.
C/ GROWTH RATE FOR 1965-86 PERIOD.

SOURCES: INTERNATIONAL TIN COUNCIL, MONTHLY STATISTICAL BULLETIN (ACTUAL);
WORLD BANK, INTERNATIONAL ECONOMICS DEPARTMENT (PROJECTED).

TABLE A2: TIN METAL - APPARENT CONSUMPTION BY MAIN COUNTRIES AND ECONOMIC REGIONS

COUNTRIES/ ECONOMIES	ACTUAL				PROJECTED					GROWTH RATES A/		
	1969-71	1979-81	1986	1987/B	1988	1989	1990	1995	2000	1961-86	1970-86	1987 - 2000
	('000 TONS)									(% PER ANNUM)		
INDUSTRIAL	133	134	117	119	121	119	117	104	91	-0.9	-2.3	-2.0
NORTH AMERICA	60	49	36	38	39	36	34	30	25	-2.1	-3.2	-3.2
UNITED STATES	55	45	33	35	36	33	31	26	22	-2.2	-3.3	-3.5
EEC-10	61	49	44	44	44	44	43	40	36	-1.4	-2.8	-1.5
JAPAN	27	31	32	32	33	33	32	30	27	3.1	0.2	-1.3
NON-MARKET	31	40	40	40	40	39	38	37	37	2.5	1.9	-0.6
DEVELOPING	34	38	48	49	51	52	53	55	57	1.4	1.2	1.2
ASIA	21	20	28	29	32	32	33	36	39	0.7	0.8	2.3
CHINA	13	11	13	13	16	18	19	21	22	-0.3	-0.9	4.1
AMERICA	7	11	13	14	15	15	15	15	15	3.3	3.1	0.5
WORLD	218	212	205	208	212	210	208	196	185	0.1	-0.9	-0.9

A/ LEAST SQUARES TREND FOR HISTORICAL PERIODS (1961-86); END-POINT FOR PROJECTED PERIODS (1987-2000).
B/ ESTIMATE.

SOURCES: INTERNATIONAL TIN COUNCIL, MONTHLY STATISTICAL BULLETIN (ACTUAL);
WORLD BANK, INTERNATIONAL ECONOMICS DEPARTMENT (PROJECTED).

TABLE A3: TIN METAL - GROSS EXPORTS BY MAIN COUNTRIES AND ECONOMIC REGIONS

COUNTRIES/ ECONOMIES	ACTUAL				PROJECTED					GROWTH RATES A/		
	1960-71	1979-81	1986	1987/B	1988	1989	1990	1995	2000	1961-86	1970-86	1987 - 2000
	('000 TONS)									(% PER ANNUM)		
INDUSTRIAL	29	21	31	27	25	25	23	15	10	-0.8	-1.8	-7.4
EEC-10	25	18	29	25	25	23	20	12	8	-1.2	-1.2	-8.4
UNITED KINGDOM	13	8	17	15	15	15	15	10	5	-0.3	-4.2	-8.1
NON-MARKET	0	0	0	0	0	0	0	0	0	0.0	0.0	0.0
DEVELOPING	140	163	148	150	152	153	156	154	149	1.2	-0.6	-0.1
ASIA	125	139	121	126	120	118	119	112	101	0.6	-1.6	-1.7
MALAYSIA	90	69	41	48	45	42	40	38	36	-2.1	-4.6	-2.2
INDONESIA	7	28	23	22	25	26	26	24	22	0.0	6.8	0.0
THAILAND	23	32	19	17	17	17	16	16	15	0.0	0.2	-1.0
CHINA	6	4	8	12	10	12	14	12	9	-2.7	-2.8	-2.2
AFRICA	11	4	1	2	2	2	1	1	1	-5.9	-10.9	-5.2
AMERICA	3	20	26	22	30	33	36	41	47	17.0	17.9	6.0
BOLIVIA	2	16	7	3	4	5	6	6	6	13.0	11.6	5.5
BRAZIL	0	3	19	19	26	28	30	35	41	...	...	6.1
WORLD	169	184	179	177	177	178	179	169	159	0.8	-0.7	-0.8

A/ LEAST SQUARES TREND FOR HISTORICAL PERIODS (1961-86); END-POINT FOR PROJECTED PERIODS (1987-2000).
B/ ESTIMATE.

SOURCES: INTERNATIONAL TIN COUNCIL, MONTHLY STATISTICAL BULLETIN (ACTUAL);
WORLD BANK, INTERNATIONAL ECONOMICS DEPARTMENT (PROJECTED).

TABLE A4: TIN METAL - GROSS IMPORTS BY MAIN COUNTRIES AND ECONOMIC REGIONS

COUNTRIES/ ECONOMIES	ACTUAL				PROJECTED					GROWTH RATES A/		
	1969-71	1979-81	1986	1987/B	1988	1989	1990	1995	2000	1961-86	1970-86	1987 - 2000
	('000 TONS)									(% PER ANNUM)		
INDUSTRIAL	137	135	124	127	125	122	120	108	96	0.5	-0.8	-2.1
NORTH AMERICA	58	52	41	46	46	42	41	36	31	-0.5	-2.0	-3.0
UNITED STATES	53	47	37	42	42	39	38	33	29	-0.5	-1.9	-2.8
EEC-10	49	50	48	46	45	43	43	39	35	0.2	-0.3	-2.1
JAPAN	27	31	32	32	32	33	33	31	28	3.6	0.4	-1.0
NON-MARKET	16	26	24	24	20	20	18	17	17	3.0	2.9	-2.6
DEVELOPING	13	15	36	34	40	41	41	44	46	1.8	3.5	2.4
ASIA	6	9	29	27	33	34	35	36	37	3.4	6.8	2.5
WORLD	165	176	184	185	185	183	179	169	159	0.9	0.1	-1.2

A/ LEAST SQUARES TREND FOR HISTORICAL PERIODS (1961-86); END-POINT FOR PROJECTED PERIODS (1987-2000).
B/ ESTIMATE.

SOURCES: INTERNATIONAL TIN COUNCIL, MONTHLY STATISTICAL BULLETIN (ACTUAL);
WORLD BANK, INTERNATIONAL ECONOMICS DEPARTMENT (PROJECTED).

TABLE A5: TIN ORE - PRODUCTION BY MAIN COUNTRIES AND ECONOMIC REGIONS

COUNTRIES/ ECONOMIES	ACTUAL				PROJECTED					GROWTH RATES A/		
	1969-71	1979-81	1986	1987/B	1988	1989	1990	1995	2000	1961-86	1970-86	1987 - 2000
	('000 TONS)									(% PER ANNUM)		
INDUSTRIAL	15	17	16	15	15	13	13	12	10	4.2	-1.1	-3.1
OCEANIA	9	12	9	8	8	8	9	8	6	5.0	-0.9	-2.2
NON-MARKET	12	19	19	19	18	18	18	19	19	2.8	2.8	0.0
DEVELOPING	193	200	144	148	152	162	172	165	156	0.0	-1.1	0.4
ASIA	138	152	97	100	103	109	114	104	95	-0.1	-1.4	-0.4
MALAYSIA	75	61	29	30	32	33	34	31	28	-2.0	-4.9	-0.5
CHINA	22	16	22	27	27	29	32	29	27	-2.1	-1.6	0.0
INDONESIA	19	32	25	26	28	29	30	27	25	3.0	1.7	-0.3
THAILAND	22	33	17	15	16	17	17	15	14	1.4	0.0	-0.5
AFRICA	19	12	5	6	4	4	4	4	2	-4.1	-6.1	-8.1
AMERICA	36	37	42	42	45	49	54	57	59	2.2	1.2	2.6
BOLIVIA	30	28	11	8	8	9	10	9	8	-0.8	-4.2	0.0
BRAZIL	3	7	25	29	33	36	39	44	48	14.3	14.7	4.0
WORLD	220	236	179	182	185	193	203	196	185	0.5	-0.8	0.1

A/ LEAST SQUARES TREND FOR HISTORICAL PERIODS (1961-86); END-POINT FOR PROJECTED PERIODS (1987-2000).
B/ ESTIMATE.

SOURCES: INTERNATIONAL TIN COUNCIL, MONTHLY STATISTICAL BULLETIN (ACTUAL);
WORLD BANK, INTERNATIONAL ECONOMICS DEPARTMENT (PROJECTED).

TABLE A6: TIN ORE - GROSS EXPORTS BY MAIN COUNTRIES AND ECONOMIC REGIONS

COUNTRIES/ ECONOMIES	ACTUAL				PROJECTED					GROWTH RATES A/		
	1969-71	1979-81	1986	1987/B	1988	1989	1990	1995	2000	1961-86	1970-86	1987 - 2000
	('000 TONS)									(% PER ANNUM)		
INDUSTRIAL	4	9	10	13	13	12	10	10	10	10.4	3.9	-2.0
EEC-10	1	2	3	2	2	2	2	2	2	8.2	7.8	0.0
NON-MARKET	0	0	0	0	0	0	0	0	0	0.0	0.0	0.0
DEVELOPING	50	23	26	32	34	36	32	27	21	-4.6	-5.6	-3.2
ASIA	14	7	9	19	20	22	17	14	12	-5.1	-2.0	-3.5
AFRICA	8	6	4	3	3	3	3	3	1	-1.6	-5.1	-8.1
AMERICA	28	10	13	10	11	11	12	10	8	-5.1	-8.9	-1.7
WORLD	54	32	36	45	47	48	42	37	31	-3.2	-4.0	-2.8

A/ LEAST SQUARES TREND FOR HISTORICAL PERIODS (1961-86); END-POINT FOR PROJECTED PERIODS (1987-2000).
B/ ESTIMATE.

SOURCES: INTERNATIONAL TIN COUNCIL, MONTHLY STATISTICAL BULLETIN (ACTUAL);
WORLD BANK, INTERNATIONAL ECONOMICS DEPARTMENT (PROJECTED).

TABLE A7: TIN ORE - GROSS IMPORTS BY MAIN COUNTRIES AND ECONOMIC REGIONS

COUNTRIES/ ECONOMIES	ACTUAL				PROJECTED					GROWTH RATES A/		
	1969-71	1979-81	1986	1987/B	1988	1989	1990	1995	2000	1961-86	1970-86	1987 - 2000
	('000 TONS)									(% PER ANNUM)		
INDUSTRIAL	36	17	21	15	15	16	14	10	5	-4.8	-5.4	-8.1
EEC-10	36	16	17	13	13	14	12	9	4	-4.9	-5.2	-8.7
UNITED KINGDOM	23	7	9	8	8	8	6	5	3	-6.3	-8.3	-7.3
JAPAN	0	0	0	0	0	0	0	0	0	0.0	0.0	0.0
NON-MARKET	1	1	1	1	1	1	1	1	1	...	1.6	0.0
DEVELOPING	16	16	19	34	31	31	27	26	25	1.7	0.6	-2.3
WORLD	55	34	40	50	47	48	42	37	31	-2.6	-2.9	-3.6

A/ LEAST SQUARES TREND FOR HISTORICAL PERIODS (1961-86); END-POINT FOR PROJECTED PERIODS (1987-2000).
B/ ESTIMATE.

SOURCES: INTERNATIONAL TIN COUNCIL, MONTHLY STATISTICAL BULLETIN (ACTUAL);
WORLD BANK, INTERNATIONAL ECONOMICS DEPARTMENT (PROJECTED).

TABLE A8: TIN - PRICES, a/ 1950-87 (ACTUAL) AND 1988-2000 (PROJECTED)

	(c/kg)			(c/kg)			
	Current $			1985 Constant $			
				MUV a/		US GNP b/	
	LME Cash c/	Export Value d/	Kuala Lumpur e/	LME Cash c/	Kuala Lumpur e/	LME Cash c/	Kuala Lumpur e/
Actual							
1950	206			870		962	
1951	2[illegible]			1,092		1,328	
1952	[illegible]			930		1,168	
1953	2[illegible]			723		869	
1954	198			728		842	
1955	204			736		840	
1956	217			756		865	
1957	208			710		800	
1958	202		200	681	671	765	752
1959	216		214	735	728	794	788
1960	220	170	213	733	710	795	770
1961	245	190	241	803	790	877	863
1962	247	210	242	794	778	865	848
1963	251	210	246	822	806	867	849
1964	341	300	335	1,098	1,079	1,158	1,138
1965	389	350	380	1,243	1,214	1,288	1,258
1966	357	330	349	1,102	1,077	1,142	1,117
1967	333	310	324	1,016	989	1,036	1,008
1968	313	290	305	964	940	928	904
1969	343	330	338	1,003	988	965	950
1970	367	360	359	1,011	989	977	955
1971	350	350	342	914	893	882	862
1972	377	370	368	903	882	907	884
1973	483	450	472	999	976	1,090	1,066
1974	820	730	784	1,391	1,330	1,700	1,625
1975	687	650	669	1,048	1,021	1,296	1,262
1976	758	700	747	1,141	1,125	1,333	1,325
1977	1,076	1,010	1,071	1,475	1,468	1,789	1,781
1978	1,291	1,165	1,252	1,537	1,490	2,000	1,939
1979	1,546	1,380	1,482	1,626	1,558	2,201	2,110
1980	1,678	1,620	1,644	1,609	1,576	2,190	2,145
1981	1,416	1,270	1,406	1,350	1,341	1,685	1,673
1982	1,283	1,190	1,295	1,241	1,252	1,435	1,448
1983	1,299	1,230	1,303	1,290	1,294	1,399	1,403
1984	1,227	1,240	1,246	1,240	1,259	1,272	1,292
1985	1,195	1,200	1,154	1,195	1,154	1,195	1,154
1986	NA	606	616	NA	521	NA	604
1987	NA	660	669	NA	515	NA	637
Projected							
1988			690		490		632
1989			800		535		701
1990			925		610		771
1995			1,200		663		770
2000			1,700		750		870

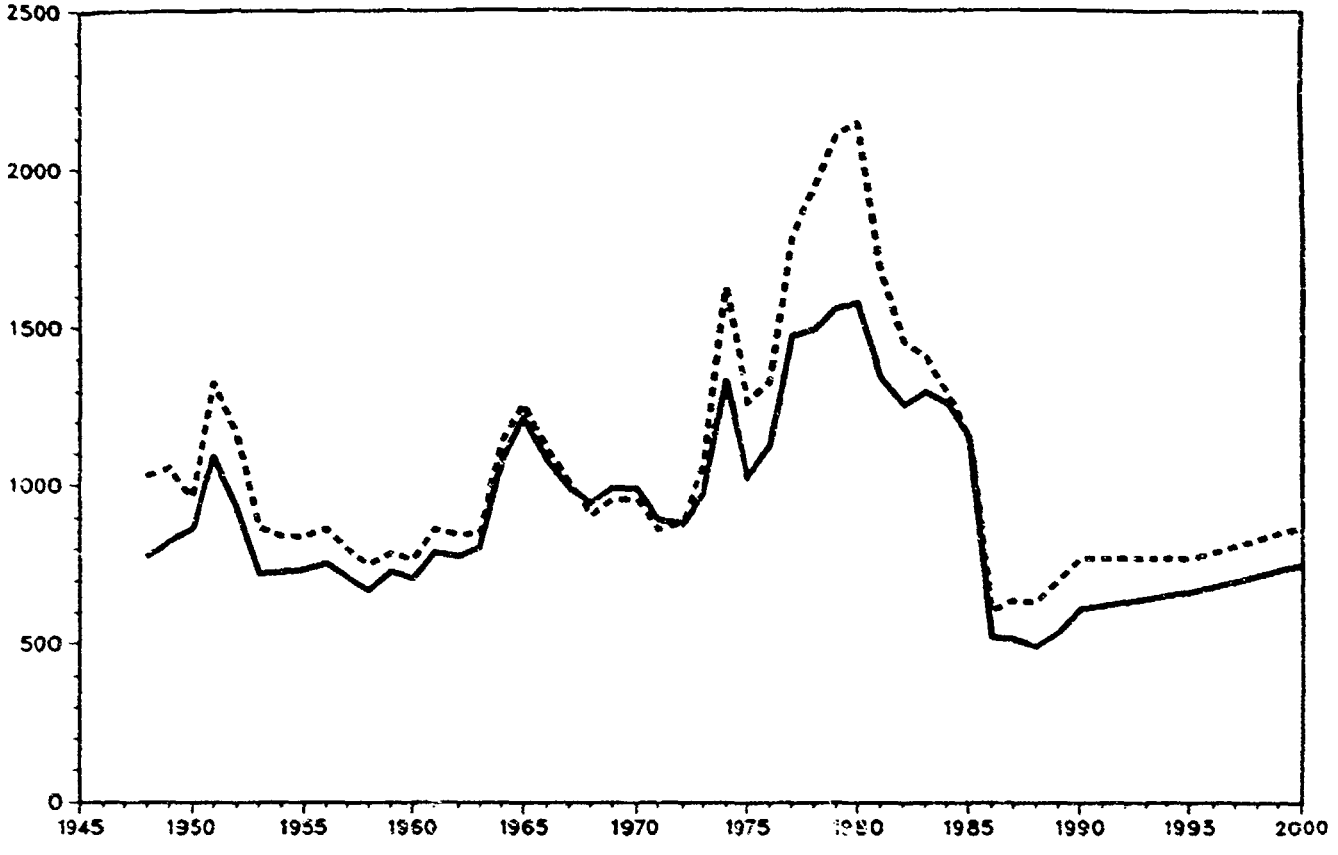
NA = Not available.

a/ Deflated by Manufacturing Unit Value (MUV) Index.
b/ Deflated by US GNP Deflator.
c/ LME Settlement Price, standard grade.
d/ Developing country export unit value.
e/ Settlement price.

Sources: Metals Week (various issues); International Tin Council Tin Statistics (various issues); World Bank, International Economics Department (projected).

TIN

(CONSTANT 1985 DOLLAR PRICES •)



——— DEFLATED BY MANUFACTURING UNIT VALUE (MUV) INDEX

• • • • • • • • • • • DEFLATED BY U.S. GNP DEFLATOR.

• 1948 – 87 ACTUAL ; 1988 – 2000 PROJECTED .

SOURCE : WORLD BANK , INTERNATIONAL ECONOMICS DEPARTMENT .

NICKEL

Summary

1. In 1987 and 1988 an unanticipated increase in nickel demand caused LME nickel prices to increase sharply. Low stock levels, production bottlenecks, and high effective capacity utilization rates exacerbated the upward movement of prices. LME nickel prices averaged US$2.21/lb (US$4,872/ton) in 1987 and US$6.26/lb (US$13,811/ton) in the first half of 1988.

2. In the next two years prices will very likely subside from their present highs as nickel demand patterns adjust to slower growth rates of stainless steel output in particular and industrial output in general. The downward movement of prices is expected to be almost as sharp as was the upward movement in the last two years. Increases in scrap recycling, in capacity utilization rates, in world effective capacity (as high-cost smelting units that were shut down in the last three years are brought back to life again) will contribute to the downward adjustment of prices in 1989 and 1990. From a yearly average price for LME nickel metal cathodes of US$5.79/lb (US$12,770/ton) in 1988, prices are expected to decline to US$3.75/lb (US$8,267/ton) in 1989 and US$2.74/lb (US$6,041/ton) in 1990. The nickel industry will move from a position of excess demand in 1987 and 1988 (when world consumption exceeded world production by about 54,000 tons) to a position of excess supply in 1989 with surpluses of around 22,000 tons. Nickel prices are projected to grow by 4.1% p.a. in current terms during the 1990-2000 period, remaining more or less unchanged in real terms. World production and consumption are expected to increase by 1.3% p.a. from 1990 to reach 933,000 tons in the year 2000.

Historical Perspective

3. In order to evaluate the short and medium prospects of the nickel industry, it is useful to briefly review developments since 1980. The 1980s started with the market economies' nickel demand at 541,000 tons and effective capacity (including an allowance for non-market economies' exports) at 727,000 tons. High capacity utilization rates resulted in excess supplies, increasing producer and LME stocks and downward pressure on nickel prices. The same pattern prevailed in subsequent years and prices fell from an average of US$2.96/lb (US$6,519/ton) in 1980 to an average of US$2.22/lb (US$4,899/ton) in 1985. While nickel demand increased only marginally during this period, slow but important changes took place on the production side. Most privately owned or controlled production units reacted to the declines in nickel prices with sharp cuts in production costs. Reductions in manpower and energy cost savings were accompanied by retirement of excess plants and equipment. However, these capacity cuts were, however, slow to come. Then in 1986 the USSR decided to double its nickel exports to the market economies, reversing expectations that prices would increase. As a result of the increase in USSR exports, prices decreased to US$1.76/lb (US$3,881/ton) in 1986, their lowest level in 12 years.

4. Most analysts expected 1987 to be a year of world economic slowdown. At best the nickel demand of market economies was projected as being almost unchanged from that of 1986 at 555,000 tons. In 1987 effective world capacity in the market economies was estimated to be close to 636,000 tons. Producers considered that effective capacity was adequate to satisfy demand. However, with OECD countries adopting expansionary monetary and fiscal policies, industrial economic activity grew rapidly in the second half of the year. Nickel demand increased by 12% in response to an upsurge in stainless steel demand.

5. In 1988 nickel demand (of market economies) is estimated to expand to 638,000 tons. Preliminary figures indicate that this estimate could be on the low side as stainless steel demand in the first half of 1988 (as compared to the first half of 1987) increased by more than 6% in most industrial countries. With 1987's effective capacity of 636,000 tons and inventories of less than two months' consumption, market prices adjusted briskly upwards in the first half of 1988. The high nickel prices are expected to put downward pressure on the growth of nickel demand and to provide a financial incentive to producers to rehabilitate any unused capacity.

6. The next four sections review nickel consumption prospects, nickel production and capacity prospects, nickel trade prospects, and the nickel price outlook for the 1988-2000 period.

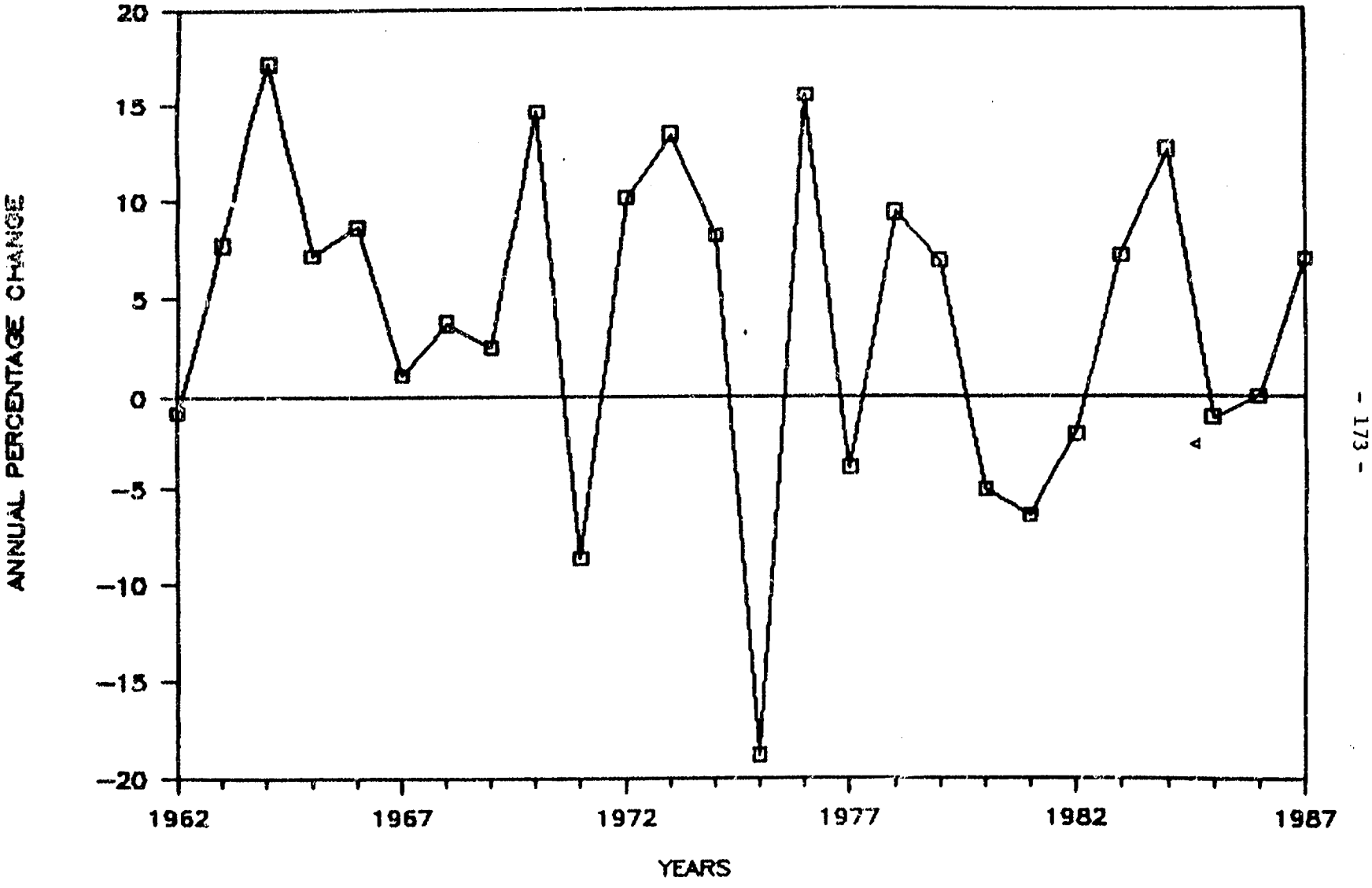
Consumption Prospects

7. Three countries, namely the United States, Japan, and the Federal Republic of Germany, account for over 60% of the market economies' consumption. In 1987 world consumption amounted to 814,000 tons and the market economies' consumption totaled 623,000 tons.

8. In the United States, which in most years has been the largest single consumer of nickel, industrial production and alloy steel demand grew rapidly in the 1960s and 1970s--albeit with setbacks after the two oil price shocks of 1973 and 1980. Consumption growth rates have been very volatile from year to year (see Figure 1). US petroleum refining and chemical industries are the main users, accounting for 24% of total nickel consumption in the form of metal, principally alloy. (Parts which are subject to normal corrosion typically contain 8% nickel while parts exposed to caustic and saline solutions typically contain higher proportions of nickel). Fabricated metal products are the next largest user and account for 11% of nickel consumption (in the form of stainless steel) while aircraft manufacturing end-uses account for 10%. The main use in this area is in the form of super alloys, valued for their strength and corrosion resistance in jet engines; but stainless and alloy steels are also used for load-bearing elements in air frames and undercarriages.

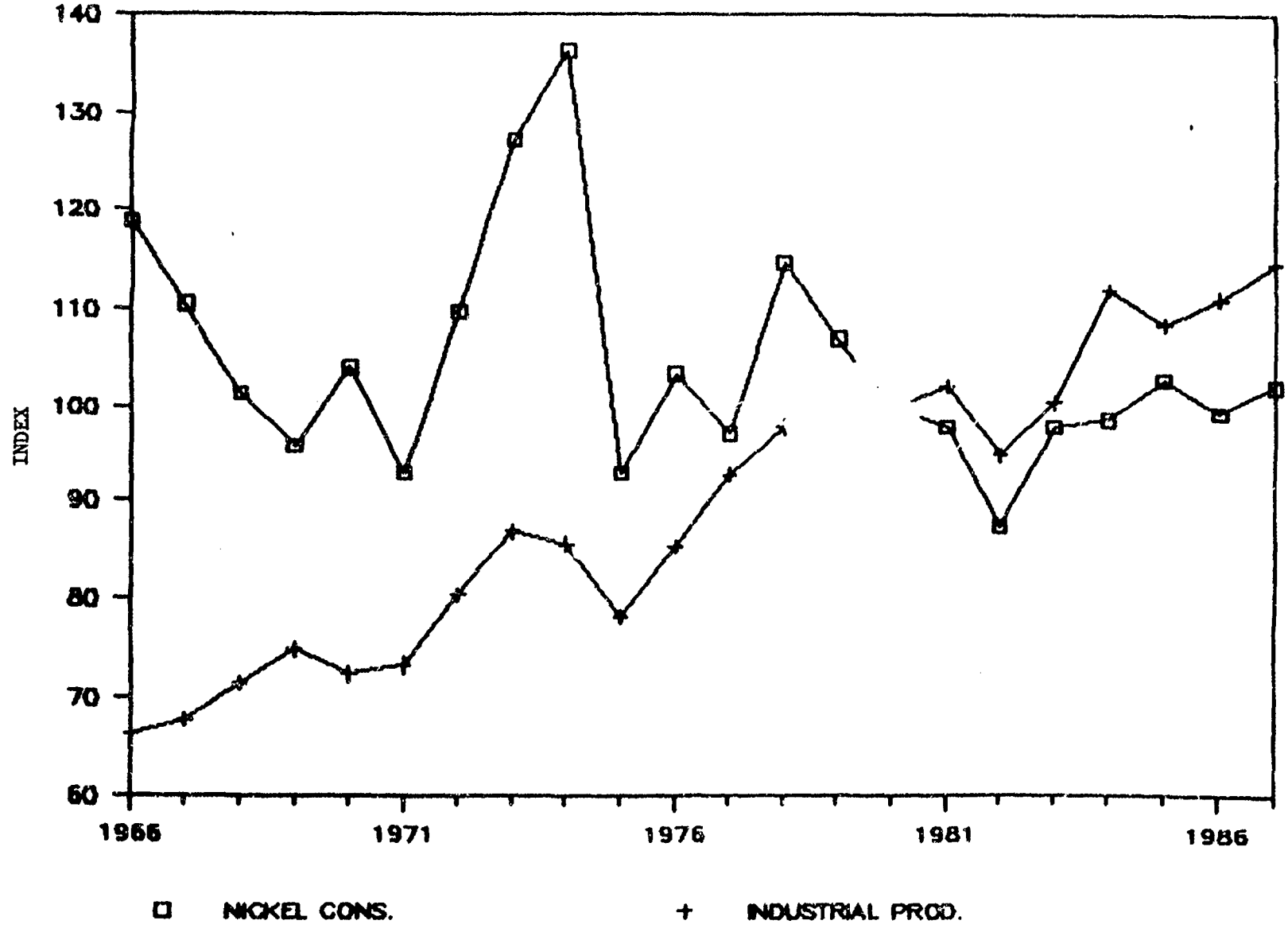
9. All consumption of nickel in the United States, Japan, and the Federal Republic of Germany moves in the same direction as industrial economic activity (see Figures 2, 3, and 4). The upsurge of nickel demand witnessed in 1987 and 1988 was thus in statistical terms not at all unusual. It is also noteworthy that world demand for nickel grew at 2.3% p.a. in the last decade,

FIGURE 1: PERCENTAGE CHANGE OF WORLD NICKEL CONSUMPTION, 1962-87



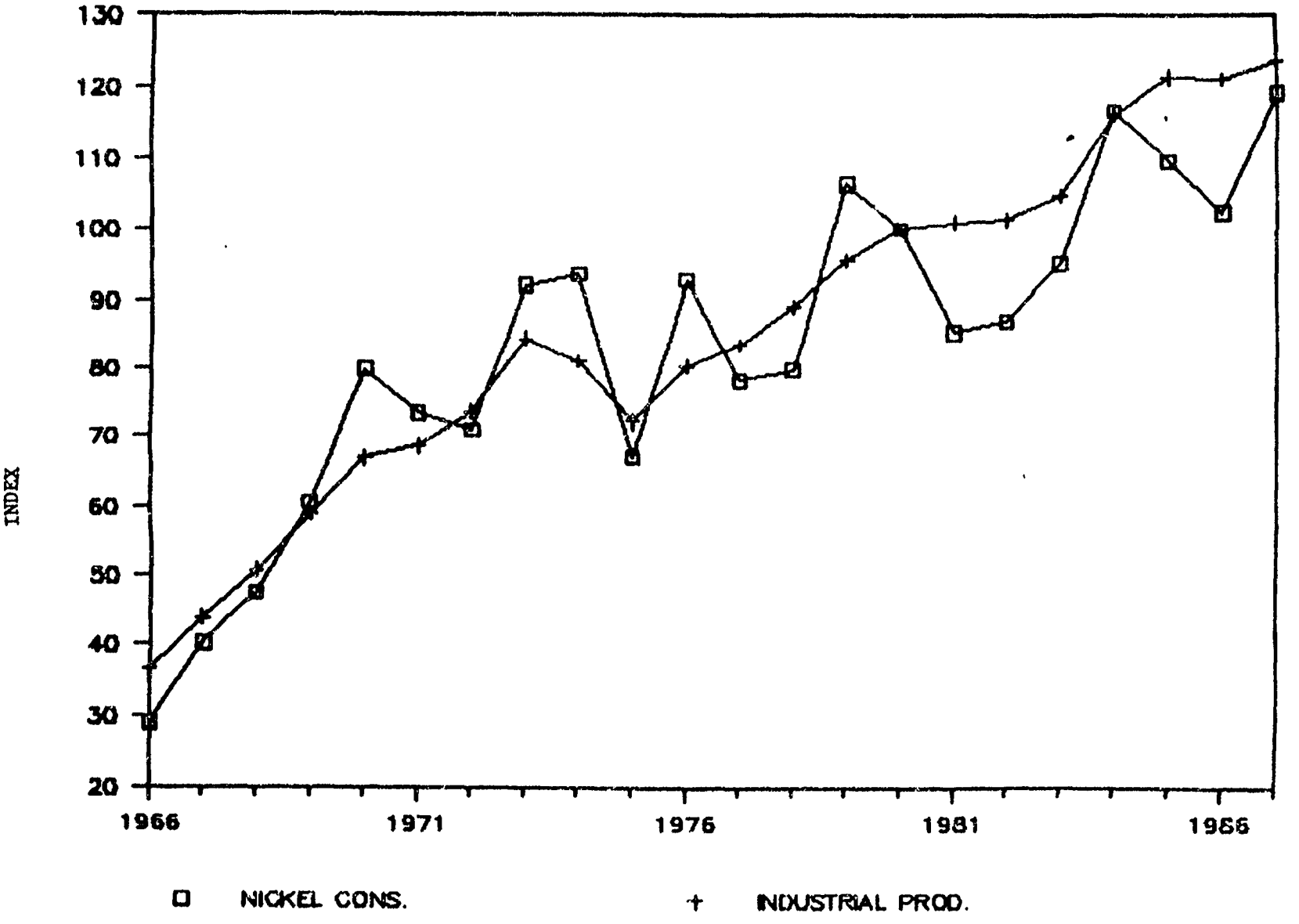
Source: World Bank.

FIGURE 2: NICKEL CONSUMPTION AND INDUSTRIAL PRODUCTION OF THE UNITED STATES, 1967-87
(INDEX, 1980=100)



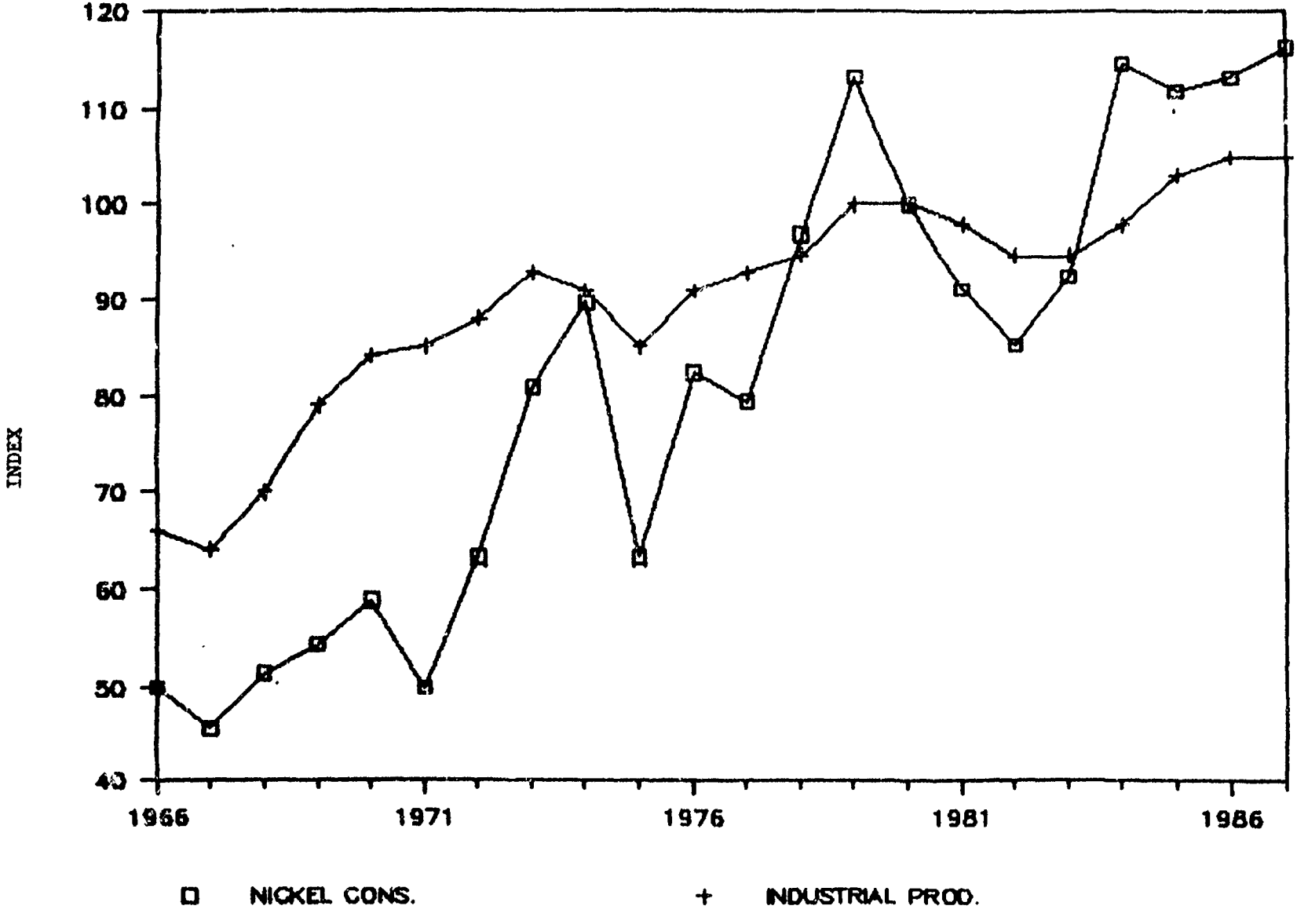
Source: World Bank.

FIGURE 3: NICKEL CONSUMPTION AND INDUSTRIAL PRODUCTION OF JAPAN, 1967-87
(INDEX, 1980=100)



Source: World Bank.

FIGURE 4: NICKEL CONSUMPTION AND INDUSTRIAL PRODUCTION OF THE FEDERAL REPUBLIC OF GERMANY, 1967-87
(INDEX, 1980=100)



Source: World Bank.

i.e., not significantly lower than the anticipated nickel consumption growth rate for 1988. Nickel consumption is not expected to suffer substantially from substitution during the 1988-2000 period. Its use has been found to be complementary to aluminum (except in the transportation sector), and to copper and lead (except in the fabricated metals, cans, and containers sector). However, nickel was found to substitute for tin (except in the transportation sector) and zinc. 1/ The biggest possible substitution threat would be a switch from austenitic (i.e., nickel-bearing) stainless steels to ferritic; however, this development does not seem close to fruition. Austenitic steels are still preferred in view of their workability and corrosion-resistance properties. Another possible substitution threat is the development of ceramic components as a substitute for nickel super alloys in jet engines and turbines. However, the scope for substitution from this source appears to be minimal.

10. World nickel apparent consumption is expected to grow at an average rate of 1.3% p.a. rate during the 1990-2000 period. A downward adjustment in world nickel demand from its 1988 level is expected in 1989 and 1990, partly in reaction to the higher nickel prices in 1987 and 1988. US consumption is expected to grow by 1.1% p.a. Improved terms of trade and increasingly export-oriented manufacturing activities will contribute to an increased growth rate of consumption in the United States with respect to that of the 1970-86 period. Given the strength of the yen, the consumption of nickel in Japan is expected to increase by an average of 1.3% p.a. during the 1987-2000 period--a lower growth rate than during the 1960-87 period.

11. The Federal Republic of Germany is the largest nickel consumer in the EEC. Industrial production grew rapidly until 1973. Since then it has grown more slowly and with significant short-term reversals following each oil crisis. Despite the deterioration of its terms of trade, the Federal Republic of Germany has plans to rehabilitate capacity and increase stainless steel production. The additional stainless steel capacity is expected to lead to nickel demand growing by 1% p.a. during the 1987-2000 period.

12. By 2000 it is expected that the industrial countries will consume 57,000 tons more nickel than in 1987. Out of this additional tonnage, 27,000 tons will be consumed in Japan and 16,000 tons will be consumed in the EEC-10 countries (of which 11,000 tons will be consumed by the Federal Republic of Germany). Developing countries are expected to add 34,000 tons to their nickel consumption between 1987 and 2000. Asian developing countries (in particular, India, Republic of Korea, and China) should account for 82% of the increase in demand.

Production Prospects

13. As pointed out in the section entitled "Historical Perspective," the nickel industry is presently faced with smelting and refining capacity shortages. However, there is no shortage of nickel resources. The US Bureau

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1/ See T. Priovolos and T. Dunietz, Substitutability of Metals in U.S. Industry, IECCM Division Working Paper No. 1987-11.

of Mines estimates world reserves of contained nickel (excluding seabed deposits) to be in the order of 55 million tons. The great majority of nickel ore producers have more than adequate reserves; the most important exceptions being Morro do Niquel in Brazil, which now has a very limited life, and Greenvale in Australia, where high-grading in response to depressed market conditions has reduced mine life to around 12 years.

14. The low nickel prices of recent years limited investment in nickel operations. Most investments made in this period have been directed towards cutting costs rather than expansion. Wherever new capacity has been built, it has generally been in the context of replacing older, high-cost facilities. Nevertheless, several projects have been proposed which, if built, would affect nominal mining, smelting, and refining capacity.

15. The cost of a 20,000 ton greenfield project is estimated to be in the US$250 million range. (Some industry officials have put it as high as US$500 million). The costs of reopening shutdown projects are substantially lower. A figure of US$50 million to $100 million has been quoted for Nonoc (this works out to $1-2/lb of annual production capacity).

16. The projects that seem to have a high probability of being developed are located in the following countries.

17. Brazil. BP Mineracao, in cooperation with local mining companies, is considering the construction of a refining facility that will be able to produce up to 12,000 tons of electrolytic nickel from sulfide mines in Fortelez de Minas. The facility is not expected to be operating at full capacity before 1990.

18. Cuba. A new mine and plant at Punta Gorda, Moa Bay, was originally scheduled for completion in 1983 but is well behind schedule. The first stage of 10,000 tons per annum production is on-stream and effective capacity is expected to rise in the 1990s to 30,000 tons per annum.

19. USSR. Norilsk was the focus of a major expansion program in the early 1980s that included the opening of a smelter in Nadezha in 1982 and the Taymyr mine a year later. Reserve depletion is expected to offset any gains due to increased production or efficiency in the next five years. Domestic demand is expected to absorb most of the expected increase in nickel production though increased exports remain a distinct possibility in the next five years.

20. China. China's production is, at present, satisfying its domestic demand. In 1986 China began exporting marginal quantities of a variety of nickel products. Domestic reserves are large and there are plans for large-scale expansions of nickel smelting and refining capacity by up to 40,000 tons by the year 2000--double its present capacity. The plans include production of matte and exports to Republic of Korea and Japan. Stage 1 of the Jinchuan No. 2 mine was completed in 1982; this helped increase production to 20,000 tons per annum by 1987. Stage 2 of the expansion is expected to be completed in the early 1990s.

21. Canada. Inco plans to invest close to 25 million Canadian dollars over two years to bring the shutdown Crean Hill mine in Sunbury back to operation at a nickel equivalent rate of 10,000 tons per annum.

22. South Africa. If platinum prices remain firm, South Africa may add up to 50,000 tons per annum of nickel products as by-products of platinum mining. The probability that platinum and nickel metal output will increase to such levels is very small, however, in view of the large investment requirements and the uncertain political and economic future of the country.

23. Overall, the market economies' effective capacity is expected to increase by at least 132,000 tons by 2000. This additional capacity is expected to alleviate present day supply shortages and amply satisfy additional demand for nickel well beyond 2000.

24. Using our econometric model of the nickel industry on the basis of our forecasts regarding industrial and steel output, the growth rate of world nickel consumption is expected to average 0.8% p.a. during the 1988-2000 period. Scrap nickel may become increasingly important in stainless steel production. In the United States, scrap accounts for 8% of primary consumption, and the stainless steel boom in the 1960s and 1970s should provide a large potential source of scrap nickel when this plant and equipment begins to be pulled down in the 1990s. By then scrap could be meeting 50,000 to 150,000 tons of nickel demand after a long period of low prices and substantial reductions in costs.

Trade Prospects

25. Before presenting and interpreting trade patterns and prospects, a review of the extent of integration of the nickel industry is in order.

26. The majority of companies in the industry are vertically integrated to finished nickel (ferronickel, metal, or their equivalents). The major exceptions are:

(a) Agnew (when operating) produces a concentrate which is tolled by WMC to a matte and refined by Amex to metal in the United States. Following the closure of Amex's refinery, matte has been refined by Sherritt-Gordon and Falconbridge.

(b) Selebi-Phikwe (Botswana) produces a matte at the mine site and refines part of its product in Zimbabwe (Eiffel) and part in Norway.

(c) Sherritt-Gordon (Alberta) was formerly integrated with its own mine supply from Lynn Lake; now a tolling operation processing (mainly) into concentrate and matte.

(d) Indonesian mines (especially Aneka and Tambang) export laterite ore and matte to Japanese smelters.

(e) All Japanese smelters rely on imported ores, concentrates, and mattes. The main sources are Indonesia, the Philippines, and Australia (Greenvale). Financial linkages do exist but are not very important.

(f) Rio Tube (Philippines) supplies laterite ore to Japanese smelters; 40% equity is held by a Japanese consortium.

(g) Moa Bay (Cuba) produces a sulphate sludge which was formerly refined at Port Nickel refinery when both belonged to Freeport. Since the Cuban revolution, the sulphate sludge has been refined in the USSR.

Overall, the share of the industry that is not integrated is somewhere in the 20% to 25% range.

27. Downstream integration into sectors using nickel--notably stainless steel alloys and fabricated products--is limited. Inco is significantly integrated downstream. Its subsidiaries include Huntington Alloys and Turbo Products in the United States and Wiggin Alloys and Doncaster Companies in the United Kingdom. Outokumpu has also an integrated downstream operation in view of its chrome mining operation. The fabricated products business of Outokumpu is relatively small, however. In Japan, major stainless steel producers own Pacific Nickel and Nippon Yakin. Lastly, in France the government owns SLN and other major steel producers; however, the companies are not fully integrated.

28. The trade data shown in Tables A3 and A4 have been compiled on the basis of UNCTAD data. It is unclear whether these data include all types of nickel smeltered or refined products and/or include all internationally traded material from all destinations; thus they should be viewed with caution. The projections of exports and imports were based on projections of net exports shown in Table 1, which, in turn, were derived from consumption and production data presented in Tables A1 and A2. The data shown in Table 1 are considered to be more reliable than those shown in Tables A3 and A4. Figures with negative signs are imports and figures without signs are exports.

29. In the industrial world only Finland, Norway, and Australia are expected to remain net exporters of nickel metal. 2/ The net nickel demand of industrial countries will continue to be satisfied by developing countries. The message from Table 1 in this regard is clear: the dependence of industrial countries on developing countries' exports will more than double between 1989 and 2000. Latin America, followed by Africa, will remain major net exporters. The non-market economies, in particular the USSR, are also expected to rapidly increase their net exports.

Price Prospects

30. The nickel industry is presently operating in an excess demand environment that is very likely going to reverse itself in the near future as demand slows and as the high nickel prices make it profitable for producers to increase their effective capacity. Although the exact timing of the demand slowdown cannot be known with certainty, when it comes (sometime in the next

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2/ New Caledonia is not part of the group of industrial countries.

TABLE 1: NICKEL METAL: PRODUCTION LESS CONSUMPTION, 1969/71-2000

Countries/ Economies	Actual				Projected				
	1969-71	1979-81	1986	1987	1988	1989	1990	1995	2000
	('000 Tons)								
Industrial	-17	-79	-120	-133	-118	-75	-91	-144	-165
North America	23	3	-27	-14	-2	21	15	-3	-18
EEC-10	-56	-112	-118	-127	-126	-119	-118	-129	-136
France	-23	-29	-24	-26	-28	-24	-22	-24	-27
United Kingdom	1	-6	4	-3	-3	-3	-2	0	-1
Other Western Europe	16	14	21	25	29	30	30	27	29
Japan	-1	-18	-34	-58	-57	-48	-60	-77	-80
Non-Market	23	8	4	4	-8	10	9	27	47
USSR	36	35	42	42	32	48	47	70	90
Developing	14	66	81	75	74	87	82	117	118
Asia	-22	2	-16	-19	-15	-18	-20	-15	-11
China	-19	-10	3	0	4	1	-1	5	20
World	20	-5	-35	-54	-52	22	0	0	0

Note: Minus sign indicates net imports; figures without signs are exports.

Sources: UNCTAD (actual); World Bank (projected).

12 months) it is very likely that it will put into action some other forces that will create additional downward pressure on prices. Consumers of nickel, mainly stainless steel producers (in 1987 they are estimated to have consumed close to 60% of nickel products), are expected to halt their purchases of nickel products as soon as they sense that the demand for their products slackens. Stainless steel producers are expected then to start using their (stainless steel) scrap, thus reducing their scrap inventory levels that have substantially increased during the last 12 months of fast output growth. The increase in the use of scrap, the slowdown of demand, and the increase of world effective capacity is expected to lead to a decline of nickel prices from their 1988 average of US$5.80/lb to US$3.80/lb in 1989 and US$2.70/lb in 1990. During this period, world nickel stocks are expected to accumulate to three to four months' consumption level. Thereafter, demand is expected to grow closer to its historical trend, and effective capacity is expected to satisfy comfortably demand needs. Changes in nickel prices are expected to reflect very closely changes in nickel average costs during the 1990-2000 period. Our forecasts call for nickel prices to grow on average by 4.1% p.a. in current dollar terms during the 1990-2000 period but remain almost unaltered in real terms (i.e., when deflated by the MUV index).

TABLE A1: NICKEL METAL - PRODUCTION BY MAIN COUNTRIES AND ECONOMIC REGIONS

COUNTRIES/ ECONOMIES	ACTUAL				PROJECTED					GROWTH RATES A/		
	1969-71	1979-81	1986	1987/B	1988	1989	1990	1995	2000	1961-86	1970-86	1987 - 2000
	('000 TONS)									(% PER ANNUM)		
INDUSTRIAL	383	404	390	406	440	461	454	431	431	1.7	-0.8	0.5
NORTH AMERICA	176	157	125	142	166	178	178	160	160	-0.5	-2.4	0.9
CANADA	162	115	124	142	166	178	178	160	160	-1.5	-3.7	0.9
EEC-10	72	59	72	67	74	76	76	74	74	-0.6	-2.9	0.8
FRANCE	10	8	8	7	8	8	8	8	8	-2.2	-4.1	1.0
UNITED KINGDOM	35	21	31	30	30	30	30	30	30	-3.5	-4.9	0.0
OTHER WESTERN EUROPE	43	47	58	62	65	65	65	60	60	2.0	0.9	-0.3
FINLAND	4	11	18	15	18	18	18	18	18	9.4	9.7	1.4
JAPAN	87	103	93	90	93	97	93	95	95	0.7	0.4	0.4
OCEANIA	5	39	42	45	42	45	42	42	42	...	13.1	-0.5
NON-MARKET	129	176	195	195	187	200	202	235	266	4.1	3.2	2.4
USSR	123	165	188	188	180	193	195	228	259	4.1	3.2	2.5
DEVELOPING	43	123	158	159	154	168	164	221	236	9.3	6.4	3.1
ASIA	0	36	29	27	29	29	29	46	63	...	...	6.7
CHINA	0	11	22	20	22	22	22	39	57	...	...	8.4
AFRICA	14	32	44	44	44	44	44	54	54	13.7	4.3	1.6
SOUTH AFRICA	9	18	28	28	28	28	28	38	38	10.7	4.8	2.4
ZIMBABWE	5	14	16	16	16	16	16	16	16	..	3.4	0.0
AMERICA	20	43	71	74	64	77	77	107	105	5.0	5.3	2.7
CUBA	18	20	17	17	17	20	20	30	30	-0.7	0.6	4.5
BRAZIL	2	2	14	14	14	14	14	33	33	...	11.8	6.8
COLOMBIA	0	0	19	21	20	21	21	22	22	...	...	0.4
DOMINICAN REPUBLIC	0	20	22	22	13	22	22	22	22	...	...	0.0
SOUTHERN EUROPE	8	13	14	14	17	18	14	14	14	6.2 C/	2.3	0.0
GREECE	8	13	10	10	13	13	10	10	10	4.4 C/	0.2	0.0
WORLD	555	704	743	760	781	829	820	887	933	3.2	1.2	1.6

A/ LEAST SQUARES TREND FOR HISTORICAL PERIODS (1961-86); END-POINT FOR PROJECTED PERIODS (1987-2000).
B/ ESTIMATE.
C/ GROWTH RATE FOR 1967-86 PERIOD.

SOURCES: UNCTAD (ACTUAL);
WORLD BANK, INTERNATIONAL ECONOMICS DEPARTMENT (PROJECTED).

TABLE A2: NICKEL METAL - APPARENT CONSUMPTION BY MAIN COUNTRIES AND ECONOMIC REGIONS

COUNTRIES/ ECONOMIES	ACTUAL				PROJECTED					GROWTH RATES A/		
	1969-71	1979-81	1986	1987/B	1988	1989	1990	1995	2000	1961-86	1970-86	1987 - 2000
	('000 TONS)									(% PER ANNUM)		
INDUSTRIAL	400	483	510	539	558	536	545	575	596	3.0	0.9	0.8
NORTH AMERICA	153	154	152	156	168	157	163	163	178	0.5	-0.9	1.0
UNITED STATES	140	145	142	146	158	150	153	153	168	0.5	-0.6	1.1
EEC-10	128	171	190	194	200	195	194	203	210	3.6	1.9	0.6
FRANCE	33	37	32	33	36	32	30	32	35	3.0	0.1	0.5
GERMANY, FED. REP.	37	69	77	79	77	79	80	89	90	5.5	4.2	1.0
ITALY	18	25	30	25	30	27	28	28	30	5.3	2.5	1.4
UNITED KINGDOM	34	27	27	33	33	33	32	30	31	-1.1	-2.3	-0.5
OTHER WESTERN EUROPE	27	33	37	37	36	35	35	33	31	3.8	1.3	-1.4
SWEDEN	19	20	17	15	15	15	15	15	15	2.5	-2.5	0.0
JAPAN	88	121	127	148	150	145	153	172	175	7.9	2.2	1.3
NON-MARKET	106	168	191	191	195	190	193	208	219	3.7	3.6	1.1
USSR	87	130	146	146	148	145	148	158	169	3.3	3.5	1.1
EASTERN EUROPE	19	38	45	45	47	45	45	50	50	5.9	4.0	0.8
DEVELOPING	29	57	77	84	80	81	82	104	118	6.2	6.2	2.6
ASIA	22	34	45	46	44	47	49	61	74	4.3	5.2	3.7
CHINA	19	21	19	20	18	21	23	26	29	1.5	0.8	2.9
WORLD	535	709	778	814	833	807	820	887	933	3.4	1.9	1.1

A/ LEAST SQUARES TREND FOR HISTORICAL PERIODS (1961-86); END-POINT FOR PROJECTED PERIODS (1987-2000).
B/ ESTIMATE.

SOURCES: UNCTAD (ACTUAL);
WORLD BANK, INTERNATIONAL ECONOMICS DEPARTMENT (PROJECTED).

TABLE A3: NICKEL METAL - GROSS EXPORTS BY MAIN COUNTRIES AND ECONOMIC REGIONS

COUNTRIES/ ECONOMIES	ACTUAL				PROJECTED					GROWTH RATES A/		
	1969-71	1979-81	1986	1987/B	1988	1989	1990	1995	2000	1961-86	1970-86	1987 - 2000
	('000 TONS)									(% PER ANNUM)		
INDUSTRIAL	280	256	244	270	294	313	307	289	289	0.3	-2.2	0.5
NORTH AMERICA	166	116	106	132	155	171	168	150	150	-1.6	-3.9	1.0
CANADA	162	101	104	132	155	171	168	150	150	-2.2	-5.0	1.0
EEC-10	67	70	62	62	62	62	62	62	62	1.7	-2.4	0.0
FRANCE	5	6	6	6	6	6	6	6	6	0.8	1.1	0.0
UNITED KINGDOM	30	15	16	16	16	16	16	16	16	-3.2	-7.9	0.0
OTHER WESTERN EUROPE	43	46	53	50	53	53	53	53	53	1.9	0.4	0.4
FINLAND	4	11	16	13	16	16	16	16	16	9.0	9.5	1.6
JAPAN	0	1	0	0	0	0	0	0	0	0.0	0.0	0.0
OCEANIA	5	23	24	27	24	27	24	24	24	...	8.0	-0.9
NON-MARKET	35	53	44	60	44	44	44	44	54	7.0	3.2	-0.8
USSR	34	46	39	55	39	39	39	39	39	6.3	2.4	-2.6
DEVELOPING	33	110	110	110	105	126	115	142	142	10.8	6.0	2.0
AFRICA	10	28	35	35	35	35	35	45	45	16.4 C/	5.2	2.0
SOUTH AFRICA	5	15	19	19	19	19	19	29	29	13.1 C/	7.3	3.3
ZIMBABWE	5	13	16	16	16	16	16	16	16	...	3.3	0.0
AMERICA	17	47	59	60	50	71	63	80	80	7.0	5.7	2.2
CUBA	17	20	18	17	17	20	20	30	30	1.7	2.2	4.5
BRAZIL	0	0	0	0	0	0	0	6	6	0.0	0.0	0.0
COLOMBIA	0	0	19	21	20	21	21	22	22	...	...	0.4
DOMINICAN REPUBLIC	0	21	22	22	13	30	22	22	22	...	...	0.0
SOUTHERN EUROPE	7	17	10	10	13	13	10	10	10	54.1 D/	2.7	0.0
GREECE	7	16	10	10	13	13	10	10	10	54.1 D/	2.7	0.0
WORLD	348	418	398	440	443	483	466	475	485	2.4	-0.1	0.8

A/ LEAST SQUARES TREND FOR HISTORICAL PERIODS (1961-86); END-POINT FOR PROJECTED PERIODS (1987-2000).
B/ ESTIMATE.
C/ GROWTH RATE FOR 1964-86 PERIOD.
D/ GROWTH RATE FOR 1962-86 PERIOD.

NOTE: HISTORICAL UNCTAD PUBLISHED EXPORTS AND IMPORTS DATA ARE NOT UNIFORMILY DEFINED; PROJECTIONS SHOULD BE VIEWED WITH CAUTION.
EXPORTS INCLUDE SITC EX 287.22 AND 671.69, AS WELL AS SITC 683.1 .

SOURCES: UNCTAD (ACTUAL);
WORLD BANK, INTERNATIONAL ECONOMICS DEPARTMENT (PROJECTED).

TABLE A4: NICKEL METAL - GROSS IMPORTS BY MAIN COUNTRIES AND ECONOMIC REGIONS

COUNTRIES/ ECONOMIES	ACTUAL				PROJECTED					GROWTH RATES A/		
	1969-71	1979-81	1986	1987/B	1988	1989	1990	1995	2000	1961-86	1970-86	1987 - 2000
	('000 TONS)									(% PER ANNUM)		
INDUSTRIAL	239	259	249	339	350	340	350	380	405	1.2	-0.3	1.4
NORTH AMERICA	108	110	87	146	158	150	153	153	168	-0.9	-2.2	1.1
UNITED STATES	96	106	84	146	158	150	153	153	168	-0.6	-1.5	1.1
EEC-10	99	112	117	128	127	120	119	130	137	2.8	0.6	0.5
FRANCE	11	21	19	32	34	30	28	30	32	6.3	4.2	0.0
GERMANY, FED. REP.	33	42	43	45	43	45	46	55	56	3.2	1.5	1.7
ITALY	13	16	18	13	18	15	16	16	18	4.2	2.7	2.5
UNITED KINGDOM	35	18	19	17	17	17	16	14	15	-2.1	-4.9	-1.0
OTHER WESTERN EUROPE	20	17	20	20	18	18	18	18	18	1.1	0.2	-0.8
SWEDEN	16	10	12	12	10	10	10	10	10	-0.1	-2.3	-1.4
JAPAN	9	18	24	45	47	52	60	79	82	15.4	6.4	4.7
NON-MARKET	20	32	39	39	41	39	39	44	44	2.8	3.3	0.9
USSR	5	0	0	0	0	0	0	0	0	0.0	0.0	0.0
EASTERN EUROPE	15	32	39	39	41	39	39	44	44	6.7	4.4	0.9
DEVELOPING	8	31	35	62	52	104	77	51	36	8.5	5.8	-4.1
WORLD	266	323	322	440	443	483	466	475	485	1.7	0.4	0.8

A/ LEAST SQUARES TREND FOR HISTORICAL PERIODS (1961-86); END-POINT FOR PROJECTED PERIODS (1987-2000).
B/ ESTIMATE.

NOTE: HISTORICAL UNCTAD PUBLISHED EXPORTS AND IMPORTS DATA ARE NOT UNIFORMILY DEFINED; PROJECTIONS SHOULD BE VIEWED WITH CAUTION. IMPORTS COVER ONLY SITC 683.1 .

SOURCES: UNCTAD (ACTUAL);
WORLD BANK, INTERNATIONAL ECONOMICS DEPARTMENT (PROJECTED).

2-16-89

TABLE A5: NICKEL - PRICES, 1950-87 (ACTUAL) AND 1988-2000 (PROJECTED)

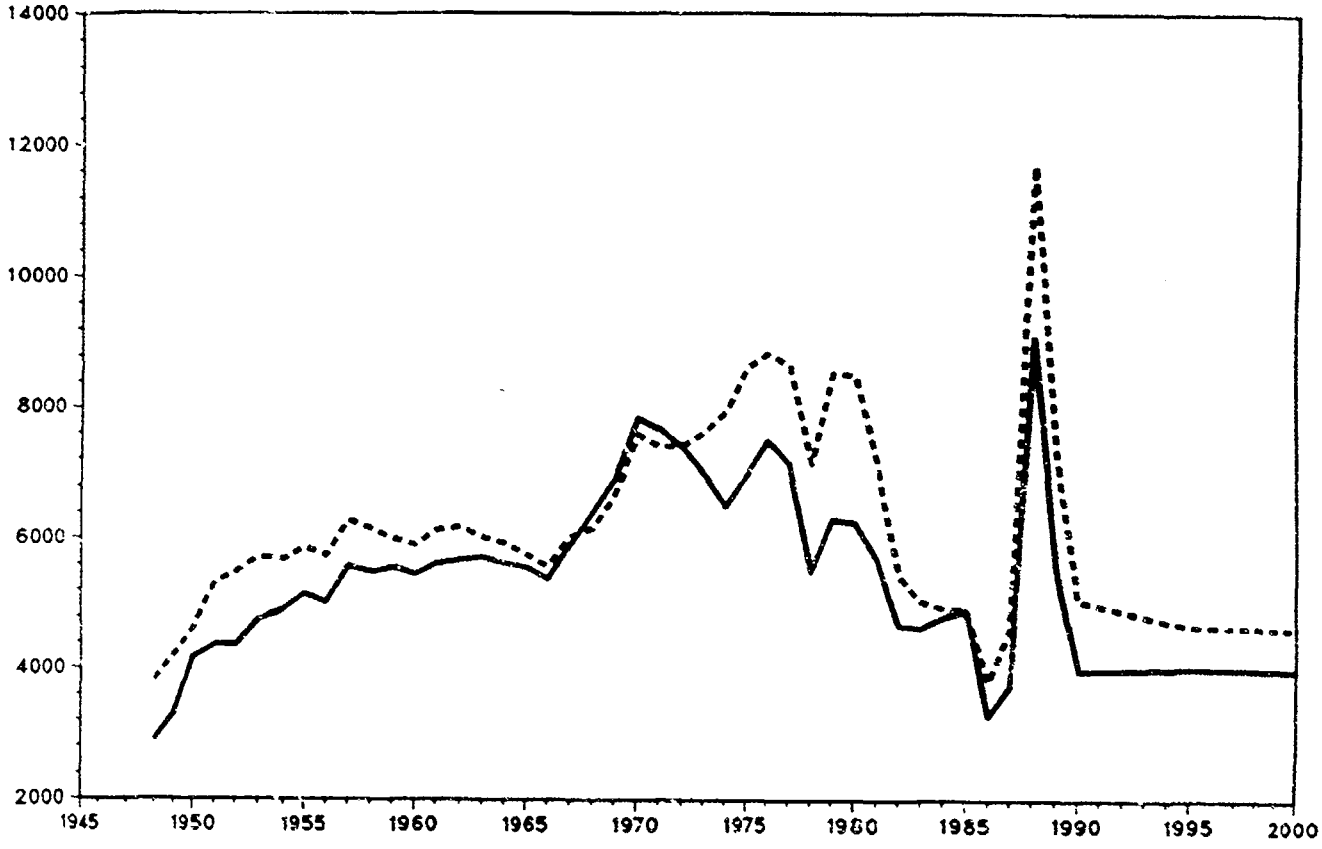
	($/Ton)		
	Current $ a/	1985 Constant US$ MUV b/	1985 Constant US$ GNP c/
Actual			
1950	988	4,173	4,613
1951	1,191	4,362	5,305
1952	1,246	4,355	5,468
1953	1,321	4,750	5,707
1954	1,334	4,906	5,673
1955	1,422	5,134	5,857
1956	1,437	5,008	5,729
1957	1,631	5,568	6,277
1958	1,631	5,475	6,149
1959	1,631	5,553	5,996
1960	1,631	5,438	5,896
1961	1,711	5,607	6,125
1962	1,762	5,660	6,170
1963	1,742	5,705	6,014
1964	1,742	5,607	5,916
1965	1,735	5,545	5,745
1966	1,739	5,370	5,566
1967	1,936	5,909	6,025
1968	2,075	6,393	6,150
1969	2,363	6,911	6,646
1970	2,846	7,830	7,576
1971	2,932	7,654	7,391
1972	3,080	7,377	7,411
1973	3,373	6,974	7,616
1974	3,825	6,491	7,929
1975	4,570	6,975	8,620
1976	4,974	7,488	8,822
1977	5,203	7,130	8,650
1978	4,610	5,490	7,141
1979	5,986	6,294	8,522
1980	6,519	6,249	8,507
1981	5,953	5,677	7,087
1982	4,838	4,678	5,411
1983	4,673	4,640	5,033
1984	4,752	4,802	4,927
1985	4,899	4,899	4,899
1986	3,881	3,280	3,806
1987	4,872	3,749	4,641
Projected			
1988	12,770	9,075	11,698
1989	8,267	5,529	7,243
1990	6,041	3,981	5,037
1995	7,275	4,020	4,669
2000	9,039	3,989	4,629

a/ For 1950-79 period: Canadian nickel, electrolytic cathodes, Ni 99.9%, shipping point. For 1980-2000: LME nickel price.
b/ Deflated by manufacturing unit value (MUV) index.
c/ Deflated by US GNP deflator.

Sources: Metals Week (actual); World Bank, International Economics Department (projected).

NICKEL

(CONSTANT 1985 DOLLAR PRICES *)



DEFLATED BY MANUFACTURING UNIT VALUE (MUV) INDEX

DEFLATED BY U.S. GNP DEFLATOR.

* 1948 – 87 ACTUAL ; 1988 – 2000 PROJECTED .

SOURCE : WORLD BANK , INTERNATIONAL ECONOMICS DEPARTMENT .

ALUMINUM AND BAUXITE

Summary

1. World aluminum production is estimated to have increased approximately 1.7 million tons in the period 1986-88, while world operating rates are estimated to average 90% during 1988. Stocks have declined steadily over the past several years and despite the recent large increase in output are now at record-low levels. Five consecutive years of strong demand growth following the low prices of the early 1980s and the resulting plant closures have contributed to the current tight supply and high prices.

2. Although aluminum consumption has been quite strong during the 1982-87 period, demand is forecast to expand rather slowly through the year 2000. Substitution by plastics and other competitive materials, generally mature markets, and the absence of important new applications will limit world primary aluminum demand to a 1.7% p.a. growth rate during the 1987-2000 period. Consumption in the industrial countries is expected to increase by 1.2% p.a., while developing countries should exhibit a 3% p.a. increase. These rates are similar to the forecasts made two years ago. World primary aluminum output is projected to increase 2% p.a. during the 1987-2000 period. Developing country production will continue to expand, particularly in Asia and South America, with Brazil, China, and Venezuela expected to become major world producers.

3. An expected slowdown in demand should alleviate the current short supply of aluminum metal. Only 1.5 million tons of additional capacity should be added through 1990. Most of this is expected to be the result of incremental expansion at currently operating units. New smelters will be required in the 1990s and many are likely to be located in developing countries. The large international aluminum companies, which dominated the industry through the 1970s, are likely to play a less prominent role in the primary aluminum sector during the 1990s.

4. The extended period of oversupply in the alumina sector has ended. The lack of new capacity and increased alumina demand have led to increased utilization rates and prices. Alumina production will continue to increase in bauxite mining areas, particularly those developing countries which are now expanding their aluminum sector.

5. Although bauxite production is expected to increase 2.2% p.a. during the 1987-2000 period, the continued trend toward local processing of bauxite will result in a -0.9% p.a. decrease in exports during the 1987-2000 period. A similar situation exists for alumina; production should increase by 2% p.a., but exports are expected to increase by only 1% p.a. Once again, the trend toward the local processing (of alumina) will dampen export markets. In contrast, aluminum exports should increase 3.1% p.a.--somewhat faster than the 2% p.a. increase expected for production. This trend reflects the expected decline of production in large aluminum-consuming countries and their increasing import requirements. Australia and Canada, as well as developing countries such as Brazil and Venezuela, are likely to become prominent exporters.

6. The aluminum market has been extremely volatile in recent years. Prices declined to US$1,110/ton in 19[illegible], but subsequently increased sharply and reached US$2,818/ton during the second quarter of 1988. Prices are expected to decline substantially by 1990 to US$1,800/ton (US$1,186/ton in 1985 dollars), as demand softens and additional supply becomes available. In the longer term, prices should reach US$2,350/ton and US$2,900/ton in 1995 and 2000, respectively. In constant 1985 dollars, these prices translate into a moderate increase to US$1,299/ton in 1995 and a slight decrease to US$1,280/ton in 2000. Bauxite prices declined in 1987 to US$29.48/ton and are expected to drop further to US$28/ton in 1988. There should be a steady increase through the 1990s to US$48/ton in 2000. Real prices in the mid- and late-1990s should be in the US$21-23/ton range (in 1985 constant dollars), substantially below levels typical during the early 1980s.

Introduction

7. Over the past 18 months the economic environment facing the world aluminum industry has improved dramatically from that generally experienced during the 1981-86 period; which raises the question whether the medium and long-term outlook for the industry is now more sanguine than was expected several years ago. In particular, seven consecutive quarterly increases in the aluminum transaction (Metal Bulletin) price--from US$1,226/ton during the fourth quarter of 1986 to a record high of US$2,818/ton for the second quarter of 1988--prompts a re-evaluation.

8. The origin of the current tight markets and rising prices can be traced to the low prices which typified the world industry in the early and mid-1980s. The market reacted as expected by curtailing investment and new projects. Moreover, large-scale closures of high-cost facilities in North America, Asia, and to a lesser extent Western Europe, led to only a marginal increase of smelter capacity--from 18.5 million tons in 1980 to 18.9 million tons in 1987. However, the stagnation of investment activity was paralleled by a strong and unexpected recovery in aluminum markets. Demand has increased in five consecutive years since the end of the world recession in 1982. By late 1986, world aluminum demand generally exceeded supply--a situation which resulted in record-low stocks by the first quarter of 1988.

9. The price and market outlook are highly sensitive to several key market and behavioral assumptions. Five years of world economic growth have contributed positively to aluminum consumption; but a slowdown in the economic expansion is expected during the next few years. A slowdown will serve to moderate the growth of aluminum demand. The buoyant market over the past several years has raised the question of whether the potential long-term intensity of aluminum use may be now somewhat higher than previously assumed; if so, this will lead to higher consumption in the medium and long term, ceteris paribus. Our view is that taking such a position is not justified, but rather that demand has been bolstered by cyclical growth in metal-intensive sectors such as capital goods.

Demand Outlook

10. Aluminum markets have been characterized by several major shifts in consumption patterns over the past three decades. During the 1960-73 period consumption increased at 9.6% p.a., reflecting strong world economic growth and declining real aluminum prices, both of which encouraged substitution and the development of new aluminum markets. During this period many aluminum markets were also associated with sectors that were expanding faster than general economic activity (e.g., automobiles and construction). The boom years came to an abrupt end during the 1975 world recession. The factors which contributed to the rapid expansion of the 1960s reinforced the slowdown. World economic growth during the 1975-82 period was decidedly lower than in the previous decade, and the rapid rise of energy prices led to large increases in both real aluminum costs and prices. Higher real prices resulted in substitution by competitive materials, particularly plastics, and efforts to use less aluminum in cases where suitable substitutes were not available (e.g., by developing lighter aluminum cans). The experience of the 1970s led to speculation that consumption could stagnate; this view contributed to more conservative estimates of required capacity levels.

11. Consumption has increased for five successive years since 1982, averaging 3.4% p.a. during this period--a distinct contrast to the 1970s, leading some observers to take a more sanguine view of medium- and long-term consumption prospects. Such a re-evaluation of aluminum demand appears premature for several reasons. First, although demand has increased, the rate of growth remains well below levels typical of the 1960s; consumption in 1987 was only marginally higher than in 1979--the peak year of consumption before the onset of the last recession. In addition, many of the aluminum-intensive industry sectors which outperformed aggregate economic activity during the 1960s show no signs of repeating this behavior in the 1990s.

12. A review of industrial country aluminum demand by major end-use is a useful tool in assessing both past and likely future consumption trends. Table 1 contains data for the six largest OECD countries, which account for approximately 80% of industrial country demand. During the 1974-82 period, aluminum consumption in the United States declined dramatically, but trends for various end-uses differed considerably. The decline in consumption in the transportation sector reflects the poor performance of the US auto industry during this period, rather than the effects of substitution. The electrical sector represents a mature market; aluminum has been the preferred metal for high voltage transmission cable but, for technical reasons, has not been able to penetrate the large residential market. Construction has been the most vulnerable sector to substitution, especially by plastics in such applications as siding/cladding. The growth of the aluminum beverage can market allowed the packaging sector to expand significantly during the mid- and late-1970s. The "other" sector includes consumer durables, machinery, and various miscellaneous applications. Depressed capital goods and consumer goods spending, as well as competitive pressures from plastics, resulted in a steady decline of aluminum in these uses.

13. Aluminum consumption in the industrial countries of Europe fared somewhat better during the 1974-82 period than it did in the United States. Only consumption in the electrical sector registered a decline--a result of

TABLE 1: TOTAL ALUMINUM CONSUMPTION BY MAIN SECTORS, 1970-86

	1970	1972	1974	1976	1978	1980	1982	1984	1985	1986
	('000 Tons)									
United States										
Transportation	734	1,066	1,169	1,163	1,431	1,042	796	1,333	1,364	1,441
Electrical Engineering	574	640	780	555	644	612	514	677	642	629
Construction	1,006	1,418	1,363	1,221	1,423	1,165	1,034	1,296	1,381	1,484
Packaging	665	824	1,027	1,166	1,425	1,512	1,618	1,832	1,863	1,899
Other	1,080	1,231	1,411	1,188	1,261	1,115	964	1,381	1,134	1,182
Exports of Semi-manufactures a/	527	255	428	379	359	995	587	488	546	376
Total	4,586	5,343	6,178	5,782	6,543	6,441	5,513	7,007	6,930	7,011
Japan										
Transportation	257	310	325	371	462	582	596	689	763	785
Electricial Engineering	156	166	163	178	210	226	170	172	155	165
Construction	298	459	546	668	687	732	677	677	701	736
Packaging	20	23	83	104	137	134	149	168	177	202
Other	409	495	472	523	507	553	561	635	632	602
Exports of Semi-manufactures a/	53	39	34	77	142	82	162	257	258	231
Total	1,193	1,492	1,623	1,921	2,145	2,309	2,315	2,598	2,686	2,712
Western Europe b/										
Transportation	611	613	617	667	720	741	688	726	766	841
Electrical Engineering	259	266	265	244	236	277	231	239	237	232
Construction	234	305	376	409	407	486	433	440	438	487
Packaging	178	222	250	238	253	258	264	283	291	298
Other	641	667	858	848	828	826	787	830	856	887
Exports of Semi-manufactures a/	300	353	493	570	718	759	904	1,056	1,048	1,062
Total	2,223	2,426	2,859	2,976	3,162	3,347	3,307	3,574	3,636	3,807

a/ Exports of semi-manufactures are not broken down into various end-uses, but are included because they represent a component of domestic consumption.

b/ Historical end-use data only reported by the Federal Republic of Germany, France, Italy, and the United Kingdom.

Note: Total aluminum consumption includes both primary and secondary aluminum. Thus, country totals in this table will be greater than primary consumption data shown elsewhere. Data for 1987 are not yet available.

Sources: Metal Statistics, Metallgesellschaft (various issues).

the same factors affecting the US market. Import penetration by foreign automakers was not a major factor in Europe, thus permitting the transportation sector to expand slightly. The packaging market also increased, but the rate was modest, and the European packaging sector remains a relatively small market when compared to its contribution to US aluminum demand.

14. Japan's performance during the period was the most robust, reflecting a strongly growing economy and the materials-intensive nature of production. The rapid expansion of automobile output and exports is illustrated in the large increase in aluminum consumption in the transportation sector. Packaging expanded, but remains a relatively small component of demand. Once again, the electrical sector stagnated.

15. The recovery of industrial country demand since 1982 has been concentrated in the United States. The near doubling of aluminum consumption in the transportation sector was the largest factor in the resurgence of the US market and reflects the recovery of the automobile industry and a slight increase in aluminum use per vehicle. Other markets improved modestly. Perhaps the most significant trend was the leveling off of packaging demand--aluminum's penetration of the beverage can market (at the expense of tinplate) is virtually complete. European and Japanese performance during the 1982-86 period was more moderate. This reflects the relatively higher levels of demand during the late-1970s vis-a-vis the United States, as well as sectoral differences in demand. In Europe, all major end-uses except electrical expanded, but the increases were rather small--particularly in the case of the transportation market. The Japanese consumption pattern was similar to Europe--all end-uses except electrical increased. Packaging performed rather well, but total volumes remained small. Transportation applications slowed considerably, primarily reflecting lower growth rates in the automobile industry.

16. In summary, sectoral demand for aluminum has varied markedly. Substitution by other materials has been a factor in many applications, particularly construction. Packaging (the aluminum beverage can) has become the major US market, but growth has slowed as the market has matured and lighter aluminum cans have been developed. Packaging has grown in other industrial countries, but in these countries the sector remains small because the aluminum beverage can is not a major component of demand. Differences in transportation markets largely reflect the vagaries of domestic automobile production. Only electrical markets have exhibited stagnation or declining trends in most industrial economies. Finally, the United States has been the primary contributor to the increased aluminum consumption during the past few years. It is problematical whether the United States can maintain this trend.

17. Developing country consumption has exhibited no marked variation in growth rates during the early and mid-1980s vis-a-vis the 1970s--consumption during the 1970-87 period increased by 8.2% p.a. The relatively large and consistent rise reflects the less mature nature of most aluminum markets in the developing countries and the importance of basic infrastructure to aluminum demand. The increases in the construction and electrical sectors are both closely associated with economic development. Brazil and Venezuela are the biggest aluminum consumers in South America--largely due to major infrastructure needs including hydroelectric dams and associated electrical

transmission requirements. Manufacturing for export markets has also contributed to demand in some developing countries, particularly in Asia. Unfortunately, detailed end-use data for the developing countries are not available.

18. Aluminum consumption projections have been made using two methods, depending on available data. For the major industrial countries (the United States, Japan, the Federal Republic of Germany, France, Italy, and the United Kingdom) total aluminum demand (both primary and secondary) by major end-use was projected. Primary aluminum demand was derived after making allowances for the recovery of secondary metal. In other countries and regions primary aluminum demand was projected directly using aggregate production indices.

19. The projections for sectoral aluminum consumption are presented in Table 2. Despite the somewhat stronger demand during the mid-1980s, the general outlook is for relatively slow increases in demand. Aluminum will continue to face substitution, and markets which are mature will offer minimal growth prospects. No large new markets are expected to be developed during the coming decade. A major feature of the aluminum industry will continue to be the diversity of sector performance between countries and within national markets. In general, packaging is expected to be the most rapidly expanding end-use. This prospect largely reflects the continued growth of the container market at the expense of other materials such as steel and glass. The transportation sector is also expected to perform reasonably well. Automobile production worldwide is expected to increase by 2.5 % p.a., and aluminum use per vehicle is expected to remain steady or even increase somewhat over the medium term. In contrast, the electrical sector should continue to stagnate or even decline, reflecting the largely completed process of electrification in these countries.

20. In the United States, total aluminum consumption is expected to increase by 1% p.a. during the 1987-2000 period. Packaging should remain the dominant market and register a 1.4% p.a. increase. The slower growth compared to that experienced during the 1970s reflects the maturity of the aluminum beverage can market. Other packaging applications such as in food cans should expand, but volumes will remain relatively small. Transportation markets should benefit from a 1% p.a. increase in automobile production and a medium-term rise in aluminum content per vehicle. For example, during the period 1979-86, the substitution of aluminum for copper radiators and the more extensive use of aluminum wheels resulted in aluminum use per vehicle increasing from 178 lb to 197.3 lb. 1/ Construction activity is expected to increase only 0.6% p.a. during the 1987-2000 period and, in conjunction with continued substitution by plastics, should result in a 0.2% p.a. decrease in the construction market. Electrical applications will continue their historical decline for the reasons noted above.

21. Aluminum markets in Europe are expected to increase 1.8% p.a. through 2000. Packaging should register the strongest growth (3.8% p.a.), largely due

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1/ Shearson Lehman Brothers, Annual Review of the Aluminum Industry--1988.

TABLE 2: TOTAL ALUMINUM CONSUMPTION BY END-USES, 1986-2000

	Actual 1986	Projected 1990	Projected 1995	Projected 2000	Growth Rate 1986-2000
	('000 Tons)				
United States					
Transportation	1,441	1,500	1,350	1,800	1.6
Electrical Engineering	629	620	605	590	-0.5
Construction	1,484	1,550	1,500	1,450	-0.2
Packaging	1,899	2,100	2,200	2,300	1.4
Other	1,182	1,240	1,320	1,400	1.2
Exports of Semi-manufactures	376	380	440	500	2.0
Total	7,001	7,390	7,715	8,040	1.0
Japan					
Transportation	785	800	950	1,100	2.4
Electrical Engineering	165	164	157	150	-0.6
Construction	736	750	850	950	1.8
Packaging	202	225	312	400	5.0
Other	602	611	650	690	1.0
Exports of Semi-manufactures	231	220	260	300	1.9
Total	2,721	2,770	3,179	3,590	2.0
Western Europe a/					
Transportation	841	830	935	1,040	1.5
Electrical Engineering	232	225	232	240	0.2
Construction	487	490	520	550	0.9
Packaging	298	320	410	500	3.8
Other	887	880	1,015	1,150	1.9
Exports of Semi-manufactures	1,062	1,075	1,238	1,401	2.0
Total	3,807	3,820	4,350	4,890	1.8

a/ Historical end-use data only reported for the Federal Republic of Germany, France, Italy, and the United Kingdom.

Note: Total aluminum consumption includes both primary and secondary aluminum.

Sources: Metal Statistics, Metallgesellschaft (actual); World Bank (projections).

to the continued expansion of the aluminum beverage container. Transportation use is expected to increase by only 1.5% p.a., due to the moderate growth in automobile production. European construction activity is forecast to increase only 0.8% p.a. during the 1987-2000 period and should limit aluminum growth to 0.9% p.a. in this use. Electrical applications will remain the slowest expanding sector.

22. Aluminum consumption in Japan should slow considerably compared to the experience of the past two decades; however, the 2% p.a. growth rate expected is the largest among major industrial countries--a trend consistent with the 4.7% p.a. increase in industrial production expected in Japan during the 1987-2000 period compared to 2.9% p.a. and 3.4% p.a. for the United States and Europe, respectively. Packaging and transportation markets should exhibit the strongest growth, as is the case in other industrial countries. The construction and electrical sectors are expected to expand, but at relatively modest rates.

23. World primary consumption should increase 1.7% p.a. from 17.1 million tons in 1987 to 21.3 million tons in 2000. Industrial country primary demand is expected to increase by 1.2% p.a. The industrial region increase is slightly lower than implied in Table 2, due to the continued rise in secondary (recycled aluminum). Consumption in developing countries is projected to increase by 3% p.a. The Asian region should expand at a vigorous 3.2% p.a. The rapidly expanding and export-oriented countries of the Pacific Rim are the primary reason for Asia's expected good performance. Consumption in Latin America should rise by 2.8% p.a. The lower growth rate is due to the less vigorous economic activity expected in developing America vis-a-vis Asia. Aluminum consumption in the centrally planned economies (CPEs) is expected to increase by 1.7% p.a., a marked slowdown from the 2.2% p.a. increase typical during the 1970-87 period--a trend which reflects the general maturation of aluminum demand, as well as the reduced infrastructure requirements in these economies.

Supply Outlook

24. A major feature in the aluminum industry in recent years has been the closure of smelting capacity in response to sharply higher real oil/natural gas prices in the 1970s. Japan's aluminum smelting industry was virtually shut down--declining from 1.4 million tons in 1980 to 64,000 tons in 1987. During this same time period US capacity contracted by some 950,000 tons as producers closed high-cost units. More limited shutdowns also occurred in Europe. Since low aluminum prices minimized new replacement investment, world capacity remained virtually unchanged from 1980 through to 1987, and utilization rates reached 0.90 by year-end 1987 as demand increased.

25. The few new investments which were committed during this period differed in several respects from those typical in the 1970s. Due to rising energy prices, only projects based upon hydroelectricity (or inexpensive lignite in the case of Australia) were viable. Many of these new smelters were located in developing countries, particularly South America, where 1.2 million tons of new capacity has been constructed since the late 1970s. An additional feature has been the less prominent role played by the traditional major aluminum companies. The trend, in part, has been due to the location of inexpensive energy in countries and regions where the major companies were not extensively involved previously. The major producers have also sought to de-emphasize primary production in favor of higher value-added products. The strategy reduced the motivation to invest in new capacity and accelerated the pace of permanent closures.

TABLE 3: ALUMINUM CAPACITY 1983-2000

Countries/ Economies	Actual 1983	Actual 1985	Actual 1987	Projected 1990	Projected 1995	Projected 2000
	('000 tpy)					
Industrial	11,054	11,099	10,429	10,533	10,859	11,446
United States	4,872	4,603	4,014	3,977	3,700	3,300
Canada	1,234	1,347	1,577	1,747	1,995	2,400
EEC-10	2,343	2,316	2,303	2,091	2,000	2,000
France	435	324	385	245		
Germany, Fed. Rep.	731	795	775	711		
Italy	220	252	243	235		
Netherlands	265	265	265	265		
United Kingdom	285	285	287	287		
Spain	407	395	348	348		
Other Western Europe	1,113	1,126	1,209	1,242	1,300	1,500
Austria	95	95	95	95		
Iceland	88	88	88	88		
Norway	774	774	869	921		
Sweden	70	83	75	90		
Switzerland	86	86	82	58		
Japan	649	649	64	64	64	64
Oceania	843	1,058	1,262	1,412	1,800	2,220
Australia	598	813	1,018	1,168		
New Zealand	245	245	244	244		
Developing	3,624	3,812	4,687	5,957	6,580	8,300
Africa	597	622	629	629	630	900
Cameroon	81	81	84	84		
Egypt	166	166	170	170		
Ghana	200	200	200	200		
South Africa	150	175	175	175		
Other	-	-	-	-	-	
Latin America	1,059	1,159	1,519	2,149	2,400	3,000
Argentina	140	140	140	140	-	-
Brazil	414	514	953	1,263		
Venezuela	400	400	470	790		
Other	105	105	96	96		
Asia	1,424	1,499	1,778	2,418	2,900	3,600
Bahrain	170	170	170	230		
China	503	503	660	1,060		
India	363	363	485	625		
Indonesia	150	225	225	225		
Iran	50	50	50	50		
Korea, Rep. of	18	18	18	18		
Other Asia	-	-	-	-		
United Arab Emirates	150	150	150	170		
Korea, Dem. Rep.	20	20	20	40		
Southern Europe	544	532	621	621	650	800
Greece	147	147	150	[illegible]		
Turkey	60	60	60	60		
Yugoslavia	337	325	411	411		
Centrally Planned	3,735	3,550	3,812	3,912	4,300	4,500
Czechoslovakia	60	60	60	60		
German Dem. Rep.	85	85	70	70		
Hungary	75	90	72	72		
Poland	55	55	115	115		
Roumania	250	250	250	250		
USSR	3,210	3,025	3,245	3,345		
Total Western World	14,658	14,891	14,336	15,390	16,399	18,424
Total World	18,413	18,461	18,928	20,402	21,739	24,246

Sources: Engineering and Mining Journal, Maclean Hunter, January 1988; James F. King, World Capacity Report, Primary Aluminum, Alumina and Bauxite (various issues); Bureau of Mines, U.S. Department of the Interior; World Bank (projected).

26. The pattern of aluminum capacity expected through 2000 is shown in Table 3 and illustrates both the recent lack of investment activity and the dramatic change in the geographical concentration of production. Although the decline of Japanese production is virtually complete, the situation in the United States is less certain. Many US producers successfully negotiated lower power and labor rates, thus improving industry competitiveness. Also, smelters accounting for approximately 525,000 tons of capacity were "spun off" by aluminum producers during 1986-87 and are now independent units operating on a toll basis (alumina is converted to metal for a fee and the metal remains the property of the alumina supplier). These toll smelters generally renegotiated labor and power contracts to lower costs and have benefited from the sharp rise in aluminum prices. However, they are older, less efficient units which are likely to close in the future as prices decline. Hence, US capacity should drop by almost 300,000 tons through 1995. In Canada, an expansion of the Beacancour smelter is expected by 1990. Incremental expansions of other units and perhaps one new smelter are likely thereafter. EEC capacity is expected to contract slightly, and little new smelting capacity is likely. An incremental expansion of the Portland smelter in Australia will boost capacity through 1990. Several new smelters are likely to be constructed during the 1990s. Considerable investment activity is anticipated for South America; both Brazil and more recently Venezuela, have become major aluminum producers. The Asian region is also expected to expand capacity. Most of the increase is likely to be limited to the Persian Gulf region, where flared natural gas can provide competitive power, and in China, whose industrial expansion and infrastructure needs require expanded capacity.

27. The principal motivation for these new investments is access to plentiful and inexpensive blocks of base-load electrical power. Smelters in Canada, Venezuela, and Brazil are predicated upon hydroelectric power, and Australian units have utilized the country's vast reserves of lignite (brown coal) to generate electricity. Australia, Brazil, and Venezuela also have large quantities of bauxite, as well as alumina refining capabilities.

28. Most of the aluminum capacity brought on-stream during the past few years is the result of investment decisions that were made at least initially during the 1979-80 price boom and illustrates the lengthy gestation period often associated with capital-intensive mineral projects. The subsequent price decline delayed or canceled many projects; this is evident in the modest rise in capacity expected during the 1987-90 period. Much of the increase is the result of incremental expansions of existing smelters rather than new units. The hesitancy of the industry to invest is also evident in the current lack of firmly committed projects which could be expected to come on-stream during the early and mid-1990s. This reluctance is in part due to a desire to avoid major investments unless price prospects are thought to be firmly positive. During the 1970s major investment decisions were made at the peak of price cycles, but many units subsequently came on-stream during a cyclical price trough. A second factor has been alluded to previously. The strategic decision of many primary producers to de-emphasize primary production may have caused a temporary shortage of the financial and technical resources required for project development. It now appears that further delays in adding new capacity could exacerbate the cyclical swings which have been typical in the past.

29. World primary aluminum production was 16.5 million tons in 1987, and utilization rates reached 0.88. Output was approximately 1 million tons higher than in 1986, indicating the strength of aluminum demand and the impact of rising prices. Historically low stocks and continued strong prices should lead to an additional output expansion to 17.2 million tons in 1988, implying a world utilization rate of 0.90. 2/ A relatively small improvement in world aluminum demand should restrict output to 17.4 million tons in 1990.

30. World primary aluminum production is projected to increase at 2% p.a. during the 1987-2000 period by which time production is expected to reach 21.3 million tons. The developing countries should account for an increasing share of output (34%) in 2000 compared with 24% in 1987. Venezuelan production alone is likely to account for 6.1% of world output (1.3 million tons) in 2000 and Brazil 5.6% (1.4 million tons). The industrial countries' share will correspondingly fall to 49% from 58%. The decline will be especially noticeable in the United States. Only Canada and Australia will expand output during the period.

31. The large degree of vertical integration typical during the 1950s to mid-1970s permitted close coordination between alumina supply and requirements. However, the decline of vertical integration made coordination more difficult and contributed to serious oversupply of alumina, commencing in the early 1980s. As shown in Table 4, permanent capacity closures have typified much of the 1980s, particularly in the United States. Only three major new facilities have come on-stream during the period through 1987 (Ireland, Brazil, and Venezuela) and during the 1987-90 period only two significant expansions are expected (Greece and Venezuela).

32. Stagnant capacity and rising demand for alumina (e.g., increasing aluminum output) have eliminated the previous alumina surplus and led to increasingly tight markets for this product. During the 1990s approximately 6.4 million tons of capacity are expected to be added worldwide. Alumina refineries will be located near sources of high-quality bauxite and, with the exception of Australia, will be limited to developing countries--particularly Brazil, China, and Venezuela. In these three countries the primary motivation for investment is expected to be an expanding domestic aluminum smelting sector rather than a desire to increase alumina exports.

33. Alumina production is expected to reach 47 million tons in 2000, a 2% p.a. increase from 1987 levels. As was the case with aluminum, the developing countries' share should increase significantly--from 27% in 1987 to 36% in 2000. Australia, Brazil, and Venezuela are likely to be the major world producers in 2000.

34. In many respects, trends in bauxite capacity and markets can be viewed as evolutionary rather than subject to the cyclical swings which have characterized alumina and aluminum. Bauxite production gradually shifted during the 1950s and 1960s from industrial countries to the Caribbean, Oceania, South America, and Africa. In 1987, these regions accounted for 70% of world capacity (Table 5). Australia accounts for approximately one-third

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2/ The western world rate is 0.96.

TABLE 4: ALUMINA CAPACITY 1983-2000

Countries/ Economies	Actual			Projected		
	1983	1985	1987	1990	1995	2000
	('000 tpy)					
Industrial	25,095	23,875	22,629	21,109	21,609	22,600
United States	7,540	5,920	4,724	4,574		
Canada	1,225	1,225	1,225	1,225		
EEC-10	5,080	5,480	5,210	4,280		
France	1,350	1,350	1,050	700		
Germany, Fed. Rep.	1,690	1,690	1,710	1,130		
Ireland	400	800	800	800		
Italy	720	720	730	730		
United Kingdom	120	120	120	120		
Spain	800	800	800	800		
Japan	1,840	1,840	1,320	880		
Oceania	9,410	9,410	10,150	10,150		
Australia	9,410	9,410	10,150	10,150		
Developing	10,855	11,400	12,520	14,905	16,325	19,325
Africa	700	700	700	700		
Guinea	700	700	700	700		
Latin America	6,155	6,700	7,485	8,005		
Brazil	615	1,160	1,310	1,380		
Guyana	315	315	-	-		
Jamaica	2,825	2,825	3,155	3,305		
Suriname	1,400	1,400	1,320	1,320		
Venezuela	1,000	1,000	1,350	2,000		
Asia	1,580	1,580	2,235	3,640		
China	920	920	1,900	2,030		
India	660	660	1,235	1,610		
Other Asia	-	-	-	-		
Southern Europe	2,420	2,420	2,100	2,560		
Turkey	200	200	200	200		
Yugoslavia	1,620	1,620	1,300	1,160		
Greece	600	600	600	1,200		
Centrally Planned	6,650	6,650	6,400	6,400	6400	6900
Czechoslovakia	130	130	130	130		
German Dem. Rep.	60	60	60	60		
Hungary	860	860	880	880		
Romania	650	650	650	650		
USSR	4,950	4,950	4,680	4,680		
World	42,600	41,925	41,549	42,414	44,334	48,825
Industrial and Developing	35,950	35,275	35,149	36,014	37,934	41,925
Western World	35,030	41,005	34,149	33,984	35,404	39,125

Sources: Engineering and Mining Journal, Maclean Hunter, January 1988; James F. King, World Capacity Report, Primary Aluminum, Alumina and Bauxite (various issues); Bureau of Mines, US Department of the Interior; World Bank (projected).

TABLE 5: BAUXITE CAPACITY 1983-2000

Countries/ Economies	Actual 1983	Actual 1985	Actual 1987	Projections 1990	Projections 1995	Projections 2000
	('000 tpy)					
Industrial	36,870	43,410	44,895	43,345	42,745	44,745
United States	2,260	2,260	1,000	600		
EEC-10	1,990	1,350	1,950	800		
France	1,990	1,350	1,950	800		
Oceania	32,620	39,800	41,945	41,945		
Australia	32,620	39,800	41,945	41,945		
Developing	61,990	60,170	62,998	71,913	75,413	81,413
Africa	14,400	14,400	14,760	16,550		
Ghana	400	400	350	350		
Guinea	13,250	13,250	13,410	14,700		
Sierra Leone	750	750	1,000	1,500		
Latin America	32,025	29,150	29,267	33,792		
Brazil	4,840	6,800	6,650	7,650		
Dominican Republic	560	-	-	-		
Guyana	4,500	4,500	4,750	4,750		
Haiti	-	-	-	-		
Jamaica	16,125	12,850	12,767	13,092		
Suriname	6,000	5,000	4,500	5,300		
Venezuela	-	-	600	3,000		
Asia	6,505	7,650	9,016	11,616		
China	1,800	2,350	2,500	4,800		
India	2,405	3,000	4,215	4,515		
Indonesia	1,300	1,300	1,500	1,500		
Malaysia	1,000	1,000	800	800		
Southern Europe	8,970	8,970	9,955	9,955		
Turkey	600	600	635	635		
Yugoslavia	4,710	4,710	4,320	4,320		
Greece	3,660	3,660	5,000	5,000		
Centrally Planned	16,450	16,450	16,450	16,450	16,450	17,000
Hungary	3,950	3,950	3,950	3,950		
Romania	1,000	1,000	1,000	1,000		
USSR	11,500	11,500	11,500	11,500		
World	102,430	120,030	124,343	131,708	134,608	143,158
Industrial and Developing	98,860	103,580	107,893	115,258	118,158	126,158
Western World	92,265	117,680	105,393	110,458	112,358	118,358

Sources: Engineering and Mining Journal, Maclean Hunter, January 1988; James F. King, World Capacity Report, Primary Aluminum, Alumina and Bauxite (various issues); Bureau of Mines, US Department of the Interior; World Bank (projected).

of world capacity--nearly 42 million tons. Most of this output is refined domestically to alumina. After nearly a decade of decline and restructuring in Jamaica, rising world demand and a modest revival of the US aluminum industry have contributed to the stabilization of capacity at about 13 million tons. Periodic renegotiation of the bauxite levy has also permitted Jamaica to improve its competitive position. Brazil's capacity has increased gradually as the result of expansion of the Trombetas mine. The majority of bauxite has been used to support the expansion of the local alumina/aluminum sectors. The newest and most likely the last entirely new mine for some time has recently come on-stream in Venezuela. Its capacity is expected to reach 3 million tons by 1990; output is planned to support Venezuela's rapidly expanding aluminum industry. Guinean capacity is second to Australia and destined primarily for export.

35. No major changes are expected in the pattern of bauxite production through the 1990s. The industrial countries will continue to lose market share to the developing countries. Guinea and Jamaica should maintain their role as major producers, but more dynamic growth is expected in Brazil and Venezuela where bauxite development is closely associated with an expanding domestic aluminum industry. Unlike the case with aluminum and alumina, bauxite is likely to remain in ample supply through the 1990s--utilization rates are currently around 0.78, and incremental expansion of existing mines should remain relatively easy.

Trade Outlook

36. Bauxite exports were limited to a 0.7% p.a. increase during the 1970-86 period. This rate was substantially below the 2% p.a. increase in production, indicating that a rising share of bauxite was being refined to alumina in the country of origin. The development of the Brazilian and Venezuelan industries typifies this trend. The outlook for exports remains poor since an increasing share of alumina refining is expected to be concentrated in the bauxite-producing developing countries. World bauxite exports are therefore projected to decrease by -0.9% p.a. during the 1987-2000 period. It is expected that bauxite exports will decrease by -2.2% p.a. in the industrial countries and decline by some -0.8% p.a. in developing countries. CPEs' exports should decrease by -0.7% p.a.

37. The outlook for alumina trade is somewhat more favorable than is the situation for bauxite. Closures of alumina units in the United States and Western Europe, and the continued expansion of Canadian aluminum capacity (with no comparable expansion of alumina capacity), should allow for a 1% p.a. expansion in alumina exports. However, trade will remain below the 2% p.a. increase expected for world production. Australia--a large and low-cost producer--is expected to expand exports by 1.8% p.a. during the 1987-2000 period. Caribbean exports are likely to expand somewhat over the medium term as the market tightens, and export volume could be even higher if Jamaica's currently-shut Alpart refinery is reactivated.

38. Prospects for aluminum trade remain favorable. The structural adjustment and shifts in corporate strategy which have typified the last decade have encouraged the development of aluminum production outside major

consuming regions. As this trend continues, exports will expand by an estimated 3.1% p.a. during the 1987-2000 period. Exports from the developing countries are expected to rise 6.2% p.a.; expansion should be particularly rapid in South America. Industrial country exports should expand by 1.8% p.a.; the major exporters within the group will remain Canada and Australia.

Price Outlook

39. Aluminum prices have been extremely volatile in recent years. The strong market of 1980 was followed by a recession-induced decline to US$1,061/ton in 1982. Although prices increased in 1983 to US$1,495/ton, a rise in stocks and the strengthening of US dollar again triggered a sharp price decline to US$1,110/ton by 1985. Prices averaged only US$1,261/ton in 1986, despite a weakening of the US dollar. The period of depressed prices since 1980 is unique in its severity and longevity. The initial fall in 1981 was to be expected, given the depth of the recession. However, the period of depressed prices during 1984/85 is not easily explainable in terms of market movements. An increase in production and modest expansion of inventory occurred in late 1983 and contributed to price weakening in 1984; but during the period of depressed prices in 1985/86, stocks were quite low by historical standards and were declining. Aluminum demand also remained strong and showed no signs of weakening. Clearly, the lean years of the 1970s and the 1981/82 recession had negatively affected industry expectations.

40. The industry reaction to low prices was twofold: additional permanent closures were made and numerous temporary shutdowns were announced. In addition, major cost-reduction programs were enacted. Labor costs were slashed by renegotiating contracts covering production workers (direct labor costs) and by cutting administrative expenses. Electricity and alumina costs were also reduced in part by renegotiating existing contracts and by the innovative method of pegging power and alumina contracts to then low aluminum prices. Table 6 illustrates how average operating costs fell approximately 20% to US$1,010/ton during the 1982-86 period. Despite these reductions, average total aluminum costs during this four-year period were consistently below market prices; average operating costs were only marginally higher than prices in most years.

41. The industry's response to the initial price increases of 1986 was cautious. Production was increased and closed facilities reopened, but these actions could not keep up with the persistently strong demand. The result was steadily declining stocks and rising utilization rates. Prices surged to US$1,608/ton in 1987 and averaged US$2,357/ton during Jan.-May 1988. Aluminum costs have been rising since 1987, largely due to higher alumina and electricity prices (many of which are tied to aluminum prices), as well as the continued decline of the US dollar which increases the dollar-denominated costs of non-US smelters (see Table 6). Nevertheless, the surge in aluminum prices has made the industry extremely profitable in recent years.

42. The short- and medium-term price outlook will be determined by the supply-demand balance. Several years of declining stocks culminated in historically low levels during the first half of 1988. Moderating demand and steadily rising output should result in a small increase in stocks this year (see Table 7) and in 1989 and allow prices to decline to US$1,800/ton by 1990

TABLE 6: ESTIMATED TRENDS IN ALUMINUM PRODUCTION COSTS

	Average Marginal Cost	Average Total Cost	Average Electricity Price (Mills/KWh)	Average Alumina Price a/	Metal Bulletin Transaction Price
	($/Ton)				
Mid-1982	1,280	1,565	20.3	206	1,061
1983	1,255	1,520	20.3	212	1,495
1984	1,140	1,400	18.2	204	1,371
1985	1,050	1,390	16.2	180	1,110
1986	1,010	1,365	16.8	158	1,261
1987	1,045	1,395	18.4	156	1,608
1988 b/	1,160	1,535	20.9	180	2,400

a/ C.i.f. import price.
b/ Estimate as of March 1988.

Source: Anthony Bird Associates, Aluminum Annual Review, March 1988.

TABLE 7: ALUMINUM MATERIALS BALANCE, 1987-1990

	1987	1988	1989	1990
	('000 tons)			
Primary Aluminum Consumption a/	13,519	13,619	13,590	13,674
Imports from CPEs b/	-250	-250	100	100
Primary Demand	13,269	13,469	13,490	13,574
Primary Production	12,972	13,689	13,852	13,682
Aluminum Stocks c/	1,482	1,702	2,064	2,172
Months Covered by Inventories	1.3	1.5	1.8	1.9

a/ Exclusive of CPEs and China.
b/ Includes China.
c/ Primary producer stocks plus exchange stocks, year-end.

Sources: World Bank.

(Table A11). In constant 1985 dollar (MUV) terms, prices are expected to decline to US$1,186/ton in 1990. Over the long term, prices should increase to US$2,900/ton by 2000, or US$1,280/ton in terms of 1985 constant dollars.

43. The long-term price projections are consistent with cost estimates shown in Table 8. Alumina prices are expected to increase by 5.5% p.a., compared to the 5.2% p.a. rise expected for total costs. The higher inflation rate for alumina reflects the depressed markets (and prices) of recent years and the expected tightening of alumina markets through the 1990s. Power (electricity) rates have been the primary factor determining smelter location during the past decade. These rates have been quite favorable to smelters, due to surplus base-load generating capacity in many regions. Since excess generating capacity has been reduced, power rates are expected to rise at a 5.1% p.a. rate through 2000. In contrast, continued automation and design efficiencies should permit labor costs to increase at a more modest 4.4% p.a.

TABLE 8: PROJECTED ALUMINUM PRODUCTION COSTS--TYPICAL NEW FACILITY

	1987	1990	2000
	----------(Current US$/Ton)----------		
Labor	170	200	298
Electricity	260	362	500
Alumina	350	429	700
Other Costs	240	290	452
Operating Costs	1,020	1,281	1,950
Capital Servicing, Profit	500	600	950
Total Costs	1,520	1,881	2,900
Alumina Price (US$/ton)	180	220	320
Electricity (Mills/KWh)	18	23	35

Note: Table 6 contains average cost data for currently operating facilities. Costs will differ for a new facility.

44. Published prices for bauxite are not available because the commodity has traditionally been shipped between units of integrated companies. In contrast to aluminum, bauxite is not traded on terminal markets such as the LME or COMEX. Previous projections have relied on a constructed series for Jamaican bauxite prices, based upon an estimate of mining costs and the bauxite levy. However, the decline in Jamaican exports and the continuing evolution of the bauxite levy have made such estimation procedures difficult. Consequently, the US import price has been adopted as the basis for projecting bauxite prices. Bauxite prices tend to lag trends in aluminum--a feature

illustrated by the high price (US$40.42/ton) reached in 1982, a year of severely depressed aluminum prices. A similar trend can be observed in 1987 when bauxite prices declined for the fifth consecutive year, despite a buoyant metal market. Prices are likely to drop further in 1988 to US$28/ton. Bauxite prices are expected to increase to US$30/ton in 1990, and for the period 1987-2000 should increase by a further 4.5% p.a. The somewhat lower rate of price increase expected for bauxite vis-a-vis aluminum reflects the adequate supplies of bauxite expected through the 1990s.

Policy Issues and Investment Climate

45. Price volatility has become increasingly prevalent during the past decade, and concern is now being voiced that such volatility may be disruptive. Price swings are likely to make the timing of investment decisions more difficult. Delays in the decisionmaking process could result in additional bunching of projects and further volatility. Also important is the potential negative impact on demand. The volatility of copper vis-a-vis aluminum during the 1960s has often been cited as contributing to the substitution of aluminum for copper because it made material cost estimation and control more difficult for consumers.

46. Price swings can be expected, given the inelastic nature of both supply and demand. However, the efforts to reduce costs during the early and mid-1980s included pegging alumina and electricity prices to then low aluminum prices. These institutional changes may exacerbate volatility by shifting the industry supply curve up during periods of rising prices and down during periods of oversupply. Over one-half of US smelter capacity now has power prices linked to the aluminum price. Numerous alumina contracts contain similar clauses. It has been estimated that these links mean that a 10% increase in price will lead to a 13.3% increase in cost. 3/

47. In many respects, the investment climate for aluminum in 1988 is more favorable than at any time in recent memory. Prices and operating rates are high, demand has been increasing, and only moderate amounts of new or incremental capacity are coming on-stream through 1990. However, by mid-1988 only a few new smelters have been announced that can be expected to come on-strear in the early 1990s. Given the extent of price fluctuations over the last several years and the past tendency to add too much capacity, the current reluctance to add new capacity may be prudent. Nevertheless, given current demand assumptions new smelter projects are likely to be required by the early- to mid-1990s to avoid another period of sharply higher prices.

48. Several factors may now be contributing to the apparent hesitation in going ahead with investment decisions. First, many of the large traditional producers in the United States and Europe have as a matter of corporate strategy been seeking to reduce their participation in the primary sector. This could serve to temporarily reduce the available financial and technical expertise needed for investment decisions. Also, power rates are higher and more even between countries/regions, hence the choice between possible projects may be more difficult.

3/ Anthony Bird Associates, Aluminum Annual Review, March, 1988.

TABLE A1: BAUXITE - PRODUCTION BY MAIN COUNTRIES AND ECONOMIC REGIONS

COUNTRIES/ ECONOMIES	ACTUAL				PROJECTED					GROWTH RATES A/		
	1969-71	1979-81	1986	1987/B	1988	1989	1990	1995	2000	1961-86	1970-86	1987 - 2000
	('000 TONS)									(% PER ANNUM)		
INDUSTRIAL	15,203	30,291	34,324	35,855	36,400	36,405	35,625	41,362	47,100	9.7	4.0	2.1
EEC-10	3,230	1,927	1,382	1,274	1,274	1,105	1,100	1,050	1,000	-2.7	-5.7	-1.8
FRANCE	3,010	1,897	1,379	1,271	1,270	1,100	1,095	1,045	995	-2.2	-5.5	-1.9
OCEANIA	9,970	26,734	32,432	34,000	34,626	34,800	34,025	39,862	45,700	25.5	6.1	2.3
NON-MARKET	8,252	9,830	9,797	9,800	9,900	9,950	9,975	9,737	9,500	2.5	0.6	-0.2
USSR	5,467	6,433	6,275	6,275	6,375	6,425	6,425	6,262	6,100	1.9	0.7	-0.2
EASTERN EUROPE	2,785	3,397	3,522	3,525	3,525	3,525	3,550	3,475	3,400	3.9	0.3	-0.3
DEVELOPING	36,567	49,869	47,084	49,058	52,700	53,550	54,300	61,980	69,660	3.6	1.3	2.7
ASIA	4,021	5,402	5,757	6,455	7,200	7,500	8,000	11,000	14,000	4.4	2.4	6.1
INDIA	1,326	1,897	2,338	2,916	3,200	3,200	3,400	4,500	5,600	6.1	3.7	5.1
INDONESIA	1,131	1,168	650	657	700	720	750	700	700	1.9	-3.2	0.5
AFRICA	3,344	14,249	16,137	17,500	18,200	18,200	18,000	18,250	18,500	11.3	10.3	0.4
GUINEA	2,526	13,371	14,656	16,100	16,500	16,500	16,500	17,000	17,500	12.3	12.0	0.6
AMERICA	24,703	23,641	19,215	18,979	20,800	21,350	21,600	25,480	29,360	1.0	-2.2	3.4
JAMAICA	11,684	11,696	6,964	7,659	8,000	8,100	8,000	8,415	8,830	0.3	-4.0	1.1
SURINAME	6,325	4,590	3,731	2,800	3,200	3,100	3,000	3,070	3,140	-0.8	-5.0	0.9
GUYANA	4,319	2,934	2,074	2,074	2,100	2,150	2,100	2,245	2,390	-0.9	-4.5	1.1
BRAZIL	476	3,419	6,446	6,446	7,000	7,000	6,500	7,750	9,000	18.4	19.4	2.6
VENEZUELA	0	0	0	0	500	1,000	2,000	4,000	6,000	0.0	0.0	...
SOUTHERN EUROPE	4,498	6,578	5,975	6,124	6,500	6,500	6,700	7,250	7,800	4.2	1.8	1.9
YUGOSLAVIA	2,062	3,133	3,459	3,394	3,500	3,500	3,400	3,450	3,500	4.2	4.3	0.2
GREECE	2,367	3,014	2,225	2,430	2,500	2,500	3,000	3,650	4,300	3.5	-0.4	4.5
WORLD	60,021	89,990	91,205	94,713	99,000	99,905	99,900	113,079	126,260	4.9	2.0	2.2

A/ LEAST SQUARES TREND FOR HISTORICAL PERIODS (1961-86); END-POINT FOR PROJECTED PERIODS (1987-2000).
B/ ESTIMATE.

SOURCES: METALLGESELLSCHAFT, METAL STATISTICS (ACTUAL);
WORLD BANK, INTERNATIONAL ECONOMICS DEPARTMENT (PROJECTED).

TABLE A2: BAUXITE - GROSS EXPORTS BY MAIN COUNTRIES AND ECONOMIC REGIONS

COUNTRIES/ ECONOMIES	ACTUAL				PROJECTED					GROWTH RATES A/		
	1969-71	1979-81	1986	1987/B	1988	1989	1990	1995	2000	1961-86	1970-86	1987 - 2000
	('000 TONS)									(% PER ANNUM)		
INDUSTRIAL	3,904	6,686	3,162	3,020	3,175	3,125	2,745	2,500	2,260	10.2	-1.2	-2.2
EEC-10	151	115	153	150	150	150	140	145	150	-2.1	3.4	0.0
OCEANIA	3,705	6,540	2,939	2,800	2,850	2,800	2,605	2,330	2,060	19.0	-1.4	-2.3
NON-MARKET	673	545	461	460	460	450	455	435	420	-1.9	-3.2	-0.7
DEVELOPING	22,892	28,491	26,303	28,175	27,900	27,175	26,200	25,815	25,420	2.4	1.2	-0.8
ASIA	2,057	2,113	1,450	1,475	1,500	1,550	1,530	1,475	1,400	1.0	-1.9	-0.4
INDONESIA	988	1,053	650	650	700	725	725	725	700	1.5	-3.2	0.6
AFRICA	1,595	11,293	14,696	15,200	15,200	15,400	15,000	14,250	13,500	18.7	15.8	-0.9
GUINEA	777	10,459	13,250	14,000	14,000	14,200	14,000	13,500	13,000	27.6	21.9	-0.6
AMERICA	16,095	12,787	8,208	9,600	9,300	8,375	7,800	8,365	8,920	-1.4	-3.6	-0.6
JAMAICA	7,722	5,987	2,940	3,400	3,500	3,400	3,100	3,450	3,800	-2.2	-5.6	0.9
SURINAME	3,565	1,707	761	800	850	850	850	975	1,100	-6.6	-10.4	2.5
GUYANA	2,810	1,559	1,374	2,075	2,100	2,000	2,050	2,225	2,400	-1.3	-5.2	1.1
SOUTHERN EUROPE	3,146	2,299	1,949	1,900	1,900	1,850	1,850	1,725	1,600	-0.5	-3.3	-1.3
YUGOSLAVIA	1,958	346	765	750	750	750	750	675	600	-4.3	-8.8	-1.7
GREECE	1,165	1,912	1,134	1,150	1,150	1,100	1,100	1,050	1,000	1.7	1.2	-1.1
WORLD	27,469	35,723	29,926	31,655	31,535	30,750	29,400	28,750	28,100	3.0	0.7	-0.9

A/ LEAST SQUARES TREND FOR HISTORICAL PERIODS (1961-86); END-POINT FOR PROJECTED PERIODS (1987-2000).
B/ ESTIMATE.

SOURCES: METALLGESELLSCHAFT, METAL STATISTICS, UNCTAD (ACTUAL);
WORLD BANK, INTERNATIONAL ECONOMICS DEPARTMENT (PROJECTED).

TABLE A3. BAUXITE - GROSS IMPORTS BY MAIN COUNTRIES AND ECONOMIC REGIONS

COUNTRIES/ ECONOMIES	ACTUAL				PROJECTED					GROWTH RATES A/		
	1969-71	1979-81	1986	1987/B	1988	1989	1990	1995	2000	1961-86	1970-86	1987 - 2000
	('000 TONS)									(% PER ANNUM)		
INDUSTRIAL	24,236	30,542	20,076	22,269	22,510	21,900	20,900	20,000	19,100	2.1	-0.9	-1.2
NORTH AMERICA	16,000	16,828	8,569	11,269	11,410	11,200	10,400	9,800	9,200	-0.2	-3.0	-1.5
UNITED STATES	13,584	14,043	6,456	9,156	9,300	9,200	8,400	7,700	7,000	-0.5	-3.6	-2.0
CANADA	2,416	2,785	2,113	2,113	2,110	2,000	2,000	2,100	2,200	1.6	-0.4	0.3
EEC-10	4,261	8,713	9,099	9,100	9,200	8,800	8,600	8,450	8,300	6.7	4.7	-0.7
GERMANY, FED. REP.	2,492	3,927	3,659	3,550	3,575	3,400	3,450	3,375	3,300	4.7	2.0	-0.6
FRANCE	491	1,689	911	910	915	900	850	825	800	12.1	4.3	-1.0
ITALY	621	2,095	1,396	1,400	1,405	1,250	1,225	1,215	1,200	7.9	4.1	-1.2
JAPAN	3,817	4,886	2,308	1,800	1,800	1,800	1,800	1,650	1,500	4.6	2.6	-1.4
NON-MARKET	2,394	4,272	6,027	6,025	6,025	6,050	6,000	6,100	6,200	7.5	5.5	0.2
USSR	1,453	2,909	4,825	4,825	4,825	4,825	4,800	4,850	4,900	11.0	7.7	0.1
EASTERN EUROPE	941	1,362	1,202	1,200	1,200	1,225	1,200	1,250	1,300	2.6	0.4	0.6
DEVELOPING	436	595	2,823	3,200	3,000	2,800	2,500	2,650	2,800	12.3	13.7	-1.0
WORLD	27,066	35,408	28,926	31,494	31,535	30,750	29,400	28,750	28,100	3.0	0.5	-0.9

A/ LEAST SQUARES TREND FOR HISTORICAL PERIODS (1961-86); END-POINT FOR PROJECTED PERIODS (1987-2000).
B/ ESTIMATE.

SOURCES: METALLGESELLSCHAFT, METAL STATISTICS, UNCTAD (ACTUAL);
WORLD BANK, INTERNATIONAL ECONOMICS DEPARTMENT (PROJECTED).

TABLE A4: ALUMINA - PRODUCTION BY MAIN COUNTRIES AND ECONOMIC REGIONS

COUNTRIES/ ECONOMIES	ACTUAL				PROJECTED					GROWTH RATES A/		
	1969-71	1970-81	1986	1987/B	1988	1989	1990	1995	2000	1966-86	1970-86	1987 - 2000
	('000 TONS)									(% PER ANNUM)		
INDUSTRIAL	12,924	20,898	19,317	20,453	21,352	21,522	20,722	21,545	22,360	3.7	2.5	0.7
NORTH AMERICA	7,172	7,701	4,335	5,003	5,400	5,450	5,100	4,550	4,000	-1.3	-2.3	-1.7
UNITED STATES	6,089	6,623	3,320	4,003	4,300	4,300	4,000	3,500	3,000	-1.7	-2.8	-2.2
CANADA	1,083	1,078	1,015	1,000	1,100	1,150	1,100	1,050	1,000	0.3	-0.1	0.0
EEC-10	2,165	4,063	4,603	4,600	4,600	4,400	4,200	3,900	3,600	5.2	5.0	-1.9
JAPAN	1,317	1,886	956	750	750	750	750	675	600	2.2	-1.7	-1.7
OCEANIA	2,265	7,247	9,423	10,100	10,602	10,922	10,672	12,420	14,160	13.5	8.1	2.6
NON-MARKET	3,446	4,886	5,993	6,000	6,050	6,050	6,025	6,960	7,900	3.5	3.2	2.1
USSR	2,683	3,417	4,500	4,500	4,550	4,550	4,525	4,560	4,600	2.9	3.1	0.2
EASTERN EUROPE	762	1,469	1,493	1,500	1,500	1,500	1,500	2,400	3,300	5.5	3.8	6.3
DEVELOPING	4,870	7,924	9,398	9,898	10,378	10,828	11,628	14,200	16,740	5.2	3.2	4.1
AMERICA	3,1[illegible]	4,409	5,523	5,860	5,940	5,990	6,290	7,645	9,000	4.4	1.9	3.4
JAMAICA	1,62[illegible]	2,340	1,586	1,642	1,700	1,700	1,900	1,900	1,900	2.9	-1.3	1.1
SURINAME	1,091	1,333	1,471	1,336	1,340	1,340	1,340	1,420	1,500	2.8	0.3	0.9
BRAZIL	124	487	1,197	1,560	1,550	1,550	1,550	2,125	2,700	14.9	13.9	4.3
WORLD	21,239	33,707	34,708	36,351	37,980	38,400	38,373	42,705	47,000	4.0	2.8	2.0

A/ LEAST SQUARES TREND FOR HISTORICAL PERIODS (1961-86); END-POINT FOR PROJECTED PERIODS (1987-2000).
B/ ESTIMATE.

SOURCES: METALLGESELLSCHAFT, METAL STATISTICS (ACTUAL);
WORLD BANK, INTERNATIONAL ECONOMICS DEPARTMENT (PROJECTED).

TABLE A5: ALUMINA (METAL CONTENT) - GROSS EXPORTS BY MAIN COUNTRIES AND ECONOMIC REGIONS

COUNTRIES/ ECONOMIES	ACTUAL				PROJECTED					GROWTH RATES A/		
	1969-71	1979-81	1986	1987/B	1988	1989	1990	1995	2000	1961-86	1970-86	1987 - 2000
	('000 TONS)									(% PER ANNUM)		
INDUSTRIAL	1,784	4,551	5,208	5,500	5,725	5,700	5,450	5,900	6,350	13.8	6.0	1.1
NORTH AMERICA	540	421	270	250	250	240	230	200	170	3.9	-5.1	-2.9
UNITED STATES	533	403	247	220	230	220	210	180	150	3.6	-5.7	-2.9
EEC-10	260	593	897	900	925	900	800	775	750	8.3	6.3	-1.4
OCEANIA	902	3,352	3,849	4,050	4,304	4,260	4,000	4,540	5,080	0.0	8.2	1.8
NON-MARKET	205	337	333	340	350	360	370	390	410	7.2	1.8	1.5
EASTERN EUROPE	205	337	333	340	350	360	370	390	410	7.2	1.8	1.5
DEVELOPING	1,836	2,662	2,396	2,472	2,609	2,620	2,650	2,675	2,700	5.7	0.8	0.7
AFRICA	304	342	300	275	280	285	290	300	310	1.6	0.7	0.9
GUINEA	304	342	300	275	280	285	290	300	310	1.6	0.7	0.9
AMERICA	1,431	1,903	1,694	1,700	1,850	1,860	1,870	1,895	1,920	5.8	-0.3	0.9
JAMAICA	790	1,173	781	800	800	800	900	900	900	4.7	-1.3	0.9
SURINAME	485	642	703	670	670	670	680	700	720	0.0	1.4	0.6
SOUTHERN EUROPE	98	381	367	370	380	370	360	380	400	20.4	9.0	0.6
WORLD	3,824	7,550	7,937	8,312	8,684	8,680	8,470	8,965	9,460	9.5	3.7	1.0

A/ LEAST SQUARES TREND FOR HISTORICAL PERIODS (1961-86); END-POINT FOR PROJECTED PERIODS (1987-2000).
B/ ESTIMATE.

SOURCES: METALLGESELLSCHAFT, METAL STATISTICS, UNCTAD (ACTUAL);
WORLD BANK, INTERNATIONAL ECONOMICS DEPARTMENT (PROJECTED).

TABLE A6: ALUMINA (METAL CONTENT) - GROSS IMPORTS BY MAIN COUNTRIES AND ECONOMIC REGIONS

COUNTRIES/ ECONOMIES	ACTUAL 1969-71	1979-81	1986	1987/B	PROJECTED 1988	1989	1990	1995	2000	GROWTH RATES A/ 1961-86	1970-86	1987-2000
	('000 TONS)									(% PER ANNUM)		
INDUSTRIAL	2,977	5,351	5,325	5,800	6,219	5,892	5,597	6,080	6,566	8.1	2.8	1.0
NORTH AMERICA	1,583	2,554	2,679	2,865	3,320	3,138	2,960	3,295	3,631	8.4	3.0	1.8
UNITED STATES	1,111	2,059	1,807	1,772	2,225	2,065	1,790	1,788	1,786	13.7	2.7	0.1
CANADA	472	495	872	1,093	1,095	1,073	1,170	1,507	1,845	2.9	3.9	4.1
EEC-10	420	1,241	1,244	1,202	1,199	1,000	915	915	913	11.3	4.4	-2.1
OTHER WESTERN EUROPE	780	1,040	1,144	1,470	1,470	1,530	1,501	1,410	1,770	5.0	2.1	1.4
JAPAN	178	359	32	32	30	25	25	22	20	14.3	-12.9	-3.6
NON-MARKET	409	799	603	642	626	636	643	512	401	10.9	0.9	-3.6
USSR	311	570	450	482	480	485	490	390	290	10.5 C/	2.4	-3.8
EASTERN EUROPE	177	229	133	160	146	151	153	132	111	4.1	-2.6	-2.8
DEVELOPING	267	1,205	1,730	1,922	1,839	2,152	2,230	2,361	2,493	16.2	11.7	2.0
AFRICA	164	451	557	570	580	585	600	650	700	11.9	7.1	1.6
AMERICA	62	466	413	540	690	835	838	536	690	20.1	15.3	1.9
WORLD	3,733	7,355	7,658	8,364	8,684	8,680	8,470	8,953	9,460	9.2	3.8	1.0

A/ LEAST SQUARES TREND FOR HISTORICAL PERIODS (1961-86); END-POINT FOR PROJECTED PERIODS (1987-2000).
B/ ESTIMATE.
C/ GROWTH RATE FOR 1966-86 PERIOD.

SOURCES: METALLGESELLSCHAFT, METAL STATISTICS, UNCTAD (ACTUAL);
WORLD BANK, INTERNATIONAL ECONOMICS DEPARTMENT (PROJECTED).

TABLE A7: PRIMARY ALUMINUM - PRODUCTION BY MAIN COUNTRIES AND ECONOMIC REGIONS

COUNTRIES/ ECONOMIES	ACTUAL				PROJECTED					GROWTH RATES A/		
	1969-71	1979-81	1986	1987/B	1988	1989	1990	1995	2000	1961-86	1970-86	1987 - 2000
	('000 TONS)									(% PER ANNUM)		
INDUSTRIAL	7,355	10,395	8,919	9,532	10,181	9,975	9,575	9,975	10,980	4.0	1.0	0.7
NORTH AMERICA	4,517	5,585	4,392	4,890	5,585	5,375	5,050	5,165	5,280	2.6	0.1	0.6
UNITED STATES	3,536	4,566	3,037	3,342	3,950	3,800	3,400	3,200	3,000	2.6	-0.5	-0.8
CANADA	981	1,019	1,355	1,548	1,575	1,575	1,650	1,965	2,280	2.4	2.2	3.0
EEC-10	1,123	2,390	2,217	2,195	2,165	2,100	2,025	1,910	1,800	6.3	3.6	-1.5
GERMANY, FED. REP.	339	734	764	738	730	690	680	655	630	7.1	4.2	-1.2
FRANCE	379	421	322	322	320	300	230	215	200	0.6	-0.8	-3.6
OTHER WESTERN EUROPE	795	990	1,059	1,134	1,154	1,150	1,150	1,225	1,300	4.7	1.5	1.1
OCEANIA	193	473	1,111	1,273	1,297	1,350	1,350	1,675	2,000	15.7	10.1	3.5
NON-MARKET	2,042	2,879	2,826	3,026	3,026	3,026	3,012	3,305	3,600	4.4	1.7	1.3
USSR	1,683	2,390	2,350	2,546	2,546	2,546	2,536	2,770	3,000	4.4	1.9	1.3
EASTERN EUROPE	359	489	476	480	480	480	476	535	600	4.6	1.1	1.7
DEVELOPING	820	2,369	3,763	3,950	4,038	4,467	4,867	6,090	7,320	12.7	9.6	4.9
ASIA	336	824	1,356	1,420	1,468	1,730	2,000	2,560	3,125	11.0	8.8	6.3
BAHRAIN	3	131	178	180	180	180	220	320	420	...	...	6.7
CHINA	162	403	480	500	520	600	750	950	1,150	8.1	7.3	6.6
INDIA	157	203	257	265	285	350	400	525	650	8.0	3.3	7.1
AFRICA	172	440	552	572	582	580	580	665	750	11.3	6.8	2.1
AMERICA	169	758	1,397	1,500	1,537	1,697	1,827	2,315	2,800	18.0	14.8	4.9
BRAZIL	60	252	757	843	850	870	980	1,050	1,200	15.1	15.2	2.8
VENEZUELA	19	282	423	430	460	600	700	1,000	1,200	...	25.3	8.9
WORLD	10,217	15,642	15,507	16,508	17,245	17,468	17,454	19,370	21,300	5.0	2.3	2.0

A/ LEAST SQUARES TREND FOR HISTORICAL PERIODS (1961-86); END-POINT FOR PROJECTED PERIODS (1987-2000).
B/ ESTIMATE.

SOURCES: METALLGESELLSCHAFT, METAL STATISTICS & WORLD BUREAU OF METAL STATISTICS (ACTUAL);
WORLD BANK, INTERNATIONAL ECONOMICS DEPARTMENT (PROJECTED).

TABLE A8: PRIMARY ALUMINUM - CONSUMPTION BY MAIN COUNTRIES AND ECONOMIC REGIONS

COUNTRIES/ ECONOMIES	ACTUAL				PROJECTED					GROWTH RATES A/		
	1969-71	1979-81	1986	1987/B	1988	1989	1990	1995	2000	1961-86	1970-86	1987 - 2000
	('000 TONS)									(% PER ANNUM)		
INDUSTRIAL	7,369	10,251	10,533	10,919	11,009	10,952	11,004	11,912	12,820	4.4	1.7	1.2
NORTH AMERICA	3,937	4,656	4,497	4,868	4,860	4,810	4,830	5,120	5,410	2.9	0.2	0.8
UNITED STATES	3,707	4,578	4,143	4,536	4,520	4,500	4,520	4,770	5,020	2.8	0.2	0.8
EEC-10	2,070	3,024	3,341	3,320	3,340	3,320	3,330	3,680	4,030	4.8	2.6	1.5
GERMANY, FED. REP.	666	1,044	1,187	1,194	1,198	1,190	1,195	1,340	1,486	5.9	3.6	1.7
FRANCE	386	579	593	602	605	600	602	666	730	4.6	3.0	1.5
UNITED KINGDOM	373	390	389	373	379	375	375	405	435	0.6	-1.1	1.2
OTHER WESTERN EUROPE	329	441	522	481	500	495	500	545	590	5.3	2.3	1.6
JAPAN	897	1,671	1,850	1,900	1,950	1,968	1,980	2,165	2,350	10.0	3.7	1.6
NON-MARKET	1,862	2,720	2,761	2,762	2,778	2,780	2,810	3,125	3,440	4.6	2.2	1.7
USSR	1,318	1,858	1,885	1,882	1,893	1,895	1,915	2,107	2,300	4.0	2.2	1.6
EASTERN EUROPE	544	861	876	880	885	885	895	1,018	1,140	5.8	2.3	2.0
DEVELOPING	890	2,308	3,308	3,430	3,495	3,538	3,640	4,333	5,040	11.1	7.7	3.0
ASIA	474	1,236	1,872	1,960	2,010	2,053	2,110	2,530	2,950	11.5	8.4	3.2
AMERICA	209	565	800	805	809	815	828	990	1,153	10.6	7.1	2.8
WORLD	10,121	15,279	16,602	17,111	17,282	17,290	17,454	19,370	21,300	5.2	2.6	1.7

A/ LEAST SQUARES TREND FOR HISTORICAL PERIODS (1961-86); END-POINT FOR PROJECTED PERIODS (1987-2000).
B/ ESTIMATE.

SOURCES: METALLGESELLSCHAFT, METAL STATISTICS & WORLD BUREAU OF METAL STATISTICS (ACUTAL);
WORLD BANK, INTERNATIONAL ECONOMICS DEPARTMENT (PROJECTED).

TABLE A9: PRIMARY ALUMINUM - GROSS EXPORTS BY MAIN COUNTRIES AND ECONOMIC REGIONS

COUNTRIES/ ECONOMIES	ACTUAL				PROJECTED					GROWTH RATES A/		
	1969-71	1979-81	1986	1987/B	1988	1989	1990	1995	2000	1961-86	1970-86	1987 - 2000
	('000 TONS)									(% PER ANNUM)		
INDUSTRIAL	1,973	3,090	4,104	4,486	4,442	4,473	4,554	5,103	5,660	4.5	5.0	1.8
NORTH AMERICA	1,052	1,068	1,374	1,456	1,426	1,615	1,615	1,935	2,110	1.8	3.1	2.9
CANADA	791	687	1,164	1,172	1,146	1,335	1,435	1,755	1,930	1.8	2.6	3.9
UNITED STATES	261	381	210	284	280	280	180	180	180	1.2	5.2	-3.4
EEC-10	330	1,128	1,080	1,098	1,100	1,050	1,000	1,000	1,000	6.2	7.5	-0.7
NETHERLANDS	72	359	301	314	320	300	320	310	300	17.1	7.2	-0.4
FRANCE	154	175	143	119	110	105	100	100	95	-0.4	-0.5	-1.7
GERMANY, FED. REP.	49	242	301	334	335	320	300	310	310	9.8	10.7	-0.6
OTHER WESTERN EUROPE	518	695	866	1,010	1,000	1,010	1,000	985	1,000	4.6	2.9	-0.1
OCEANIA	63	190	783	922	916	798	939	1,283	1,550	20.3 C/	13.2	4.1
NON-MARKET	497	710	829	830	800	846	817	887	945	7.0	2.4	1.0
USSR	365	488	580	590	575	610	600	650	690	5.8	2.2	1.2
DEVELOPING	305	802	1,731	1,856	1,592	1,896	2,327	3,200	4,080	15.0	11.4	6.2
AFRICA	149	244	371	390	350	350	375	475	575	8.5	6.2	3.0
GHANA	111	151	110	130	120	120	140	150	160	-1.1 D/	-3.7	1.6
AMERICA	54	292	694	800	700	800	1,000	1,400	2,700	26.0 E/	20.4	9.8
WORLD	2,775	4,602	6,664	7,172	6,834	7,215	7,698	9,190	10,685	5.9	5.6	3.1

A/ LEAST SQUARES TREND FOR HISTORICAL PERIODS (1961-86); END-POINT FOR PROJECTED PERIODS (1987-2000).
B/ ESTIMATE.
C/ GROWTH RATE FOR 1964-86 PERIOD.
D/ GROWTH RATE FOR 1967-86 PERIOD.
E/ GROWTH RATE FOR 1965-86 PERIOD.

SOURCES: METALLGESELLSCHAFT, METAL STATISTICS & WORLD BUREAU OF METAL STATISTICS (ACTUAL);
WORLD BANK, INTERNATIONAL ECONOMICS DEPARTMENT (PROJECTED).

TABLE A10: PRIMARY ALUMINUM - GROSS IMPORTS BY MAIN COUNTRIES AND ECONOMIC REGIONS

COUNTRIES/ ECONOMIES	ACTUAL				PROJECTED					GROWTH RATES A/		
	1969-71	1979-81	1986	1987/B	1988	1989	1990	1995	2000	1961-86	1970-86	1987 - 2000
	('000 TONS)									(% PER ANNUM)		
INDUSTRIAL	2,115	3,377	5,314	5,580	5,264	5,663	5,983	7,040	8,100	6.9	6.0	2.9
NORTH AMERICA	430	579	1,411	1,298	890	1,050	1,395	1,800	2,240	4.6	5.6	4.3
UNITED STATES	417	563	1,346	1,245	845	980	1,300	1,750	2,200	4.4	5.7	4.5
EEC-10	1,313	1,706	2,243	2,167	2,271	2,270	2,305	2,770	3,230	5.3	3.4	3.1
GERMANY, FED. REP.	399	517	764	734	803	820	815	995	1,166	7.8	5.0	3.6
FRANCE	164	316	428	407	395	405	472	551	625	9.4	5.6	3.4
OTHER WESTERN EUROPE	105	155	293	280	203	403	333	305	280	7.0	5.4	0.0
JAPAN	266	929	1,366	1,835	1,900	1,940	1,950	2,150	2,350	20.6	13.3	1.9
NON-MARKET	225	500	543	560	520	565	615	700	785	9.2	4.8	2.6
EASTERN EUROPE	225	500	543	560	520	565	615	700	785	9.2	4.8	2.6
DEVELOPING	231	608	931	1,050	1,050	987	1,100	1,450	1,800	10.9	9.0	4.2
ASIA	67	399	763	780	860	880	900	1,250	1,600	18.6	17.1	5.7
WORLD	2,572	4,485	6,788	7,190	6,834	7,215	7,698	9,190	10,685	7.6	6.2	3.1

A/ LEAST SQUARES TREND FOR HISTORICAL PERIODS (1961-86); END-POINT FOR PROJECTED PERIODS (1987-2000).
B/ ESTIMATE.

SOURCES: METALLGESELLSCHAFT, METAL STATISTICS & WORLD BUREAU OF METAL STATISTICS (ACTUAL);
WORLD BANK, INTERNATIONAL ECONOMICS DEPARTMENT (PROJECTED).

TABLE A11: PRIMARY ALUMINUM PRICES, 1958-87 (ACTUAL) AND 1988-2000 (PROJECTED)

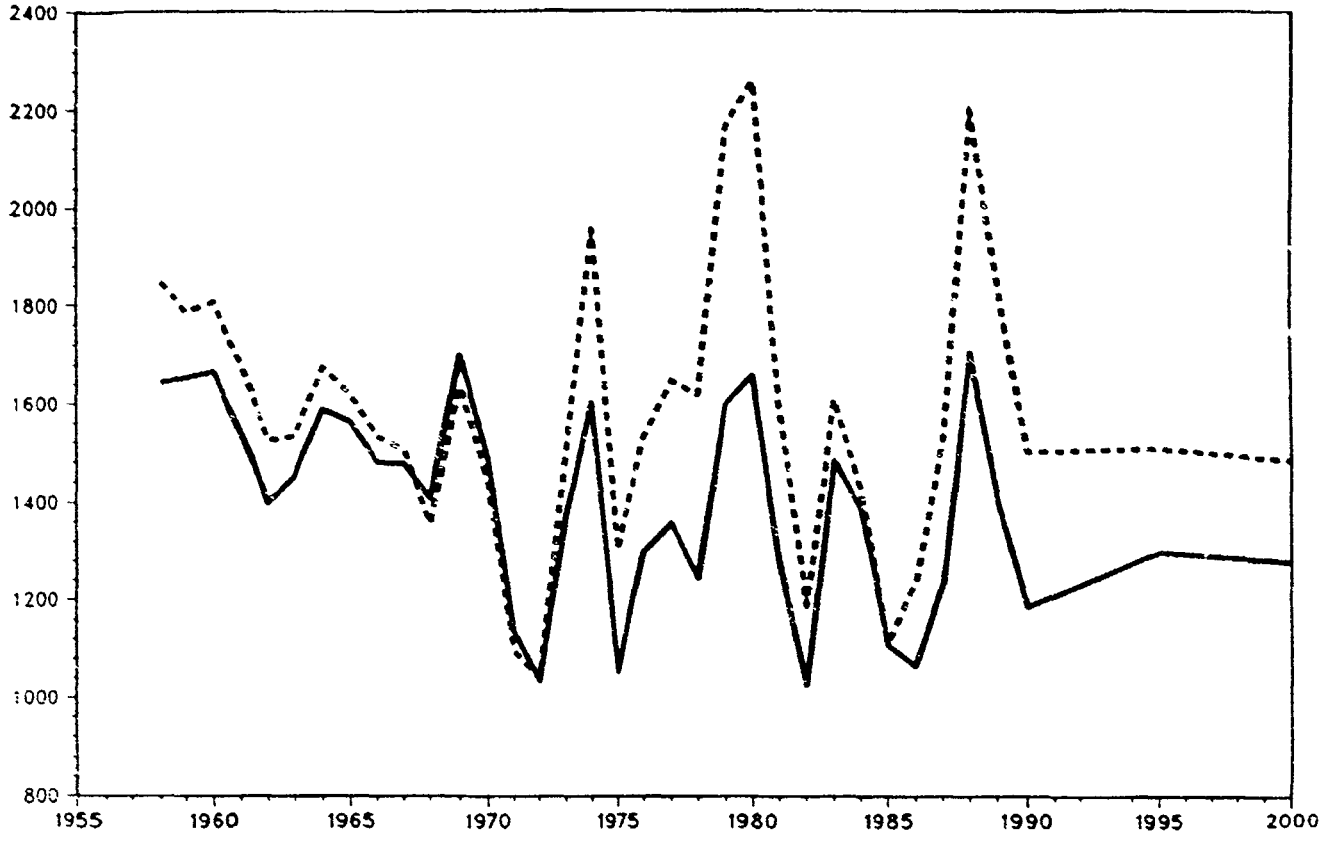
	($/Ton)		($/Ton)			
			1985 Constant $			
	Current $		MUV a/		US GNP b/	
	Transactions Price c/	LME Cash d/	Transactions Price c/	LME Cash d/	Transactions Price c/	LME Cash d/
Actual						
1958	490		1,644		1,847	
1959	486		1,654		1,786	
1960	500		1,667		1,807	
1961	470		1,540		1,683	
1962	435		1,398		1,524	
1963	444		1,454		1,535	
1964	493		1,587		1,675	
1965	489		1,563		1,619	
1966	479		1,479		1,533	
1967	486		1,477		1,506	
1968	457		1,408		1,355	
1969	591		1,699		1,634	
1970	540		1,486		1,437	
1971	435		1,135		1,097	
1972	432		1,035		1,039	
1973	563		1,371		1,497	
1974	944		1,602		1,957	
1975	690		1,053		1,301	
1976	862		1,298		1,529	
1977	991		1,358		1,648	
1978	1,045		1,244		1,619	
1979	1,520	1,602	1,598	1,685	2,164	2,281
1980	1,730	1,780	1,659	1,706	2,258	2,323
1981	1,338	1,262	1,276	1,203	1,593	1,502
1982	1,061	991	1,026	958	1,187	1,108
1983	1,495	1,440	1,484	1,430	1,610	1,551
1984	1,371	1,251	1,385	1,264	1,421	1,297
1985	1,110	1,041	1,110	1,041	1,110	1,041
1986	1,261	1,150	1,066	972	1,236	1,128
1987	1,608	1,565	1,237	1,204	1,531	1,491
Projected						
1988	2,400		1,706		2,199	
1989	2,100		1,404		1,840	
1990	1,800		1,186		1,501	
1995	2,350		1,299		1,508	
2000	2,900		1,280		1,485	

a/ Deflated by Manufacturing Unit Value (MUV) index.
b/ Deflated by US GNP Deflator.
c/ Certain other transaction, US shipments to Europe, Min 99.5%, c.i.f. Europe (Source: Metal Bulletin). This quotation was published beginning December 20, 1957.
d/ Average bid/asked (Source: Metals Week).

Sources: See footnotes for actual; World Bank (projected).

ALUMINUM

(CONSTANT 1985 DOLLAR PRICES *)



——— DEFLATED BY MANUFACTURING UNIT VALUE (MUV) INDEX

• • • • • • • • • • • DEFLATED BY U.S. GNP DEFLATOR.

* 1948 – 87 ACTUAL ; 1988 – 2000 PROJECTED .

SOURCE : WORLD BANK , INTERNATIONAL ECONOMICS DEPARTMENT .

TABLE A12: BAUXITE PRICES, a/ 1972-87 (ACTUAL) AND 1988-2000 (PROJECTED)

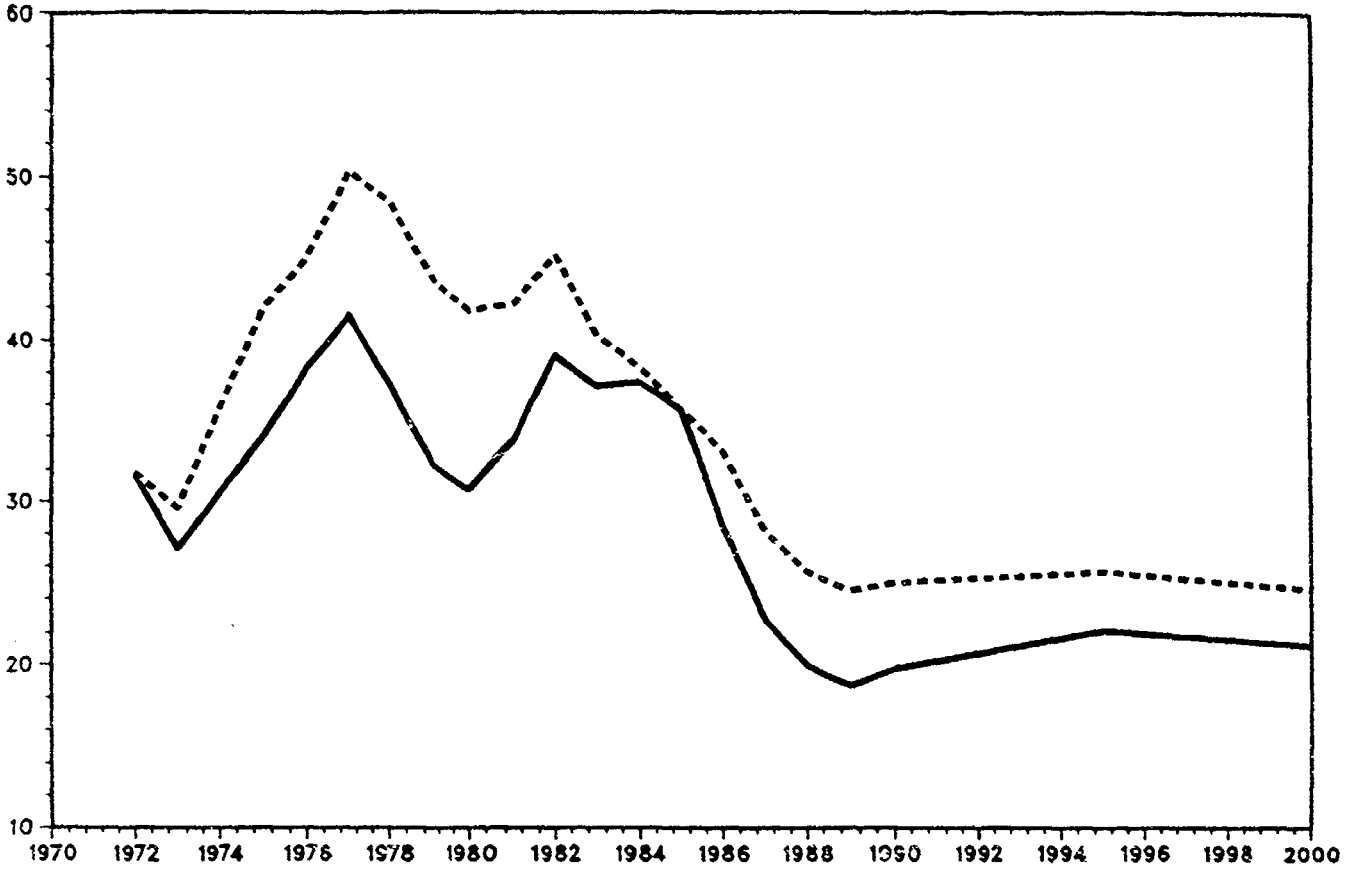
	($/Ton)	($/Ton) 1985 Constant $	
	Current $	MUV b/	US GNP c/
Actual			
1972	13.20	31.62	31.76
1973	13.10	27.08	29.58
1974	NA	NA	NA
1975	22.15	33.81	41.78
1976	25.44	38.30	45.12
1977	30.25	41.46	50.29
1978	31.25	37.22	48.40
1979	30.70	32.28	43.71
1980	32.00	30.68	41.76
1981	35.37	33.73	42.11
1982	40.42	39.09	45.21
1983	37.40	37.14	40.28
1984	37.00	37.39	38.36
1985	35.72	35.72	35.72
1986	33.66	28.45	33.00
1987	29.48	22.68	28.08
Projected			
1988	28.00	19.90	25.65
1989	28.00	18.73	24.53
1990	30.00	19.77	25.01
1995	40.00	22.10	25.67
2000	48.00	21.20	24.58

a/ US import price c.i.f. US port.
b/ Deflated by Manufacturing Unit Value (MUV) Index.
c/ Deflated by US GNP Deflator.

Sources: Bureau of Mines Minerals Yearbook, "Bauxite and Alumina," various years (actual); World Bank, International Economics Department (projected).

BAUXITE

(CONSTANT 1985 DOLLAR PRICES *)



——— DEFLATED BY MANUFACTURING UNIT VALUE (MUV) INDEX

- - - - - - - - - - DEFLATED BY U.S. GNP DEFLATOR.

* 1948 – 87 ACTUAL ; 1988 – 2000 PROJECTED .

SOURCE : WORLD BANK , INTERNATIONAL ECONOMICS DEPARTMENT .

STEEL

Summary

1. The world demand for crude steel is expected to grow by an average of 1.6% p.a. during the 1987-2000 period. Steel prices, on average, are not expected to increase in real terms as neither significant shortages nor capacity bottlenecks are anticipated during the forecast period. The share of alloy steel products output to total steel products output will continue increasing, reducing the demand for crude steel. The shift towards lighter, stronger steels, rising efficiency within the steel industry (reflecting particularly the rapid spread of continuous casting), and substitution by other materials will also put downward pressure on the demand for crude steel.

Consumption Prospects

2. Steel demand in the industrial countries as indicated by apparent consumption figures (presented in Table A2) covering the period 1979-81 to 1987 has declined significantly. The decline in apparent consumption figures is particularly striking when the 1987 volume of steel production in crude steel terms (or in finished product terms) is compared with the 1973 volume level. In the EEC apparent consumption of crude steel was approximately 140 million tons in 1973; it declined drastically to a low point of 97.7 million tons in 1983. By 1987 it had recovered to 103.01 million tons. Similarly, in the United States, apparent consumption reached 149.6 million tons in 1973; it fell sharply in 1982 (to 83.9 million tons) and recovered to 96 million tons in 1987. The same kind of story can be told for Japan.

3. Industrial steel demand is not expected to recover to the 1973 level before the year 2000. The shift towards lighter, stronger steels and some substitution by other materials will dampen the demand for finished steel products despite robust industrial growth rates. A potential threat for steel demand is the substitution of steel by ceramics in areas where substantial heat must be endured and by plastics and aluminum (particularly in the container field).

4. The rapid rise in continuous casting will also result in downward pressure on crude steel consumption. Steel producers through their improvements in production methods have reduced the amount of scrap generated and therefore the amount of steel needed. The US automotive industry, for example, has reduced the amount of scrap generated from 32% to 28%. The high degree of market saturation in the industrial countries for such products as automobiles and appliances will also dampen the prospects of industrial countries' steel demand in the 1987-2000 period. Automobile output in industrial countries reached 45 million vehicles in 1986 but has only bleak prospects for further growth. Replacement demand, rather than new growth, will be the key in the automotive industry in most industrial markets in the years to come.

5. Steel demand has also been negatively affected in the last ten years by the slow demand growth of new ships. The Japanese steel industry has been principally affected by this slowdown. It is estimated that the 1975 Japanese shipments of 5 million tons of steel to the ship building industry was halved by 1987.

6. On the positive side, infrastructure replacement will increase demand for steel, notably in Japan, where the government is committed to invest billions of dollars in infrastructure over the next decade. In the United States there is a need for infrastructure investments; however there is no definite program.

7. On the basis of the aforementioned factors, industrial countries' apparent consumption of steel is expected to increase on the average by only 0.1% p.a. between 1987 and 2000. Among industrial countries the changed terms of trade resulting from the lower dollar will help the manufacturing sector of the United States compete against other foreign steel suppliers; this should also benefit the US steel consuming sector and hamper that of the EEC and Japan.

8. Taking the United States and Canada together, annual consumption of crude steel is projected to grow from 109 million tons in 1987 to 120 million tons in 1995 (mostly as a result of infrastructure replacement needs) and fall back to 114 million tons by 2000.

9. The European Community's (EEC-10, i.e., excluding Greece and Portugal) consumption of steel will be affected negatively by (i) the move to lighter steels and other substitutes; (ii) the poor terms of trade (in view of the appreciation of their currencies vis-a-vis the US dollar); and (iii) the rapidly aging population. Yield improvements in the steel industry are putting additional downward pressure on the growth rate of consumption in crude steel in Europe. It is expected that the savings in crude steel consumption due to improvements will subside sometime in the second half of the 1990s as continuous casting will by then be widespread. (The growth of steel consumption in crude steel terms and in finished product terms would then be similar). Overall, EEC-10 steel consumption is expected to remain stagnant during the 1987-2000 period.

10. Steel consumption in Japan is also likely to be under downward pressure for the same reasons as in the United States and the EEC-10. The Japanese manufacturing industry will face intensified competition in third export markets in view of Japan's appreciated currency. In the domestic market, however, the government's liberal fiscal policies and public works programs will greatly stimulate expenditures on steel-intensive infrastructure projects. Japanese steel demand is expected to increase from 73 million tons in 1987 to 77 million tons in 1995 and fall back to 73 million tons in 2000.

11. In contrast to the outlook for industrial countries, steel demand prospects in the developing world look bright. Youthful populations and increased demand for industrial goods will increase demand for steel products. However, the problems that have restricted the expansion of the steel markets through the 1980s, in particular the developing countries' debt servicing problems, will not disappear. Economic and financial difficulties

will continue to slow domestic expansion and the prospects for exports--either of steel products or of steel contained in manufactured goods--will remain, with very few exceptions, severely limited. With favorable assumptions for industrial growth in the 1990s, steel-consuming countries in Asia and in Latin America will outgrow those in Africa and the Middle East. Impressive gains in steel consumption should be realized in China, India, Republic of Korea, and Brazil.

12. China is by far the leader among developing countries in steel output and consumption. It is estimated that consumption was close to 81.4 million tons in 1987 and production was close to 58 million tons. Steel demand (on the basis of an average GDP growth rate of less than 7% p.a. for the 1987-2000 period) is projected to reach 158 million tons by 2000. Much basic investment for infrastructure, as well as the establishment and expansion of steel-consuming industries, lie behind this additional demand for steel in China. Republic of Korea's rapid growth in demand for steel is also expected to be mainly generated from investments in infrastructure in other than the major two urban centers of Seoul and Pusan and from expanding the automobile industry. India's and Brazil's growth in demand is expected to come primarily from infrastructure projects and the overall industrial development efforts by these countries. For the developing countries taken together, the average expected crude steel growth rate during the 1987-2000 period is 3.6% p.a. This increase would take their total consumption from 216 million tons in 1987 to 342 million tons in 2000.

13. In the USSR, and the other non-market industrial economies, steel consumption is projected to grow by 1.2% p.a. during the 1987-2000 period. The non-market economies' steel output may become more oriented towards the requirements of the user and away from official plan targets which, together with greater efficiency within the industry, would lead to a slowdown in the need for crude steel.

14. World demand outlook for crude steel is thus projected to grow from 739 million tons in 1987 to 779 million tons by 1990 and to 908 million tons by 2000.

Production and Capacity Prospects

15. While the major part of the additional consumption of steel between 1987 and 2000 will be in the developing countries and the non-market economies, the additional supply will be more evenly spread among the industrial and the developing and non-market countries. In virtually all of the industrial countries plant closures are continuing. Further programs for capacity reduction are under discussion in various countries such as those that are members of the EEC and it is, therefore, difficult to assess the volume of capacity which will be operational in 1990 and thereafter. Based on reports from the International Iron and Steel Institute (IISI), known closure plans and expansion projects which have been firmly decided upon are presented in Table 1. It can be seen that further sharp reductions are expected for Western Europe, North America, and Japan--amounting to close to 10% of the 1985 level.

16. In the steel-making developing countries (excluding China), 1990 capacity will exceed 1985 capacity by around 60 million tons. China's

TABLE 1: CRUDE STEEL ROLLING CAPACITY: 1985 AND 1990

	1985	1990
	(Million Tons)	
Austria	4.95	4.80
Belgium	17.05	12.15
Denmark	0.90	0.90
France	26.86	25.58
Germany, Fed. Rep. of	57.32	52.93
Ireland	0.44	0.44
Italy	38.15	32.35
Luxembourg	5.45	5.45
Netherlands	7.97	7.97
Spain	21.72	20.90
United Kingdom	24.03	24.03
Canada	20.66	20.66
United States	130.00	114.31
Japan	153.04	152.04
Finland	2.75	2.75
Norway	1.15	1.15
Switzerland	1.20	1.20
Greece	3.25	3.25
Portugal	0.73	0.73
Turkey	5.01	6.91
Yugoslavia	6.14	7.52
India	15.51	18.64
Indonesia	2.15	2.15
Malaysia	0.58	1.18
Pakistan	1.74	1.74
Philippines	0.74	0.74
Korea, Rep. of	13.98	16.68 (22)
Korea, Dem. People's Rep. of	9.75	13.25
China	52.51	60.88 (80)
Taiwan, China	6.00	8.40
Other Asia	2.20	2.42
Argentina	5.40	5.61
Brazil	22.82	27.50
Chile	1.17	1.17
Colombia	0.65	0.85
Cuba	0.35	0.60
Mexico	11.75	14.05
Peru	0.79	0.79
Venezuela	5.46	5.56
Other Latin America	1.36	1.36
Algeria	2.23	2.23
Egypt	1.90	2.80
Libya	0.02	1.32
Nigeria	1.20	2.70
South Africa	10.42	11.00
Zimbabwe	1.00	1.00
Other Africa	0.57	0.77
Iran	2.18	3.35
Iraq	0.45	0.45
Saudi Arabia	0.85	0.85
Other Middle East	1.25	1.25
USSR	178.13	186.26
Poland	20.98	22.98
Czechoslovakia	18.71	18.11
Romania	18.90	22.70
German Democratic Rep.	10.70	10.10
Hungary	4.95	4.95
Bulgaria	4.20	5.10
Albania	0.40	0.40
Other	62.66	73.13
Total	1,025.39	1,054.69

Note: Numbers in parenthesis represent tonnage assumed in our forecasts.

Sources: International Iron and Steel Institute (actual); World Bank (forecasts).

capacity is expected to exceed 60 million tons and, more likely, 70 million tons by 1990. Total world capacity in 1990 and thereafter should be ample to satisfy the 1990 and 2000 steel demand needs of 779 million tons and 908 million tons, respectively. There is, therefore, room for further closures in the industrial countries.

17. Table 2 compares costs in the production of steel for selected industrial and developing countries in 1980 and 1986. Some significant changes have occurred in the costs for the United States, EEC members, Japan, and other European countries during this period. Noteworthy is the improved international competitiveness of the US steel industry following the depreciation of the US dollar. This improvement (accentuated further in 1987) is expected to reduce the gap between production and consumption in the United States.

18. Table 2 also shows the dramatic improvement of steel costs per ton produced for the UK steel industry between 1980 and 1986. Labor cost declines indicate substantial improvement in the UK's labor productivity. Despite significant gains in labor productivity, Argentina's steel costs in 1986 remain almost as high as in 1980; high debt servicing expenses have likely been the reason for this. India's costs per ton produced have also been substantially increased partly due to the increase of material costs during the period. Republic of Korea's costs are still among the lowest in the industry. High labor productivity is among the key reasons for this impressive performance. Preliminary estimates of China's steel cost of production show a 1988 total cost of US$289/ton with a labor content of US$37/ton. These numbers compare favorably with those of Republic of Korea.

19. In the next 10 to 15 years the steel industry will experience an increase in the demand for and production of alloy steels. IISI has noted the increasing share of alloy steel in total output for the United States, EEC members, and Japan between 1970 and 1985 (see Table 3). 1/ In some EEC countries such as the Federal Republic of Germany the share of alloy steel in total steel output is approaching 20%. Similar trends are discernible in the United States and Japan. It is expected that the continuing need for improvements in the mechanical and chemical properties of steel products will lead to increases in the use of alloys.

Trade Prospects

20. Within the industrial world, Japan and the EEC-10 countries should remain net exporters during the 1987-2000 period. The improvement in the US terms of trade is reflected in increased steel exports (see Table 4). The United States should become a major net exporter of steel by the year 2000. Steel production and consumption remain almost in balance in the non-market economies during the 1987-2000 period. The USSR should continue to be an importer of steel from Eastern European countries.

1/ IISI, "Outlook for the World Steel Industry," by L. Holschuh, Chairman, Metal Bulletin Ferro Alloy Conference, Monte Carlo, 1987.

TABLE 2: LABOR MATERIAL AND TOTAL COSTS OF STEEL PRODUCTION, SELECTED COUNTRIES, 1980-86

		Labor Costs	Materials and Other Costs	Total Costs (Operating and Financial)
		(US$/Ton Produced)		
United States	1980	169.9	249.9	442.1
	1986	134.8	267.6	438.7
Japan	1980	56.6	289.7	415.1
	1986	89.7	349.5	527.9
Germany, Fed. Rep.	1980	125.4	310.2	472.6
	1986	114.3	275.7	420.0
France	1980	81.4	307.9	434.0
	1986	139.3	311.7	504.4
United Kingdom	1980	198.8	401.7	657.1
	1986	89.1	270.0	377.5
Canada	1980	95.4	177.5	295.6
	1986	112.2	196.7	337.1
Brazil	1980	83.0	287.2	410.6
	1986	67.8	178.2	339.6
Argentina	1980	141.9	344.4	571.6
	1986	94.5	292.3	524.7
India	1980	80.3	266.0	375.0
	1986	87.5	393.4	528.9
Korea, Rep. of	1980	11.8	182.1	264.0
	1986	14.2	166.8	243.1

Source: P. Marcus and K. Kirsis, World Steel Dynamics, Paine Webber, New York, 1988.

TABLE 3: SHARE OF ALLOY STEEL OUTPUT IN TOTAL CUTPUT (%)

Country	1970	1980	1985
	(%)		
United States	10.7	14.9	13.9
Japan	9.7	12.6	16.9
EEC-7	6.2	12.3	12.9

Source: IISI, "Outlook for the World Steel Industry," by L. Holschuh, Chairman, Metal Bulletin, Ferro Alloy Conference, Monte Carlo, 1987.

TABLE 4: STEEL (CRUDE EQUIVALENT) PRODUCTION MINUS CONSUMPTION BY MAIN COUNTRIES AND ECONOMIC REGIONS

Countries/ Economies	Actual				Projected				
	1969-71	1979-81	1986	1987 a/	1988	1989	1990	1995	2000
	('000 Tons)								
Industrial	24,974	49,180	34,613	44,987	58,959	67,619	71,808	67,044	97,506
North America	-12,920	-14,603	-19,298	-13,815	-3,413	2,567	5,781	-9,258	13,840
United States	-12,309	-15,923	-20,840	-16,943	-6,017	204	3,425	-12,440	11,479
EEC-10	15,876	30,130	23,546	31,149	31,848	32,825	32,933	34,763	34,277
Germany, Fed. Rep.	4,799	8,831	6,626	5,795	6,001	6,211	6,020	8,716	14,030
France	790	3,149	3,316	3,337	4,978	6,237	7,042	7,705	7,759
United Kingdom	2,767	-822	375	6,255	6,835	7,466	7,498	5,021	3,244
Japan	24,952	32,171	28,334	25,603	29,159	31,177	32,054	39,417	48,343
Non-Market	3,757	-348	2,517	3,193	-3,945	-8,035	-9,979	-2,189	-10,668
USSR	5,468	-2,429	-4,437	-3,816	-8,909	-12,057	-13,974	-9,412	-14,681
Eastern Europe	-1,711	2,081	6,954	7,008	4,964	4,022	3,995	7,223	4,013
Developing	-28,731	-54,275	-46,696	-48,179	-55,014	-59,583	-61,829	-64,855	-86,838
Asia	-13,002	-33,997	-45,216	-46,930	-52,361	-56,317	-58,605	-66,649	-89,324
China	-3,573	-9,249	-26,111	-22,902	-26,351	-28,917	-30,667	-36,472	-54,329
Korea, Republic of	-845	1,947	2,955	1,450	893	508	701	352	315
India	-403	-7,728	-2,587	-4,985	-5,857	-6,606	-7,330	-10,094	-14,007
Latin America	-6,647	-6,242	5,631	5,840	5,246	5,005	5,058	8,798	10,761
Brazil	-898	1,098	6,756	6,951	6,907	6,920	6,981	9,850	12,679
World	0	-5,443	-9,566	0	0	0	0	0	0

Note: A minus sign before a figure indicates imports.

a/ Estimate.

Source: World Bank.

21. Over the forecast period the developing countries should also continue to import steel (in net terms) from the rest of the world. The most important importers will be China and India. The youthful populations of these countries will demand metal-intensive industrial goods; steel demand will increase faster than production, and the excess will have to be imported. China, in particular, is expected to be a major importer of semis and flat products. The ability of these countries to grow will in large part depend on their ability to raise sufficient funds to finance steel imports.

Price Outlook

22. The World Bank's steel prices (WBSP) index is a weighted sum of Japanese export prices of the following products: rebars, plates, sections, hot roll, cold roll, wire rod, merchant bars, and galvanized sheet. The index weights used are the shares of these products in the total output of Japan, the United States, and the Federal Republic of Germany for the 1979-81 period.

23. The WBSP index (1980=100) declined from its 1981 high of 103.1 to 75.0 in 1985 (a 27.3% decline) and has increased since then (see Table 5). In May 1988 the WBSP index reached the level of 117.9. The reasons that lie behind the sharp price increase for steel products over the last three years have been discussed in the previous three sections; however, the closing of excess or obsolete capacity and the sharp increases in industrial activity in the industrialized countries should be singled out. Not all steel products prices fared the same during the 1985-88 period. Cold rolled sheets, wire rods, and rebars prices rose less than the index. In contrast, galvanized sheets and sections prices rose faster than the index.

24. Over the forecasting period the WBSP index of steel product prices is expected to grow somewhat less fast than the MUV index in the 1988-95 period and at the same pace as the MUV index in the second half of the 1990s. The slower pace of price increase in the first half of the 1990s reflects the expected slowdown in industrial activity during this period. Long product prices are expected to increase at a faster rate than flat product prices. This development partly reflects the expected sharp increases in the availability of flat products.

TABLE 5: STEEL PRODUCT PRICES, 1980-87 (ACTUAL) AND 1988-2000 (FORECAST)

Year	World Bank Steel Index	CR Sheets	HR Sheets	Galv. Sheets	Merchant Bars	Plates	Sections	Wire Rod	Rebars
	(1980=100)	(Japan, f.o.b. US$/Ton)							
1980	100.0	394.2	324.3	473.9	342.1	341.7	362.1	352.5	327.9
1981	103.1	401.0	331.8	516.3	331.7	360.8	383.3	391.3	316.7
1982	88.1	367.9	281.7	431.7	258.3	309.2	333.8	353.3	242.5
1983	83.0	360.8	270.4	420.0	245.8	286.7	285.8	312.5	222.5
1984	87.4	376.7	283.8	451.7	266.4	305.1	300.8	308.8	233.3
1985	75.0	317.9	245.8	369.6	229.6	266.7	246.7	272.5	225.4
1986	77.3	325.4	269.6	384.6	237.5	284.2	248.8	239.6	219.6
1987	90.4	385.4	323.3	452.5	243.3	360.8	330.0	246.3	202.9
1988	116.0	483.1	382.5	607.5	360.0	422.5	435.0	310.6	245.0
1989	119.5	492.7	392.5	623.2	375.5	434.0	452.1	324.5	260.3
1990	121.0	496.7	396.7	629.8	381.9	438.8	459.2	330.2	266.7
1991	120.9	496.3	396.3	629.1	381.3	438.4	458.5	329.7	266.1
1992	121.1	497.1	397.1	630.4	382.5	439.3	459.8	330.7	267.3
1993	123.3	503.1	403.3	640.2	392.2	446.5	470.5	339.4	276.9
1994	129.1	518.8	419.6	665.8	417.3	465.2	498.1	361.9	301.8
1995	135.1	535.1	436.6	692.6	443.5	484.8	527.1	385.5	327.9
1996	143.7	558.8	461.1	731.2	481.4	513.1	568.8	419.5	365.5
1997	149.6	574.8	477.7	757.4	507.1	532.3	597.2	442.5	391.0
1998	156.2	592.9	496.5	787.0	536.1	553.9	629.2	468.5	419.8
1999	161.7	607.9	512.1	811.5	560.2	571.9	655.7	490.2	443.7
2000	167.0	622.3	527.0	834.9	583.2	589.1	681.0	510.8	466.5

Source: World Bank.

TABLE A1: STEEL (CRUDE EQUIV.) - PRODUCTION BY MAIN COUNTRIES AND ECONOMIC REGIONS

COUNTRIES/ ECONOMIES	ACTUAL				PROJECTED					GROWTH RATES A/		
	1969-71	1979-81	1986	1987/B	1988	1989	1990	1995	2000	1961-86	1970-86	1987 - 2000
	('000 TONS)									(% PER ANNUM)		
INDUSTRIAL	376,897	400,486	330,974	347,951	371,583	375,298	375,207	387,922	405,585	1.3	-1.2	1.2
NORTH AMERICA	129,438	127,175	88,113	94,727	106,062	109,311	108,997	110,546	128,105	-0.6	-2.8	2.3
UNITED STATES	118,907	111,586	74,032	79,060	90,919	94,409	94,?	94,825	113,205	-1.1	-3.3	2.8
EEC-10	140,638	143,802	124,126	134,149	140,722	139,759	138,813	140,570	136,946	1.0	-1.1	0.2
GERMANY, FED. REP.	43,557	43,829	37,134	36,304	38,591	38,300	38,022	39,817	40,295	0.5	-1.2	0.8
FRANCE	23,042	22,598	17,857	17,726	20,680	21,038	21,190	21,381	21,473	0.2	-2.0	1.5
UNITED KINGDOM	26,316	16,105	14,725	20,739	22,396	22,193	21,599	18,580	16,471	-2.5	-4.4	-1.8
ITALY	17,052	25,176	22,882	22,839	22,976	22,713	22,502	23,365	23,197	4.0	1.6	0.1
JAPAN	88,015	108,273	98,275	98,596	105,005	106,749	107,928	116,255	121,059	5.2	0.1	1.6
NON-MARKET	155,521	208,243	221,797	223,831	221,783	220,323	221,069	241,729	247,590	3.4	1.9	0.8
USSR	115,613	148,512	160,685	162,664	162,661	162,143	162,916	180,348	189,419	3.1	1.7	1.2
EASTERN EUROPE	39,908	59,731	61,112	61,166	59,122	58,180	58,153	61,381	58,171	4.2	2.4	-0.4
DEVELOPING	51,828	114,970	162,638	167,425	175,758	178,141	182,536	221,465	255,243	7.7	7.4	3.3
ASIA	28,441	67,708	100,749	104,479	111,056	113,533	117,587	149,308	178,655	8.0	8.3	4.2
CHINA	18,767	38,990	57,445	58,497	61,422	63,219	66,055	86,934	103,295	7.4	7.1	4.5
KOREA, REPUBLIC OF	442	8,974	14,555	16,795	20,154	21,001	22,112	30,157	42,171	26.0	26.4	7.3
INDIA	6,311	10,140	12,197	12,620	13,466	13,555	13,669	15,592	17,432	3.6	4.3	2.5
AMERICA	13,108	27,924	37,708	38,743	41,309	41,587	41,939	47,869	53,571	7.8	6.6	2.5
BRAZIL	5,437	14,143	21,233	22,254	25,370	25,902	26,262	31,321	37,889	9.4	8.7	4.2
WORLD	584,246	723,699	715,409	739,206	769,124	773,761	778,812	851,116	908,418	2.7	0.9	1.6

A/ LEAST SQUARES TREND FOR HISTORICAL PERIODS (1961-86); END-POINT FOR PROJECTED PERIODS (1987-2000).
B/ ESTIMATE.

SOURCES: INTERNATIONAL IRON AND STEEL INSTITUTE (ACTUAL);
WORLD BANK, INTERNATIONAL ECONOMICS DEPARTMENT (PROJECTED).

TABLE A2: STEEL (CRUDE EQUIV.) - APPARENT CONSUMPTION BY MAIN COUNTRIES AND ECONOMIC REGIONS

COUNTRIES/ ECONOMIES	ACTUAL				PROJECTED					GROWTH RATES A/		
	1969-71	1979-81	1986	1987/B	1988	1989	1990	1995	2000	1961-86	1970-86	1987 - 2000
	('000 TONS)									(% PER ANNUM)		
INDUSTRIAL	351,923	351,306	296,361	302,964	312,624	307,679	303,399	320,878	308,079	0.9	-1.6	0.1
NORTH AMERICA	142,358	141,778	107,411	108,542	109,475	106,744	103,216	119,804	114,265	0.0	-2.1	0.4
UNITED STATES	131,216	127,509	94,872	96,003	96,936	94,205	90,677	107,265	101,726	-0.2	-2.3	0.4
EEC-10	124,762	113,672	100,580	103,000	108,874	106,934	105,880	105,807	102,669	0.5	-2.0	0.0
GERMANY, FED. REP.	38,758	34,998	30,508	30,509	32,590	32,089	32,002	31,101	26,265	0.1	-1.7	-1.1
FRANCE	22,252	19,449	14,541	14,389	15,702	14,801	14,148	13,676	13,714	0.0	-3.3	-0.4
UNITED KINGDOM	23,549	16,927	14,350	14,484	15,561	14,727	14,101	13,559	13,227	-1.7	-3.9	-0.7
ITALY	19,387	23,612	22,508	24,680	25,324	25,620	25,932	27,774	29,766	2.7	0.4	1.5
JAPAN	63,063	76,102	69,941	72,993	75,846	75,572	75,874	76,838	72,716	4.4	0.2	0.0
NON-MARKET	151,764	208,591	219,280	220,638	225,728	228,358	231,048	243,918	258,258	3.5	2.0	1.2
USSR	110,145	150,941	165,122	166,480	171,570	174,200	176,890	189,760	204,100	3.5	2.2	1.6
EASTERN EUROPE	41,619	57,650	54,158	54,158	54,158	54,158	54,158	54,158	54,158	3.4	1.4	0.0
DEVELOPING	80,559	169,245	209,334	215,604	230,772	237,724	244,365	286,320	342,081	7.2	6.0	3.6
ASIA	41,443	101,705	145,965	151,409	163,417	169,850	176,192	215,957	267,979	8.2	8.2	4.5
CHINA	22,340	48,239	83,556	81,399	87,773	92,136	96,722	123,406	157,624	8.1	7.9	5.2
KOREA, REPUBLIC OF	1,287	7,027	11,600	15,345	19,261	20,493	21,411	29,805	41,856	19.0	14.7	8.0
INDIA	6,714	12,868	14,784	17,605	19,323	20,161	20,999	25,686	31,439	3.9	4.9	4.6
AMERICA	19,755	34,166	32,077	32,903	36,063	36,582	36,881	39,071	42,810	5.4	2.0	2.0
BRAZIL	6,335	13,045	14,477	15,303	18,463	18,982	19,281	21,471	25,210	7.0	3.0	3.9
WORLD	584,246	729,141	724,975	739,206	769,124	773,761	778,812	851,116	908,418	2.8	1.0	1.6

A/ LEAST SQUARES TREND FOR HISTORICAL PERIODS (1961-86); END-POINT FOR PROJECTED PERIODS (1987-2000).
B/ ESTIMATE.

SOURCES: INTERNATIONAL IRON AND STEEL INSTITUTE (ACTUAL);
WORLD BANK, INTERNATIONAL ECONOMICS DEPARTMENT (PROJECTED).

IRON ORE

Summary

1. World iron ore demand is expected to grow by 1.7% p.a. during the 1987-2000 period. The low growth expected for iron ore demand is directly related to the low growth expected for steel production, to the increased use of scrap-based electric arc furnaces for steel making, and to improvements in yield in steel making. Reflecting the rapid growth of their steel production, developing countries' iron ore apparent consumption is expected to increase by 3.1% p.a. In contrast, iron ore consumption in industrial countries is expected to increase by only 1% p.a., consistent with their slower increase in steel production.

2. World iron ore capacity is expected to increase by 121.8 million tons (in Fe content) during the 1987-2000 period, reaching 738 million tons (in Fe content). Australia, Brazil, and China are expected to increase their annual iron ore production by 105.7 million tons during the forecast period. Most of this increase is expected to come from expansions of existing capacity in these low-cost producers. New capacity is expected to come from China. By the year 2000 China is expected to be the second largest producer (after the USSR) and the largest consumer of iron ore in the world. The increasing importance of China in international iron ore markets is expected to change the negotiating process and settlement of iron ore prices. Sustained iron ore capacity increases by major producers and slow iron ore demand growth are expected to keep iron ore prices under downward pressure and profit margins at lower levels in the forecasting period than during the historical period. Sinter fine iron ore (c.i.f.) prices are expected to grow at 4.3% p.a. in current terms and to remain unaltered on average in MUV terms during the 1987-2000 period.

Consumption Prospects

3. Demand for steel essentially determines iron ore demand. During the 1961-86 period, world consumption of iron ore and world output of crude steel increased by 2.9% p.a. and 2.7% p.a., respectively. During the 1970-86 period, these growth rates slowed considerably--to 0.7% p.a. and 0.9% p.a., respectively. The decline in the growth of steel output and iron ore consumption in the late 1970s and 1980s is attributed to: (a) the slowdown in the growth rate of industrial output in most industrial countries during this period; (b) the decline in steel intensity in industrial countries; and (c) technical developments that have either reduced the demand for iron ore directly or indirectly (through substitution with scrap). Such technical developments include the increased use of electric arc furnaces for steel making and the increased use of direct-reduction methods in iron making. In 1987, the world demand for steel increased despite an appreciation of the Japanese and European currencies vis-a-vis the US dollar that, ceteris paribus, might have had a depressing effect on their export-dependent economies. The 3.3% increase in world steel output during 1987 was accompanied by a 3.9% increase in iron ore demand.

4. In 1988, the steel output of industrial countries is expected to grow by 6.8%; following a 5.1% increase in crude steel output in 1987. Robust industrial production growth and increases in capital expenditures lie behind this significant increase in steel output in major OECD countries. The supply of steel is expected to increase by 5% in developing countries in 1988. This high growth rate is the consequence of either developing countries' effort to increase exports (as with Brazil and Republic of Korea) and or to respond to domestic demand (as with China and India). Steel output growth is expected to decelerate somewhat in non-market economies as restructuring of their steel industries take place. In world terms, steel output is expected to increase by 4.1% p.a. in 1988.

5. World iron ore demand is also expected to increase by 4.8% in 1988. 1/ Low stocks, high scrap prices, and robust industrial demand have contributed to the large increase in iron ore consumption despite substantially higher freight rates. During the 1989-2000 period, world iron ore demand is expected to increase by an average growth rate of 1.8% p.a. Higher iron ore prices and slower industrial growth are expected to lead to a deceleration in the growth rate of iron ore demand. By 2000 industrial countries are expected to consume 11.6 million tons more of iron ore than in 1989. Non-market and developing country economies are expected to increase their 1989 consumption by an additional 13.2 million tons and 74 million tons, respectively, by 2000. Japan, the United States, and the Federal Republic of Germany are expected to have the largest increases in the consumption of iron ore among the industrial countries in response to their steel supply needs. Among developing countries, China, Republic of Korea, India, and Brazil have ambitious steel production plans and even the partial realization of these plans implies that their total demand for iron ore will outpace that of all other developing countries. With the exception of Republic of Korea, these major developing country consumers of iron ore have important reserves. Brazil and India are also major exporters of iron ore.

Production Prospects

6. The rapid increase in steel output in the 1960s led to large investments in iron ore mines in the 1960s and early 1970s. The slowdown of steel demand growth since the mid-1970s has resulted in excess iron ore capacity and many iron mine projects have been canceled, postponed, or delayed.

7. In 1985 world iron ore capacity (nominal capacity in terms of metal content) was estimated at 616.2 million tons. The USSR, Brazil, and Australia were three of the largest, accounting for 23.1%, 13%, and 12.3%, respectively, of world capacity (see Table 1). It is estimated that proven iron ore reserves can satisfy world consumption at current levels for 194 years.

1/ The projections are based on the econometric iron ore model described in T. Priovolos, An Econometric Model of the Iron Ore Industry, World Bank Staff Commodity Working Paper No. 19, October, 1987.

TABLE 1: IRON ORE NOMINAL CAPACITY: 1985, 1990, AND 2000 GROSS WEIGHT AND METAL CONTENT (MILLION TONS)

	Gross Weight			Metal Content		
	1985	1990	2000	1985	1990	2000
Canada	56.0	59.9	59.9	34.0	36.4	36.4
United States	86.6	82.2	82.3	51.2	48.6	48.6
France	15.1	15.4	15.4	4.6	4.7	4.7
Sweden	22.4	22.4	22.4	14.0	14.0	14.0
Spain	8.0	8.2	8.2	4.7	4.8	4.8
Germany, Fed. Rep. of	0.4	0.4	0.3	0.1	0.1	0.1
Australia	119.3	142.4	168.3	75.9	90.6	107.1
South Africa	34.3	34.2	34.2	21.8	21.7	21.7
Liberia	21.5	13.2	13.2	14.3	8.8	8.8
Mauritania	10.8	10.8	8.0	6.8	6.8	5.0
India	64.6	70.0	89.0	40.1	43.5	55.3
Brazil	119.5	191.3	239.0	79.9	128.0	159.9
Chile	7.8	7.8	7.8	5.1	5.1	5.1
Mexico	8.0	8.2	8.2	5.3	5.3	5.3
Peru	8.0	8.0	8.0	5.0	5.0	5.0
USSR a/	256.9	287.2	305.3	142.1	158.8	167.0
China a/	130.0	210.6	277.1	68.2	110.5	145.4
Venezuela	26.3	26.8	26.8	15.7	16.0	16.0
Subtotal	995.5	1,199.0	1,373.4	592.2	707.0	810.2
% of World	94.6	94.6	94.6	96.1	96.1	96.1
World	1052.3	1,267.4	1,451.8	616.2	735.7	843.1

a/ World Bank estimate.

Sources: International Iron and Steel Institute (actual); World Bank (projected).

8. By 2000, the USSR, Brazil, China, and Australia are expected to account for 19.8%, 19%, 17.3%, and 12.7%, respectively, of world capacity. It is noteworthy that there have been new developments in iron preparation techniques involving beneficiation and agglomeration. The development of improved beneficiation methods has made numerous low-grade deposits economically viable, in spite of an abundance of high-quality ore throughout the world. Technical developments along these lines, however, are expected to diminish as technical and cost factors eventually will limit the degree to which the iron ore content of ore can be improved. Table 1 indicates the increased importance of Brazil and China in the iron ore markets. While China's iron ore supply developments are a response to its own domestic demand, Brazil's capacity developments are a result of the country's drive to not only satisfy its domestic demand but also to expand its exports in order to service its external debt. Brazil is able to follow this policy economically because it is a low-cost producer (see Table 2).

TABLE 2: INTERNATIONAL IRON ORE COSTS

	Pellets	Sinter Feed
	(US$/Long Ton, f.o.b. port, 1987) a/	
Australia		
Savage River	16.90	
Mt. Newman		11.70
Brazil		
CVRD	17.20	
CVRD		11.70
MBR		12.10
Liberia		
Bong	20.90	
Bong		13.40
South Africa		
ISACOR		12.40
Sweden		
KINUNO	23.10	
KINUNO		17.40

a/ One long ton = 1.016 metric tons.

Source: P. Marcus, K. Kirsis and P. Kakela, 1987, "The Threatened North American Iron Ore Industry," Paine Webber, World Steel Dynamics.

9. Table A2 shows that iron ore production in the industrial countries (with the exception of Australia and Canada) is expected to stagnate during the 1987-2000 period while that of developing countries is expected to grow by an average 2.3% p.a. Among the industrial countries, Canada's mines and pelletizing facilities are expected to increase output at a 1.3% p.a. rate between 1987 and 2000. Canadian iron ore producers have improved their cost competitiveness by cutting substantially their labor costs and energy expenses in the 1986-87 period. Canadian pelletizing operations are expected to play an increasingly important role in satisfying European demand as Europe's obsolete pelletizing facilities are closing down.

10. China's iron ore production plans are significant but they are expected to be short of demand requirements. China is expected to increase its imports from 0.4 million tons in 1987 to 16 million tons in 2000. Australian, Brazilian, and Indian iron ore producers will benefit the most from steel industry developments in the Pacific Basin countries. Australia's low-cost iron ore production is expected to satisfy the largest share of

China's import demand of iron ore. While Australia will remain the major supplier of the Japanese iron ore market, Brazil will remain the major supplier of European iron ore markets. Other Latin American countries such as Chile and Peru are also expected to benefit somewhat from increased demand in the Pacific Basin. Their (relative to Brazil) high cost of production, however, will constrain their ability to expand. Mexico plans to restructure and modernize its iron ore capacity in order to reduce its cost of production. Venezuela has important plans to develop DRI production. Such a development is expected to affect favorably the production and consumption of iron ore in Venezuela.

11. During the 1987-2000 period, the non-market economies' output is not expected to increase as fast as during the 1960-86 period. The USSR and the other Eastern European countries have plans to restructure their steel capacity by increasing the share of electric furnaces. Such a development is expected to slow the pace of growth of their iron ore production. Electric furnaces are fed with scrap or sponge iron. The use of the former will slow the demand for iron ore.

Trade Prospects

12. The percentage of world iron ore production traded internationally rose from 30% in 1961 to 41% in 1986. The total international export volume reached a peak of about 226.4 million tons (in iron content) in 1986. Six countries (Brazil, Australia, Canada, the USSR, India, and Liberia) accounted for 81.6% of total exports in 1986. Three importers (Japan, the EEC-10, and the United States) accounted for 69% of total imports in that year. Exports and imports have been projected for individual countries and for major regional groups on the basis of the production and apparent consumption projections. (These are presented in Tables A3 and A4.) By 2000 world imports are expected to account for 41.8% of world iron ore consumption.

13. Japan and Republic of Korea will continue to rely on the Pacific Basin iron ore-producing countries for their iron ore needs. The share of African exports to the EEC will remain constant or decline while that of Brazil, and possibly Canada, will increase. Efforts by Australia to penetrate Western European markets will be constrained by shipping cost considerations. Increasingly, major iron ore producers in the developing world will aim at replacing their iron ore exports with higher value added products such as pig iron, DR products, or steel semis.

Price Outlook

14. Iron ore presently accounts for only 10-15% of the cost of a ton of steel, even though it takes about 1.2 tons of iron ore to produce one ton of steel. Moreover, the price of iron ore does not fluctuate with the prices of iron/steel. Iron ore is mainly traded on the basis of long-term contracts with an annual renegotiation of prices. Japanese and European steel makers dominate the market for iron ore and, to a great extent, influence the iron ore prices set in the annual contracts.

15. Although the exact pricing policies adopted during the contractual negotiations for a specific iron ore are rather complex, some basic mechanisms have been established and in general have applied through the years. Until a few years ago, the annual European iron ore price negotiations normally started in October/November and ended before Christmas (in Europe "the iron ore year" is the calendar year whereas in Japan it is the fiscal year--April 1 to March 31). In some recent years the negotiations have had a tendency to drag on well into the new year. In cases where no price agreement had been reached before the end of the delivery year, the parties normally agreed on a provisional price for shipments. In view of the large ore quantities received via Rotterdam, it has for very many years been trade practice to take the c.i.f. Rotterdam price as a reference price for negotiations in Europe. Most iron ore f.o.b. prices for European destinations are quoted and agreed upon on the basis of the c.i.f. Rotterdam reference price, after deducting an estimated freight rate. The price is defined in US$/Fe unit/DMT (dry metric ton). The f.o.b. price of an ore is also determined by the special properties of the ore. Such differences are expressed as premia or discounts on the calculated general f.o.b. price in US¢/Fe.

16. Up to 1970-75, contractual arrangements between the Swedish iron ore exporters and the steel mills of the Federal Republic of Germany set the pace for other contractual negotiations. In subsequent years, the negotiated price between the same steel mills and the Brazilian company, CVRD, served as the benchmark price for other ore price negotiations.

17. In the 1980s, however, a worldwide abundance of iron ore put the producers at a great disadvantage during price negotiations. The oversupply of iron ore, reinforced by expectations of declining world steel demand and the fear of smaller iron producers that the upcoming increase of high-quality, low-cost Brazilian (Carajas) capacity would undercut their market share, has made the market very competitive and led to iron ore prices declining in real terms.

18. Although steel companies have diversified their markets and ensured the expansion of available iron ore, the iron ore exporters themselves have not been successful in diversifying their markets. Each of the major exporting countries rely mainly on one market, which weakens their bargaining position. Examples of this are Canada to the United States, Sweden to Western Europe, and Australia to Japan. Thus, what seemed to be a bilateral oligopolistic market a few years ago has been increasingly turning into a highly competitive market.

19. In Japan, prices are quoted in US$/Fe unit/DLT (dry long ton). In the past, the Japanese steel mills agreed to pay for the "Atlantic" Basin ores the f.o.b. price valid for delivery to European buyers, plus the freight for the transport to Japan. This practice made the c.i.f. price for "Atlantic" ores substantially higher than the "Pacific" ores. As the expansion of steel capacity slowed down in Japan, Japanese steel mills felt more secure in their supply of iron ore. Their pricing policy was gradually replaced by a "freight sharing" system under which the seller and the buyer shared the difference between the freights to Europe and to Japan on an equal basis. However, the Japanese steel mills now seem to be inclined to shift from this "freight sharing" system to the European system that equalizes c.i.f. prices for various imported iron ores.

20. Among the different qualities of iron ore the premium for pellets over and above sinter fines varied from US¢18-20/Fe unit in times of high steel demand and from US¢9-10 when steel demand was low. The premium for lump ores as compared with sinter fines varied from US¢3-10/Fe unit.

21. During the 1987 negotiations, Japanese steel producers concluded their negotiations before the European steel producers. The long delay in the 1987 negotiation was not repeated during the 1988 negotiations. During these negotiations lower sinter fine f.o.b. prices were agreed upon. In c.i.f. or c. & f. terms iron ore prices increased by 4.5% to 8.8% in 1988; in f.o.b. terms, however, the iron ore prices declined by 1.5% to 7.7%. The difference is due to higher freight costs. Pellet prices fared better than lump ore and fine prices.

22. Despite the expected 14.7% upsurge in c.i.f. sinter fine iron ore prices in 1989, mostly due to the increased demand for iron ore and freight rate increases, continued oversupply will keep downward pressure on iron ore prices in real terms in the years to come. Despite gradual increases in capacity utilization rates, ample capacities at relatively low cost will continue to depress the iron ore markets in the 1990s. The market shares of iron ore producers with higher costs and/or poorer quality than Brazil's and Australia's will also decline. Australia will compete with Brazil and India for the Pacific Basin market. Industrial countries will remain important importers of iron ore products. Developing countries, however, are expected to increase steel output faster than industrial countries. In particular, countries with young populations such as China, India, and Brazil are expected to demand industrial goods with high metal content. It is primarily these types of countries that are expected to show the largest increase in their demand for iron ore products. For this reason, China is expected to play an increasingly important role in future iron ore price negotiations. The European and American markets will be dominated by Brazilian and Canadian producers. African high-cost producers are not expected to sustain their market share in these markets. As long as the anticipated increases in capacity take place, and excess iron ore capacity persists in the iron ore markets, producers will find it difficult to obtain significant price concessions from steel mills. Sinter fine iron ore prices are projected to grow by 4.3% p.a. in nominal terms during the 1987-2000 period. In 1985 MUV terms, however, c.i.f. sinter fine iron ore prices are expected to remain unaltered, on average, during this period.

TABLE A1: IRON ORE (METAL CONTENTS) - PRODUCTION BY MAIN COUNTRIES AND ECONOMIC REGIONS

COUNTRIES/ ECONOMIES	ACTUAL				PROJECTED					GROWTH RATES A/		
	1969-71	1979-81	1986	1987/B	1988	1989	1990	1995	2000	1961-86	1970-86	1987 - 2000
	('000 TONS)									(% PER ANNUM)		
INDUSTRIAL	164,702	174,332	130,118	127,692	140,049	140,442	140,885	146,074	154,380	0.8	-2.3	1.5
NORTH AMERICA	78,448	81,980	46,527	47,427	51,387	50,918	49,517	50,220	50,897	-0.6	-3.5	0.5
UNITED STATES	52,052	48,769	23,766	27,966	27,833	27,264	26,563	27,296	27,973	-2.0	-4.8	0.0
CANADA	26,396	33,211	22,761	19,461	23,554	23,654	22,954	22,924	22,924	2.0	-1.6	1.3
EEC-10	27,886	14,271	7,363	7,008	7,100	7,196	7,170	7,170	7,170	-5.9	-8.6	0.2
FRANCE	17,523	8,339	3,768	3,408	3,610	3,590	3,570	3,570	3,570	-6.3	-10.2	0.4
OTHER WESTERN EUROPE	24,991	20,488	17,063	17,153	15,691	15,091	14,761	14,517	14,362	-0.8	-4.0	-1.4
SWEDEN	20,700	16,296	13,246	13,346	12,988	12,588	12,688	12,191	11,886	-1.5	-4.8	-0.9
OCEANIA	32,455	57,315	59,003	56,104	65,871	67,237	69,437	74,167	81,951	13.5	2.0	3.0
AUSTRALIA	32,417	55,390	57,584	54,634	64,401	65,937	67,937	72,667	80,351	13.3	1.9	3.0
NON-MARKET	107,514	136,686	137,900	136,900	135,950	135,900	136,900	140,500	149,400	2.6	1.3	0.7
USSR	104,466	134,722	136,202	135,202	134,650	134,900	135,900	139,000	141,900	2.8	1.4	0.4
DEVELOPING	141,317	221,644	254,996	265,773	280,044	285,313	289,637	330,485	356,690	5.3	3.1	2.3
ASIA	50,801	92,689	112,024	131,151	135,024	138,339	142,874	167,447	181,313	5.7	5.1	2.5
CHINA	23,400	62,374	77,280	90,280	94,721	95,146	99,451	116,996	130,820	8.2	8.2	2.9
INDIA	19,686	25,619	30,269	37,569	38,303	39,193	40,423	40,451	41,493	4.3	1.7	0.8
AFRICA	37,560	38,538	34,634	32,298	30,486	29,307	29,106	28,430	27,972	3.6	-1.1	-1.1
SOUTH AFRICA	5,686	18,075	15,422	15,022	14,731	14,902	14,383	15,007	15,491	8.4	7.3	0.2
LIBERIA	15,557	11,344	9,516	9,416	8,585	7,085	6,405	6,400	6,485	2.9	-4.2	-2.8
MAURITANIA	5,640	5,543	5,960	4,860	4,820	4,820	4,820	3,700	3,500	6.7	-0.9	-2.5
AMERICA	49,784	87,220	103,701	97,687	109,897	112,897	113,020	128,971	138,768	5.9	3.4	2.7
BRAZIL	21,864	62,627	80,771	80,471	90,371	95,771	96,241	112,271	119,911	10.9	6.6	3.1
WORLD	413,533	532,663	523,014	530,365	556,043	561,655	567,422	617,059	660,470	3.0	0.8	1.7

A/ LEAST SQUARES TREND FOR HISTORICAL PERIODS (1961-86); END-POINT FOR PROJECTED PERIODS (1987-2000).
B/ ESTIMATE.

SOURCES: UNCTAD (ACTUAL);
WORLD BANK, INTERNATIONAL ECONOMICS DEPARTMENT (PROJECTED).

TABLE A2: IRON ORE (METAL CONTENTS) - APPARENT CONSUMPTION BY MAIN COUNTRIES AND ECONOMIC REGIONS

COUNTRIES/ ECONOMIES	ACTUAL				PROJECTED					GROWTH RATES A/		
	1969-71	1979-81	1986	1987/B	1988	1989	1990	1995	2000	1961-86	1970-86	1987 - 2000
	('000 TONS)									(% PER ANNUM)		
INDUSTRIAL	244,133	252,097	196.635	205,035	218,886	220,848	220,797	225,272	232,430	1.2	-2.2	1.0
NORTH AMERICA	80,077	73,360	37,933	39,154	42,394	43,694	43,596	43,861	49,547	-1.9	-5.3	1.8
UNITED STATES	75,231	63,328	31,372	32,994	36,135	37,230	37,147	37,370	43,091	-2.5	-6.1	2.1
EEC-10	87,543	85,740	72,993	76,396	80,244	79,895	79,274	78,777	77,616	0.6	-1.7	0.1
GERMANY, FED. REP.	27,230	28,720	24,362	23,866	25,728	25,555	25,392	26,452	26,734	1.0	-1.0	0.9
FRANCE	17,080	16,404	12,352	12,315	12,992	13,079	13,117	13,167	13,190	-0.3	-2.9	0.5
UNITED KINGDOM	14,716	8,849	8,970	12,926	14,154	14,018	13,620	11,610	10,216	-2.4	-4.1	-1.8
ITALY	6,879	9,784	10,209	10,189	10,270	10,143	10,045	10,448	10,376	5.0	2.0	0.1
JAPAN	62,204	77,850	69,302	69,485	75,391	76,672	77,070	81,777	84,410	6.7	-0.1	1.5
NON-MARKET	108,091	145,010	145,912	146,999	148,099	149,213	150,341	156,204	162,449	2.8	1.7	0.8
USSR	84,914	110,782	111,320	112,545	113,783	115,034	116,299	122,838	129,745	2.6	1.6	1.1
DEVELOPING	57,363	124,073	167,718	178,331	189,058	191,594	196,284	235,583	265,591	7.4	6.4	3.1
ASIA	35,952	89,289	114,208	119,694	126,233	129,088	133,496	166,381	185,278	8.0	7.9	3.4
CHINA	23,444	66,895	89,349	90,689	95,224	97,504	101,146	127,208	146,776	8.8	9.0	3.8
KOREA, REPUBLIC OF	-3	5,723	7,557	8,839	10,253	10,745	11,392	14,154	16,430	...	...	4.9
INDIA	8,280	11,484	9,645	10,166	10,756	10,847	10,958	12,419	13,072	4.2	1.1	2.0
AMERICA	9,200	22,175	33,192	34,674	37,745	37,869	38,159	41,955	46,676	7.6	5.9	2.3
BRAZIL	4,056	11,765	20,784	21,574	23,947	24,362	24,630	28,465	33,216	8.5	7.5	3.4
WORLD	409,587	522,080	510,265	530,365	556,043	561,655	567,422	617,059	660,470	2.9	0.7	1.7

A/ LEAST SQUARES TREND FOR HISTORICAL PERIODS (1961-86); END-POINT FOR PROJECTED PERIODS (1987-2000).
B/ ESTIMATE.

SOURCES: UNCTAD (ACTUAL);
WORLD BANK, INTERNATIONAL ECONOMICS DEPARTMENT (PROJECTED).

TABLE A3: IRON ORE (METAL CONTENTS) - GROSS EXPORTS BY MAIN COUNTRIES AND ECONOMIC REGIONS

COUNTRIES/ ECONOMIES	ACTUAL				PROJECTED					GROWTH RATES A/		
	1969-71	1979-81	1986	1987/B	1988	1989	1990	1995	2000	1961-86	1970-86	1987 - 2000
	('000 TONS)									(% PER ANNUM)		
INDUSTRIAL	77,291	99,814	87,627	79,326	91,768	93,357	95,772	100,686	108,350	4.0	0.0	2.4
NORTH AMERICA	25,488	30,261	22,301	19,402	23,396	23,291	22,606	22,534	22,569	1.1	-0.9	1.2
CANADA	22,738	26,812	19,527	16,628	20,622	20,517	19,832	19,760	19,795	1.6	-1.4	1.4
EEC-10	6,800	3,570	2,291	2,291	2,291	2,291	2,291	2,291	2,291	-5.1	-8.0	0.0
FRANCE	5,750	2,609	1,292	1,292	1,292	1,292	1,292	1,292	1,292	-6.8	-10.5	0.0
OTHER WESTERN EUROPE	19,278	15,368	11,798	10,888	10,265	10,493	11,493	11,749	11,594	-1.0	-3.9	0.5
SWEDEN	17,521	13,423	10,504	10,612	10,093	9,863	9,793	9,296	8,991	-1.4	-4.2	-1.3
OCEANIA	25,724	50,614	51,237	46,745	55,816	57,262	59,382	64,112	71,896	24.6 C/	2.8	3.4
AUSTRALIA	25,710	48,925	50,027	46,484	55,555	57,175	59,091	63,821	71,505	24.4 C/	2.6	3.4
NON-MARKET	20,085	24,357	24,882	22,795	22,795	22,795	22,795	22,795	22,795	4.0	0.4	0.0
USSR	19,552	23,940	24,882	22,657	22,657	22,657	22,657	22,657	22,657	3.9	0.7	0.0
DEVELOPING	85,440	112,660	113,859	111,305	119,276	122,022	122,823	139,369	144,976	4.1	1.1	2.1
ASIA	14,938	13,904	20,624	27,403	27,547	28,346	29,465	34,432	35,421	1.7	0.8	2.0
INDIA	11,406	14,135	20,624	27,403	27,547	28,346	29,465	28,032	28,421	4.6	2.0	0.3
AFRICA	29,041	30,074	21,135	19,298	17,986	17,057	16,906	16,330	15,872	3.4	-1.9	-1.5
LIBERIA	12,993	12,902	9,700	9,416	8,585	7,085	6,405	6,400	6,485	4.0	-2.0	-2.8
AMERICA	41,383	66,678	72,100	64,604	73,743	76,619	76,452	88,607	93,683	5.4	2.7	2.9
BRAZIL	17,807	50,861	59,987	58,897	66,424	71,409	71,611	83,805	86,695	11.9	6.7	3.0
WORLD	182,816	236,831	226,368	213,426	233,839	238,174	241,390	262,850	276,121	4.0	0.6	2.0

A/ LEAST SQUARES TREND FOR HISTORICAL PERIODS (1961-86); END-POINT FOR PROJECTED PERIODS (1987-2000).
B/ ESTIMATE.
C/ GROWTH RATE FOR 1964-86 PERIOD.

SOURCES: UNCTAD (ACTUAL);
WORLD BANK, INTERNATIONAL ECONOMICS DEPARTMENT (PROJECTED).

TABLE A4: IRON ORE (METAL CONTENTS) - GROSS IMPORTS BY MAIN COUNTRIES AND ECONOMIC REGIONS

COUNTRIES/ ECONOMIES	ACTUAL				PROJECTED					GROWTH RATES A/		
	1969-71	1979-81	1986	1987/B	1988	1989	1990	1995	2000	1961-86	1970-86	1987 - 2000
	('000 TONS)									(% PER ANNUM)		
INDUSTRIAL	156,722	177,579	154,144	156,669	170,605	173,763	175,684	179,884	186,400	3.1	-0.9	1.3
NORTH AMERICA	27,117	21,641	13,707	11,129	14,403	16,067	16,685	16,175	21,219	-2.6	-5.9	5.1
UNITED STATES	25,929	18,008	10,380	7,802	11,076	12,740	13,358	12,848	17,892	-3.3	-7.6	6.6
EEC-10	66,457	75,039	67,921	71,679	75,435	74,990	74,395	73,898	72,737	2.5	-0.5	0.1
GERMANY, FED. REP.	25,304	28,193	24,147	23,866	25,728	25,555	25,392	26,452	26,734	1.9	-0.6	0.9
FRANCE	5,306	10,675	9,876	10,19[illegible]	10,674	10,781	10,839	10,889	10,912	9.1	2.9	0.5
UNITED KINGDOM	11,492	8,338	8,880	12,926	14,154	14,018	13,620	11,610	10,216	-0.6	-2.7	-1.8
ITALY	6,534	9,721	10,209	10,189	10,270	10,143	10,045	10,448	10,376	5.8	2.3	0.1
JAPAN	61,283	77,572	69,140	69,485	75,391	76,672	77,070	81,777	84,410	7.1	0.0	1.5
NON-MARKET	20,662	32,681	32,894	32,894	34,944	36,108	36,236	38,499	35,844	4.6	2.5	0.7
DEVELOPING	1,486	15,989	26,581	23,863	28,290	28,303	29,470	44,467	53,877	18.8	20.8	6.5
ASIA	88	12,504	22,808	15,946	18,756	19,095	20,087	33,366	39,386	40.4	42.5	7.2
CHINA	44	4,522	12,069	409	503	2,358	1,695	10,212	15,956	35.3	41.1	32.6
KOREA, REPUBLIC OF	23	5,466	7,260	8,839	10,253	10,745	11,392	14,154	16,430	0.0	45.7	4.9
AMERICA	800	1,633	1,591	1,591	1,591	1,591	1,591	1,591	1,591	6.8	4.7	0.0
WORLD	178,870	226,249	213,619	213,426	233,839	238,174	241,390	262,850	276,121	3.8	0.4	2.0

A/ LEAST SQUARES TREND FOR HISTORICAL PERIODS (1961-86); END-POINT FOR PROJECTED PERIODS (1987-2000).
B/ ESTIMATE.

SOURCES: UNCTAD (ACTUAL);
WORLD BANK, INTERNATIONAL ECONOMICS DEPARTMENT (PROJECTED).

TABLE A5: IRON ORE - PRICES, a/ 1950-87 (ACTUAL) AND 1988-2000 (PROJECTED)

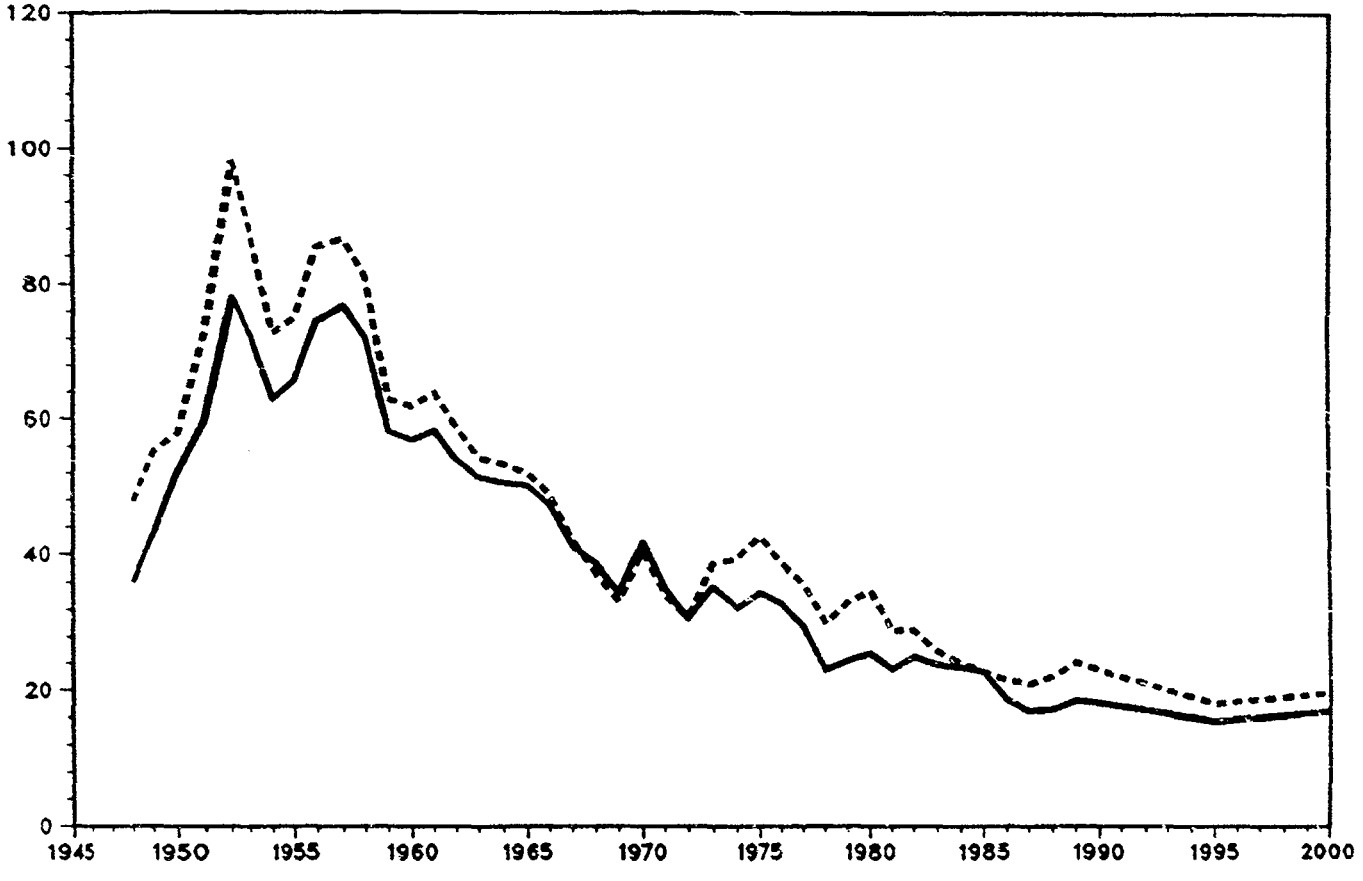
	($/Ton)		
	Current $	1985 Constant $	
		MUV b/	GNP c/
Actual			
1950	12.4	52.4	57.9
1951	16.3	59.7	72.6
1952	22.3	78.0	97.9
1953	20.1	72.3	86.9
1954	17.1	62.9	72.7
1955	18.2	65.7	75.0
1956	21.4	74.6	85.3
1957	22.5	76.8	86.6
1958	21.5	72.1	81.0
1959	17.1	58.2	62.8
1960	17.1	57.0	61.8
1961	17.8	58.3	63.7
1962	16.8	54.0	58.8
1963	15.7	51.4	54.2
1964	15.7	50.5	53.3
1965	15.7	50.2	52.0
1966	15.3	47.2	49.0
1967	13.5	41.2	42.0
1968	12.6	38.8	37.4
1969	11.8	34.5	33.2
1970	15.2	41.8	40.5
1971	13.5	35.2	34.0
1972	12.8	30.7	30.8
1973	17.1	35.4	38.6
1974	19.0	32.2	39.4
1975	22.6	34.5	42.6
1976	21.9	33.0	38.8
1977	21.6	29.6	35.9
1978	19.4	23.1	30.0
1979	23.3	24.5	33.2
1980	26.7	25.6	34.8
1981	24.3	23.2	28.9
1982	25.9	25.0	29.0
1983	24.0	23.8	25.8
1984	23.2	23.4	24.1
1985	22.7	22.7	22.7
1986	22.0	18.6	21.6
1987	22.2	17.1	21.1
Projected			
1988	24.2	17.2	22.1
1989	27.7	18.5	24.3
1990	27.6	18.2	23.0
1995	28.1	15.5	18.0
2000	38.5	17.0	19.7

a/ Spot sinter fines of Brazilian ore, c.i.f. German ports, 65% MC content (1975-77); from 1978, 61.5% MC content; prior to 1975, 68% MC content. Prices for 1950-59 are estimated on the basis of Swedish ore.
b/ Deflated by Manufacturing Unit Value (MUV) Index.
c/ Deflated by US GNP deflator.

Sources: Statistiches Bundesamt, Preise und Preisindizes fur die ein und Ausfuhr, (actual, 1964-87) and computations of the World Bank; World Bank, International Economics Department (projected).

IRON ORE

(CONSTANT 1985 DOLLAR PRICES *)



——————— DEFLATED BY MANUFACTURING UNIT VALUE (MUV) INDEX

▪▪▪▪▪▪▪▪▪▪▪ DEFLATED BY U.S. GNP DEFLATOR.

* 1948 – 87 ACTUAL ; 1988 – 2000 PROJECTED .

SOURCE : WORLD BANK , INTERNATIONAL ECONOMICS DEPARTMENT .

LEAD

Summary

1. World consumption of lead increased at 1.3% p.a. during the 1970-86 period compared to slightly over 4% p.a. during the 1960s. Slower economic growth, material substitution, the downsizing of batteries, and health/environmental regulations were responsible for the slower growth. These factors were particularly prevalent in the industrial countries which registered a modest 0.2% p.a. increase in consumption during the 1970-86 period. In contrast, developing countries' consumption increased at 4.5% p.a. during the comparable period. The growth of world lead consumption should continue to moderate to 0.8% p.a. during the 1987-2000 period. Material substitution and health/environmental considerations will constrain industrial country consumption growth to 0.2% p.a. during this period. Developing country consumption should increase at 2% p.a. during the 1987-2000 period. The slower growth expected for developing countries during the 1990s vis-a-vis the 1970-86 period reflects the increasing importance of the factors which have constrained industrial country demand. For example, legislation restricting leaded gasoline is likely to become more widespread.

2. Industrial and developing country lead mine capacity totaled 3.4 million tons in 1987; by the year 2000 capacity is projected to increase only by 170,000 tons to 3.6 million tons. In contrast, industrial and developing lead country refinery capacity was estimated to be 5.8 million tons in 1987 and is expected to increase by approximately 450,000 tons during the period 1987-2000. The difference in mine and smelter capacity levels and expected growth reflects continued expansion of the secondary (recycled) lead sector. Therefore, lead mine and smelter (refined) production during the 1987-2000 period are expected to increase at 0.2% and 0.7% p.a., respectively. No major shifts in the current mine production pattern are anticipated, and the most current producers of lead ore (Australia, Canada, Mexico, Peru, and the United States) will remain major suppliers. Mexico and Peru are expected to increase their share of world output, and the opening of the Red Dog mine is likely to permit an increase in US production. Most of the increase in lead metal production during the 1987-2000 period is likely to come from recycling, and it is anticipated that most of the incremental production will be located in developing countries. Consequently, the developing countries' share of world lead production is projected to increase from 22% in 1987 to 25% in 2000.

3. Lead metal exports are projected to increase at 0.4% p.a. during the 1987-2000 period compared to 0.7% p.a. for lead metal production. Slow consumption growth and adequate smelting capacity in the large consuming countries will minimize their import requirements. Trade in lead ores/concentrates is expected to increase at 0.3% p.a. during the 1987-2000 period--approximately the same rate as production.

4. The depressed lead prices in 1985 elicited the expected supply cutbacks, and prices increased to US$597/ton in 1987. Prices increased further to US$661/ton during the first half of 1988. Unanticipated supply disruptions have also contributed to the recent price increases. Over the near term, lead

markets are expected to move into surplus as demand increases only marginally and production expands in response to price. By 1990 the lead price is projected to decline to US$540/ton (US$356/ton in 1985 constant dollars). Recent cost reductions should limit long-term price increases to US$795/ton (US$434/ton in constant 1985 dollars) and US$950/ton (US$420/ton in constant 1985 dollars) in 1995 and 2000, respectively.

Introduction

5. The performance of the world lead industry during the 1980s has been mixed. Weak demand and depressed prices early in the decade resulted in a generally poor perception of lead's prospects over the medium and long term. From the standpoint of the producer, lead was viewed as one of the least attractive base metals. A modest recovery in lead demand since 1982 and supply curtailments have permitted lead prices to increase significantly since 1985--as has been the case with a number of other base metals. However, the longer-term view remains basically pessimistic. Prices are expected to decline from their current high levels in line with long-term cost trends. Moreover, demand will remain sluggish as material substitution and environmental concerns continue to erode the lead markets. Lead consumption will continue to be buoyed by the battery market, but this may be a mixed blessing. As the lead sector increasingly becomes a one-market industry (batteries), the risks associated with the loss of this market increase. Although no substitute for the lead-acid battery is currently foreseen, such a technological development would result in severe overcapacity.

Demand Outlook

6. Lead consumption during the 1970-86 period increased at 1.3% p.a. However, during this period developing country consumption increased at 4.5% p.a. while industrial country consumption registered a negligible 0.2% p.a. rise. As has been the case with other major metals, demand was particularly weak during the mid- to late-1970s and suffered declines once again during the 1981-82 recession. The recovery of lead consumption during the 1983-87 period has been rather weak--a total of only 6% compared to increases of 20% and 14% for aluminum and zinc, respectively.

7. The modest improvement in lead demand should be viewed cautiously, given the declining consumption in many end-use markets. Lead is unique in the number of markets/applications for which serious health and environmental concerns have been raised. Lead gasoline additives have been reduced or eliminated through legislation in many countries. 1/ It appears likely that virtually no lead additives will be used by 2000 in the industrial countries. The impact of such legislation is illustrated by the experience in the United States where the additive market has declined from 253,000 tons in 1970 to 28,500 tons in 1986. Household lead-based paints (pigments) are yet another

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1/ International Lead and Zinc Institute (ILZSG), "The Market Situation for Lead," London, 1986.

example of a market severely constrained by health issues. Only the battery market has exhibited sustained growth. Metal Bulletin concluded, "No other base metal has received as much adverse environmental publicity as lead, but despite this, usage is steadily rising." 2/ A major question remains the extent to which the battery market can continue to support lead demand.

8. Table 1 shows lead consumption trends by major use in selected industrial countries. 3/ All major applications--with the notable exception of batteries--have declined since the peak demand year of 1979. Batteries accounted for approximately 61% of consumption in 1986 compared to 50% in 1979. The next largest market was pigments and other compounds which accounted for about 12% of consumption in 1986. A large number of relatively small markets comprised the remainder.

9. Gasoline additives have suffered the largest decline since 1979--approximately 14% p.a.--with much of the drop attributable to the mandated shift to lead-free gas in the United States. Lead-based paints for household applications have also been sharply reduced for health reasons and have contributed to the 2.4% p.a. decline in pigment markets since 1979. The 7.3% p.a. decline in lead alloy use during the 1979-86 period largely reflects technological shifts. Solder is the single most important application of lead-based alloys and its use has fallen with the decline of the three-piece steel (soldered) food can and its replacement by two-piece or three-piece welded cans which use little solder. Other soldering applications (e.g., automobiles) have also declined. Similarly, lead alloys used for printing and type declined markedly with the introduction of new printing methods such as offset lithographic reproduction. Cable sheathing has also declined markedly--at 7.3% p.a. since 1979. Plastics have substituted for lead in telephone cables and some high-tension power cables; where lead has been retained in these uses, the required thicknesses are lower.

10. The battery market has been the only growth sector for lead in the industrial countries. The 1.2% p.a. increase during the 1979-87 period reflects the strong growth in world vehicle production and the continued rise in vehicle registrations (a proxy for vehicles-in-use). World vehicle production averaged 37 million units during the 1970s, but increased to 44.8 million units in 1985 (the last year of comprehensive data). 4/ Similarly, vehicle registrations in the major industrialized countries have expanded from 230 million units in 1970 to an estimated 324 million units in 1986. 5/

2/ Metal Bulletin, "Lead Comes in From the Cold," September 17, 1987.

3/ End-use data include most industrial countries. Comprehensive data are not available.

4/ Motor Vehicle Manufacturers Association, "World Motor Vehicle Data 1987 Edition," Detroit 1987.

5/ Shearson Lehman Brothers, "Annual Review of The World Lead and Zinc Industries," 1987.

TABLE 1: LEAD CONSUMPTION TRENDS BY MAIN USES IN SELECTED INDUSTRIAL COUNTRIES, 1979-86

	1979	1980	1981	1982	1983	1984	1985	1986	Average Rate of Change
	('000 Tons)								
Batteries	1,751	1,558	1,640	1,591	1,702	1,856	1,888	1,902	+1.2%
Cable Sheathing	251	241	230	209	189	169	171	162	-6.1%
Rolled and Extruded Products	297	301	282	255	283	295	271	276	-1.0%
Shot/Ammunition	94	85	90	91	90	103	101	90	-0.6%
Alloys	216	184	157	167	154	154	140	127	-7.3%
Pigments and Other Compounds	433	413	398	360	362	380	386	364	-2.4%
Gasoline Additives	284	232	200	204	171	158	126	101	-13.7%
Miscellaneous	144	142	143	114	115	119	117	118	-2.8%
Total	3,470	3,156	3,140	2,991	3,066	3,234	3,200	3,140	-1.4%

Sources: International Lead and Zinc Study Group, Principal Uses of Lead and Zinc, various issues.

11. Lead demand for batteries has been particularly strong in Japan--4.5% p.a. during the 1979-86 period. The increase reflects the rapid expansion of the domestic auto industry and concomitant need for original equipment batteries. The much more modest US increase of 0.8% p.a. during the same period results from the greater need for replacement batteries as the vehicle population expanded.

12. The positive influence of rising vehicle production and population has been offset somewhat by several factors. High lead prices in the late 1970s prompted renewed efforts to reduce its use. Also, the desire to improve energy efficiency after the two oil-price shocks led automobile producers to reduce vehicle weight. This facilitated the development of lighter, less lead-intensive batteries. Since 1980, average battery weight in the United States has decline by approximately 6%. In addition, technological improvements have extended battery life.

13. Comparable end-use data for most developing countries are not available. However, partial information indicates that batteries represent

the largest and most dynamic single use in that region. 6/ This trend is consistent with rapidly expanding automobile production. The more vigorous growth in developing country demand implies that the environmental/technical factors that have constrained lead consumption in the industrial countries have not played a major a role as yet. For example, leaded gasoline remains the predominant fuel in developing countries.

14. World consumption of lead during the 1987-2000 period is expected to increase at a relatively slow 0.8% p.a., in contrast with 1.3% p.a. increase experienced during the 1970-86 period. The slowdown in demand growth reflects the continued decline of many markets and the modest growth anticipated in the battery sector.

15. Lead consumption in the industrial countries is projected to rise at 0.2% during the 1987-2000 period--the same rate experienced during the 1970-86 period. Most markets for lead in the industrial countries should continue to contract. Gasoline use--particularly outside the United States--will decline as additional restrictive legislation becomes effective. Health and environmental issues will continue to negatively impact other uses such as paints. Plastics should further erode lead cable and sheathing applications. Technological shifts in manufacturing processes are likely to diminish solder uses. However, many of these markets are now quite small, and their continued decline will be compensated by the steady, albeit moderate, increase in the battery market.

16. Because most lead-acid batteries are used in automobiles and trucks for starting/ignition purposes, the vehicle production and population will determine battery demand. The demand for original equipment batteries (in new cars) is likely to be limited since vehicle production in the United States and Europe is estimated to expand by only 1% p.a. through 2000. Japanese vehicle production is expected to increase by about 2% p.a. Replacement battery demand represents a large proportion of total battery use (generally 50-80% in the industrial countries) and is a function of fleet size (vehicle population). Fleet size is expected to increase by 1-2% through 2000. 7/

17. Given vehicle production and population, the growth in lead-in-battery demand is likely to vary within a 1-1.5% p.a. range in most industrial countries. However, several caveats are necessary. It is assumed that the reductions in battery weight and increases in battery life have largely run their course and will not severely constrain lead demand. Second, it is assumed that no substitute for the lead-acid battery in automotive applications is likely through 2000.

6/ In Brazil, the battery market in 1986 accounted for approximately 65% of total consumption and increased 15% p.a. during the 1979-86 period. The battery market in the Republic of Korea expanded by 13% p.a. during a comparable period and accounted for approximately one-half of total demand in 1986.

7/ P. King, "Lead and Zinc Developments to the Year 2000, with Focus on Asia," in Economics of Internationally Traded Minerals, US Society of Mining Engineers, New Orleans, 1986.

18. Lead consumption in the developing countries should increase at 2% p.a. during the projection period. The relatively stronger performance of the developing countries vis-a-vis the industrial countries is due to higher expected economic growth. For example, growth of manufacturing output is expected to average 4-5% p.a. in the developing countries, compared with 3-4% anticipated in the industrial countries. However, lead consumption growth is expected to remain well below the growth rates achieved during the 1970-86 period. The factors which constrained its expansion in industrial countries are anticipated to become increasingly relevant in developing countries.

Supply Outlook

19. Industrial and developing countries' lead mine capacity amounted to 3.4 million tons in 1987, an increase of approximately 110,000 tons from 1985 estimated levels (see Table 2). The largest individual increment to supply was accounted for by the reopening of the Faro mine in Canada. Other (smaller) mine additions included Montana Tunnels (United States) and the Heller unit (Australia), as well as various expansions in Latin America. Mine capacity through 1990 is expected to increase only by 40,000 tons. The stagnation reflects mine closures in Canada (Pine Point in 1988) and several European facilities including Bad Grund, Rammelsburg, and Black Angel. A more fundamental reason is the rather poor expectations for lead demand. No major new lead mines are expected to come on-stream over the medium term, and the expansions that are now anticipated are largely the result of zinc mines which have relatively small lead concentrations (e.g., Caribou in Canada; Green Creek in Canada; Cadjebut and Lady Loretta in Australia).

20. During the 1987-2000 period, lead mine capacity will expand by only 170,000 tons in the industrial and developing countries. Industrial countries will continue to account for a large proportion of capacity, but their share is expected to decline from 57% in 1987 to 50% in 2000 even though a major contributor to world lead capacity during the 1990s will be Alaska's Red Dog mine. 8/ Developing countries should increase their share of capacity by a corresponding amount. A significant constraint on mine capacity remains the expected increase in secondary (recycled) lead.

21. Lead smelter capacity in 1987 was 5.8 million tons and represented a decline of 180,000 tons from 1985 (see Table 3). The contraction of capacity was primarily the result of smelter closures in industrial countries--particularly the United States. In the US primary sector, several mergers/consolidations led to smelter closures. The US secondary sector also has contracted as excess capacity and stringent environmental regulations served to close high-cost units. Developing country primary smelting capacity in 1987 declined slightly from 1985 levels, but the decrease was more than

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8/ The Red Dog mine is expected to have a capacity of 65,000 tons of lead.

TABLE 2: WORLD LEAD MINE CAPACITY a/

Countries/Economies	Actual 1980	Actual 1985	Actual 1987	Projected 1990	Projected 1995	Projected 2000
	'000 tons					
Industrial	1,775	1,812	1,949	1,890	1,875	1,800
North America	994	958	1,070	1,040	1,125	
United States	616	551	640	640		
Canada	378	407	430	400		
Other Industrial	781	854	879	850	750	
EEC-10	249	204	204	180		
Oceania	412	525	535	570		
Other	120	125	140	100		
Developing	1,315	1,511	1,480	1,579	1,650	1,800
Asia	323	450	455	510		
China	180	190	200	240		
Africa	295	300	300	300		
Morocco	110	114	90	90		
Namibia	38	38	38	38		
South Africa	97	97	97	97		
Latin America	553	609	570	617		
Mexico	192	192	220	220		
Peru	227	240	245	245		
Southern Europe	144	152	155	152		
Yugoslavia	111	119	119	119		
Industrial and Developing	3,090	3,323	3,429	3,469	3,525	3,600

a/ Excluding European CPEs.

Sources: International Lead and Zinc Study Group; Engineering & Mining Journal, (January 1988); Bureau of Mines, US Department of the Interior, "Lead" in Mineral Facts and Problems, Washington, D.C., 1985; World Bank (projected)

compensated for by an increase in secondary capacity. During the 1987-2000 period, total industrial and developing country smelter capacity is expected to increase by 450,000 tons. However, most of the increase is due to expanding secondary capacity. The growing importance of the battery market implies that, ceteris paribus, the supply of used (recyclable) batteries will increase. The trend will be especially noticeable in the developing countries where secondary capacity is expected to increase 52% (from 461,000 to 700,000 tons) during the 1987-2000 period.

22. World mine production is expected to increase at 0.2% p.a. during the 1987-2000 period and regional production should parallel capacity trends. Industrial country output is projected to decline by 0.4% p.a., largely due to contractions in the EEC and North America. In contrast, Australian production should increase modestly. The decline of industrial country production will be mitigated somewhat by the opening of the Red Dog mine. The 0.9% p.a. increase in developing country output reflects the generally higher ore grades and presence of by-products (particularly silver).

23. Lead metal production should increase at about 0.7% p.a. over the long run. The faster growth rate vis-a-vis mine output results from the continued expansion of secondary lead. Industrial country output is projected to increase at only 0.2% p.a.--paralleling the increase in industrial world lead consumption. The stronger 1.9% p.a. increase in developing country production reflects a more robust domestic lead market, greater emphasis on secondary lead, and the strategy of many developing countries to increase value-added through local smelting of ores/concentrates.

Trade Outlook

24. Trade in lead ores/concentrates during the 1987-2000 period is expected to increase at 0.3% p.a.--approximately the same rate as ore production--somewhat faster than the growth experienced during the 1970-86 period. Industrial country exports are expected to decline by 0.6% p.a. Although EEC exports should decline significantly (1.1% p.a.) during the period, the start-up of the Red Dog mine will allow North American exports to expand by 0.2% p.a. Developing country lead ore/concentrate trade is projected to increase 2% p.a. during the 1987-2000 period.

25. Exports of lead metal increased 0.7% p.a. during the 1970-86 period, in contrast to the 1.6% p.a. rise in lead production. The slower growth in exports likely reflects two trends. First, slow consumption growth and adequate capacity in the industrial countries reduced import requirements during the period. In addition, secondary (recycled) output has expanded rapidly and the production is used predominantly for local markets (e.g., the manufacture of batteries), thus minimizing import requirements. This pattern is expected to continue with lead exports increasing by only 0.4% p.a. during the 1987-2000 period--compared to a 0.7% p.a. increase in lead metal production. Developing country exports should increase by 0.7% p.a. compared to the 0.3% p.a. growth expected for the industrial countries.

TABLE 3: WORLD LEAD REFINERY CAPACITY a/

Countries/Economies	Actual 1980	Actual 1985	Actual 1987	Projected 1990	Projected 1995	Projected 2000
	('000 tons)					
Primary Plants						
Industrial	2,363	2,354	2,206	2,221	2,221	2,100
North America	931	922	781	781	781	
United States	714	714	573	573		
Canada	217	208	208	208		
Other Industrial	1,432	1,432	1,425	1,440	1,440	
EEC-10	875	875	860	875		
Oceania	250	250	250	250		
Japan	260	260	260	260		
Other	47	47	55	55		
Developing	1,110	1,265	1,241	1,301	1,400	1,450
Africa	200	200	170	170		
Latin America	522	554	540	540		
Asia	213	330	350	410		
Southern Europe	175	181	181	181		
Industrial and Developing	3,473	3,619	3,447	3,522	3,621	3,550
Secondary Plants						
Industrial	2,442	1,947	1,897	1,897	1,921	2,000
North America	1,345	921	871	871	871	
United States	1,224	800	750	750		
Canada	121	121	121	121		
Other Industrial	1,097	1,026	1,026	1,026	1,050	
EEC-10	871	800	800	800		
Oceania	53	53	53	53		
Japan	126	126	126	126		
Other	47	47	47	47		
Developing	377	418	461	523	625	700
Africa	56	56	56	56		
Latin America	200	213	213	225		
Asia	79	107	150	200		
Southern Europe	42	42	42	42		
Industrial and Developing	2,819	2,365	2,358	2,420	2,546	2,700
Total Primary and Secondary	6,292	5,984	5,805	5,942	6,167	6,250

a/ Excluding CPEs.

Sources: International Lead and Zinc Study Group; Engineering & Mining Journal (January 1988); Bureau of Mines, US Department of the Interior, "Lead" in Mineral Facts and Problems, Washington, D.C., 1985; World Bank (projected).

Price Outlook

26. As has been the case with most other base metals, lead prices have exhibited considerable volatility. Prices reached an all-time high in 1979 (US$1,208/ton) and subsequently declined through 1983 (to US$425/ton), as the world recession depressed demand. The consequent cutback in production, as well as an increase in consumption, resulted in a moderate price recovery during 1984 (to US$443/ton). However, the higher output, in conjunction with slower growth in demand, resulted in a further price decline in 1985 (to US$391/ton). Lower production (the result of depressed prices), as well as the continued increase in lead demand, led to prices averaging US$597/ton in 1987. An additional factor leading to the increase in lead prices has been supply disruptions. Labor disputes in 1986-87 occurred in Australia, Canada, and Latin America and contributed to the steady decline in stocks during these two years. Lead prices increased further to average US$661/ton during the first half of 1988.

27. Price swings over the short term are determined by the current and anticipated near-term market balance. Our projections indicate that the current tight supply/demand balance will moderate. Lead demand should continue to increase only marginally, while output should be more than adequate since producers are likely to increase production in response to current high price levels. Supply disruptions are not expected to constrain output to the extent typical in 1986-87 because no major labor contracts are due for renewal over the near term. Consequently, inventories are expected to rise over the near term (see Table 4). Lead prices are projected to average US$630/ton in 1988. Prices should decline to US$590/ton and US$540/ton in 1989 and 1990, respectively. However, a precipitous price decline is not anticipated since demand should continue to expand slowly and smelter capacity will increase only marginally.

28. Average lead operating costs in 1986 were estimated to be 18.2¢/lb (US$401/ton) on a fully allocated basis. Costs have declined significantly since the early 1980s, particularly for mining and milling. Producers have struggled to reduce costs and improve productivity and these efforts, as well the closure of high-cost units, appear to have both contributed to the cost reductions. It appears likely that there will not be further significant cost reductions over the next few years and that real lead costs will be in the 18-20¢/lb range during the 1990s. Long-run prices should parallel these cost trends and average US$795/ton and US$950/ton in 1995 and 2000, respectively, (US$439/ton and US$420/ton in constant 1985 dollars).

TABLE 4: WORLD LEAD MARKET SITUATION AND OUTLOOK 1987-90 a/

	Actual 1987	Projected 1988	Projected 1989	Projected 1990
	('000 Tons)			
Refined Production	4,190	4,219	4,235	4,165
Refined Net Exports to Eastern Europe and China	34	50	50	50
Lead Metal Available	4,156	4,169	4,185	4,115
Lead Metal Consumption	4,093	4,133	4,118	4,127
Refined Metal Stocks, Commercial	422	458	525	513
Months Consumption Covered by Inventory	1.2	1.3	1.5	1.5

a/ Excluding CPES, China, and the Democratic People's Republic of Korea.

Sources: International Lead Zinc Study Group (actual); World Bank (projected).

TABLE A1: LEAD ORE - PRODUCTION BY MAIN COUNTRIES AND ECONOMIC REGIONS

COUNTRIES/ ECONOMIES	ACTUAL				PROJECTED					GROWTH RATES A/		
	1969-71	1979-81	1986	1987/B	1988	1989	1990	1995	2000	1961-86	1970-86	1987 - 2000
	('000 TONS)									(% PER ANNUM)		
INDUSTRIAL	1,703	1,613	1,425	1,491	1,490	1,480	1,420	1,417	1,414	1.2	-1.2	-0.4
NORTH AMERICA	876	841	702	734	740	730	690	695	700	2.1	-2.1	-0.4
EEC-10	242	249	173	177	180	170	165	150	140	0.2	-1.3	-1.8
OCEANIA	425	388	411	455	450	455	450	467	485	0.8	0.7	0.5
AUSTRALIA	424	388	411	455	450	455	450	462	485	0.8	0.7	0.0
NON-MARKET	681	759	726	729	730	725	725	740	750	1.7	-0.1	0.2
USSR	477	580	550	552	553	552	551	556	561	2.2	0.6	0.1
EASTERN EUROPE	205	179	176	177	177	173	174	184	189	0.3	-1.9	0.5
DEVELOPING	1,003	1,159	1,200	1,192	1,198	1,209	1,203	1,269	1,336	1.4	1.0	0.9
ASIA	230	318	371	372	375	385	388	429	470	3.2	2.0	1.8
CHINA	110	158	185	190	192	200	205	220	245	3.0	3.0	2.0
AFRICA	209	255	227	227	227	228	220	220	220	0.9	2.4	-0.2
MOROCCO	77	115	72	71	70	71	68	67	65	1.2	1.5	-0.7
AMERICA	422	432	454	461	463	465	460	493	526	0.7	0.1	1.0
MEXICO	165	157	197	204	205	210	208	219	238	0.1	0.4	1.2
PERU	155	187	194	204	205	202	207	221	235	1.4	1.2	1.1
SOUTHERN EUROPE	141	154	148	132	133	131	135	127	120	1.1	0.0	-0.7
YUGOSLAVIA	123	129	117	103	102	102	104	111	95	0.6	-0.5	-0.6
WORLD	3,387	3,531	3,351	3,412	3,418	3,414	3,348	3,426	3,500	1.4	-0.2	0.2

A/ LEAST SQUARES TREND FOR HISTORICAL PERIODS (1961-86); END-POINT FOR PROJECTED PERIODS (1987-2000).
B/ ESTIMATE.

SOURCES: INTERNATIONAL LEAD AND ZINC STUDY GROUP, LEAD AND ZINC STATISTICS (ACTUAL);
WORLD BANK, INTERNATIONAL ECONOMICS DEPARTMENT (PROJECTED).

TABLE A2: LEAD ORE - GROSS EXPORTS BY MAIN COUNTRIES AND ECONOMIC REGIONS

COUNTRIES/ ECONOMIES	ACTUAL				PROJECTED					GROWTH RATES A/		
	1969-71	1979-81	1986	1987/B	1988	1989	1990	1995	2000	1961-86	1970-86	1987 - 2000
	('000 TONS)									(% PER ANNUM)		
INDUSTRIAL	360	361	326	443	435	420	382	397	411	1.9	-2.2	-0.6
NORTH AMERICA	158	179	111	245	245	234	203	228	250	2.3	-5.0	0.2
CANADA	153	148	107	242	240	230	200	125	125	1.4	-5.3	-5.0
EEC-10	97	106	74	84	80	78	72	61	50	6.7	-1.3	-3.9
OTHER WESTERN EUROPE	44	47	44	46	45	44	44	42	40	1.0	-0.4	-1.1
OCEANIA	45	21	92	58	60	59	58	64	71	0.0	0.5	1.6
NON-MARKET	10	0	0	0	0	0	0	0	0	...	...	0.0
DEVELOPING	399	318	162	208	232	242	238	254	270	-0.7	-3.1	2.0
ASIA	132	41	22	30	31	32	29	29	30	-6.3	-13.0	0.0
AFRICA	50	127	79	111	112	114	110	107	105	0.4	5.8	-0.4
MOROCCO	44	69	22	32	33	31	32	31	29	-2.0	-3.1	-0.8
AMERICA	152	117	50	55	78	86	90	110	130	0.5	-2.5	6.8
PERU	108	86	27	35	55	65	70	85	100	1.4	-2.1	8.4
MEXICO	1	2	2	2	2	2	3	5	15	0.0	0.0	16.8
SOUTHERN EUROPE	65	33	12	12	11	10	9	8	5	3.0	-9.2	-6.5
WORLD	769	679	488	651	667	662	620	651	681	0.4	-2.7	0.3

A/ LEAST SQUARES TREND FOR HISTORICAL PERIODS (1961-86); END-POINT FOR PROJECTED PERIODS (1987-2000).
B/ ESTIMATE.

SOURCES: INTERNATIONAL LEAD AND ZINC STUDY GROUPS, LEAD AND ZINC STATISTICS (ACTUAL);
WORLD BANK, INTERNATIONAL ECONOMICS DEPARTMENT (PROJECTED).

TABLE A3: LEAD ORE - GROSS IMPORTS BY MAIN COUNTRIES AND ECONOMIC REGIONS

COUNTRIES/ ECONOMIES	ACTUAL				PROJECTED					GROWTH RATES A/		
	1969-71	1979-81	1986	1987/B	1988	1989	1990	1995	2000	1961-86	1970-86	1987 - 2000
	('000 TONS)									(% PER ANNUM)		
INDUSTRIAL	572	522	564	603	594	579	531	545	560	1.0	-0.1	-0.6
NORTH AMERICA	87	80	14	15	14	13	5	40	40	-6.0	-8.8	7.8
EEC-10	348	305	347	372	374	368	350	330	325	0.7	-0.2	-1.0
OTHER WESTERN EUROPE	4	4	4	4	4	3	4	4	4	2.3	0.4	0.0
JAPAN	133	134	199	208	202	195	172	171	191	7.3	2.3	-0.7
NON-MARKET	33	47	40	40	41	41	40	43	46	...	0.0	1.1
DEVELOPING	7	44	8	8	32	42	49	63	75	...	-4.4	18.8
WORLD	612	613	612	651	667	662	620	651	681	1.1	0.2	0.3

A/ LEAST SQUARES TREND FOR HISTORICAL PERIODS (1961-86); END-POINT FOR PROJECTED PERIODS (1987-2000).
B/ ESTIMATE.

SOURCES: INTERNATIONAL LEAD AND ZINC STUDY GROUPS, LEAD AND ZINC STATISTICS (ACTUAL);
WORLD BANK, INTERNATIONAL ECONOMICS DEPARTMENT (PROJECTED).

TABLE A4: LEAD METAL - PRODUCTION BY MAIN COUNTRIES AND ECONOMIC REGIONS

COUNTRIES/ ECONOMIES	ACTUAL 1969-71	ACTUAL 1979-81	ACTUAL 1986	ACTUAL 1987/B	PROJECTED 1988	PROJECTED 1989	PROJECTED 1990	PROJECTED 1995	PROJECTED 2000	GROWTH RATES A/ 1961-86	GROWTH RATES A/ 1970-86	GROWTH RATES A/ 1987 - 2000
	('000 TONS)									(% PER ANNUM)		
INDUSTRIAL	2,747	3,338	3,141	3,269	3,297	3,285	3,230	3,292	3,355	2.5	1.2	0.2
NORTH AMERICA	1,211	1,389	1,182	1,212	1,237	1,225	1,190	1,242	1,295	1.9	0.0	0.5
UNITED STATES	1,037	1,148	917	992	997	980	950	987	1,025	1.7	-0.6	0.3
CANADA	175	242	265	220	240	245	244	255	270	2.4	3.2	1.6
EEC-10	1,050	1,340	1,322	1,370	1,400	1,395	1,380	1,370	1,360	3.0	1.8	-0.1
OCEANIA	209	244	168	217	210	225	220	232	245	0.2	0.2	0.9
AUSTRALIA	209	244	168	217	210	215	220	232	245	0.2	0.2	0.9
NON-MARKET	820	1,089	1,116	1,116	1,135	1,130	1,130	1,200	1,270	2.9	1.9	1.0
USSR	578	787	790	790	805	800	800	860	921	3.1	2.1	1.2
EASTERN EUROPE	242	302	326	326	330	330	330	340	349	2.4	1.6	0.5
DEVELOPING	759	1,026	1,181	1,219	1,225	1,265	1,255	1,380	1,505	2.3	2.5	1.6
ASIA	189	321	462	497	500	525	530	595	660	4.0	5.5	2.2
CHINA	120	198	274	285	290	310	315	350	388	4.2	5.8	2.4
AFRICA	139	147	134	156	160	160	155	168	180	2.8	1.1	1.1
MOROCCO	23	44	55	62	65	65	62	65	70	8.2	120.0	0.9
AMERICA	310	416	395	403	400	410	405	440	477	1.3	1.0	1.3
MEXICO	172	192	189	189	182	188	185	208	230	0.2	0.4	1.5
PERU	73	87	68	71	70	72	71	77	84	-0.2	0.1	1.3
SOUTHERN EUROPE	121	143	190	163	165	170	165	177	188	1.7	1.5	1.1
YUGOSLAVIA	101	113	155	142	145	150	148	155	162	1.1	1.5	1.0
WORLD	4,326	5,453	5,438	5,604	5,657	5,680	5,615	5,872	6,130	2.5	1.6	0.7

A/ LEAST SQUARES TREND FOR HISTORICAL PERIODS (1961-86); END-POINT FOR PROJECTED PERIODS (1987-2000).
B/ ESTIMATE.

SOURCES: INTERNATIONAL LEAD AND ZINC STUDY GROUP, LEAD AND ZINC STATISTICS (ACTUAL);
WORLD BANK, INTERNATIONAL ECONOMICS DEPARTMENT (PROJECTED).

TABLE A5: LEAD METAL - APPARENT CONSUMPTION BY MAIN COUNTRIES AND ECONOMIC REGIONS

COUNTRIES/ ECONOMIES	ACTUAL				PROJECTED					GROWTH RATES A/		
	1969-71	1979-81	1986	1987/B	1988	1989	1990	1995	2000	1961-86	1970-86	1987 - 2000
	('000 TONS)									(% PER ANNUM)		
INDUSTRIAL	2,954	3,265	3,163	3,155	3,185	3,165	3,155	3,197	3,238	1.4	0.2	0.2
NORTH AMERICA	1,323	1,307	1,224	1,248	1,260	1,243	1,239	1,277	1,315	0.6	-0.9	0.4
UNITED STATES	1,265	1,189	1,119	1,147	1,160	1,145	1,140	1,175	1,210	0.4	-1.4	0.4
EEC-10	1,228	1,368	1,348	1,337	1,345	1,350	1,345	1,331	1,320	1.6	0.2	-0.1
GERMANY, FED. REP.	339	342	359	345	347	348	349	347	345	1.5	0.2	0.0
UNITED KINGDOM	271	298	282	287	285	283	279	277	276	0.1	-0.1	-0.3
FRANCE	202	211	205	208	210	211	210	205	202	1.2	-0.2	-0.2
ITALY	189	263	232	244	248	251	252	250	250	4.8	0.8	0.2
JAPAN	203	380	390	378	380	370	372	382	393	5.2	4.9	0.3
NON-MARKET	834	1,209	1,179	1,179	1,190	1,195	1,195	1,268	1,340	3.7	2.2	1.0
USSR	515	793	760	760	770	774	774	825	875	4.1	2.7	1.1
EASTERN EUROPE	319	416	419	419	420	421	421	443	465	3.1	1.4	0.8
DEVELOPING	560	984	1,201	1,205	1,220	1,220	1,257	1,407	1,552	5.6	4.5	2.0
ASIA	249	430	594	630	640	650	670	765	860	6.2	5.3	2.4
CHINA	167	236	274	290	298	308	320	360	400	4.9	3.2	2.5
AMERICA	172	281	273	270	272	274	275	307	340	4.0	2.5	1.8
SOUTHERN EUROPE	94	169	216	187	193	192	198	215	232	5.8	4.3	1.7
WORLD	4,348	5,458	5,543	5,539	5,595	5,590	5,607	5,872	6,130	2.5	1.3	0.8

A/ LEAST SQUARES TREND FOR HISTORICAL PERIODS (1961-86); END-POINT FOR PROJECTED PERIODS (1987-2000).
B/ ESTIMATE.

SOURCES: INTERNATIONAL LEAD AND ZINC STUDY GROUPS, LEAD AND ZINC STATISTICS (ACTUAL);
WORLD BANK, INTERNATIONAL ECONOMICS DEPARTMENT (PROJECTED).

TABLE A6: LEAD METAL - GROSS EXPORTS BY MAIN COUNTRIES AND ECONOMIC REGIONS

COUNTRIES/ ECONOMIES	ACTUAL				PROJECTED					GROWTH RATES A/		
	1969-71	1979-81	1986	1987/B	1988	1989	1990	1995	2000	1961-86	1970-86	1987 - 2000
	('000 TONS)									(% PER ANNUM)		
INDUSTRIAL	752	957	945	945	1,085	950	910	941	977	4.1	1.9	0.3
NORTH AMERICA	124	181	123	104	130	120	103	115	142	14.1	0.7	2.4
CANADA	120	122	112	100	124	117	100	113	139	0.0	0.5	2.6
EEC-10	306	414	422	440	560	445	435	456	470	5.1	2.5	0.5
OTHER WESTERN EUROPE	20	39	69	70	70	60	50	40	30	7.5	7.2	-6.3
OCEANIA	298	318	305	311	310	315	315	320	330	1.9	0.9	0.5
NON-MARKET	69	14	20	20	20	25	15	22	28	-10.7	-11.1	2.6
DEVELOPING	373	328	302	292	270	295	290	306	321	-1.3	-1.5	0.7
ASIA	49	40	49	50	45	50	48	50	52	-1.0	-2.1	0.3
AFRICA	115	99	80	90	80	87	87	91	95	0.9	-0.5	0.4
MOROCCO	22	35	50	59	54	58	56	59	59	7.1	162.0	0.0
AMERICA	151	164	157	132	128	138	137	147	159	-1.5	-0.4	1.4
PERU	68	70	52	44	42	45	44	49	52	-1.1	-1.0	1.3
MEXICO	83	93	105	88	86	93	93	98	107	-1.8	0.1	1.5
SOUTHERN EUROPE	58	24	16	20	17	20	18	18	15	-5.5	-8.4	-2.2
WORLD	1,194	1,299	1,267	1,257	1,375	1,270	1,215	1,269	1,326	1.6	0.7	0.4

A/ LEAST SQUARES TREND FOR HISTORICAL PERIODS (1961-86); END-POINT FOR PROJECTED PERIODS (1987-2000).
B/ ESTIMATE.

SOURCES: INTERNATIONAL LEAD AND ZINC STUDY GROUPS, LEAD AND ZINC STATISTICS (ACTUAL);
WORLD BANK, INTERNATIONAL ECONOMICS DEPARTMENT (PROJECTED).

TABLE A7: LEAD METAL - GROSS IMPORTS BY MAIN COUNTRIES AND ECONOMIC REGIONS

COUNTRIES/ ECONOMIES	ACTUAL				PROJECTED					GROWTH RATES A/		
	1969-71	1979-81	1986	1987/B	1988	1989	1990	1995	2000	1961-86	1970-86	1987 - 2000
	('000 TONS)									(% PER ANNUM)		
INDUSTRIAL	912	924	925	911	901	850	840	846	860	0.4	0.0	-0.4
NORTH AMERICA	220	131	142	202	193	163	152	150	162	-3.0	-2.4	-1.7
UNITED STATES	218	126	138	199	190	160	150	147	160	-3.2	-2.5	-1.7
EEC-10	614	633	627	557	560	540	530	535	530	1.2	-0.4	-0.4
OTHER WESTERN EUROPE	70	81	82	80	78	75	74	70	68	1.0	1.6	-1.2
JAPAN	5	74	70	67	68	70	84	91	100	4.8	21.0	3.1
NON-MARKET	108	145	96	96	95	90	92	90	98	0.6	0.1	0.2
DEVELOPING	175	182	231	240	245	260	283	333	368	4.9	2.4	3.3
WORLD	1,195	1,251	1,252	1,247	1,241	1,200	1,215	1,269	1,326	1.0	0.4	0.5

A/ LEAST SQUARES TREND FOR HISTORICAL PERIODS (1961-86); END-POINT FOR PROJECTED PERIODS (1987-2000).
B/ ESTIMATE.

SOURCES: INTERNATIONAL LEAD AND ZINC STUDY GROUPS, LEAD AND ZINC STATISTICS (ACTUAL);
WORLD BANK, INTERNATIONAL ECONOMICS DEPARTMENT (PROJECTED).

TABLE A8: LEAD - PRICES, 1950-87 (ACTUAL) AND 1988-2000 (PROJECTED)

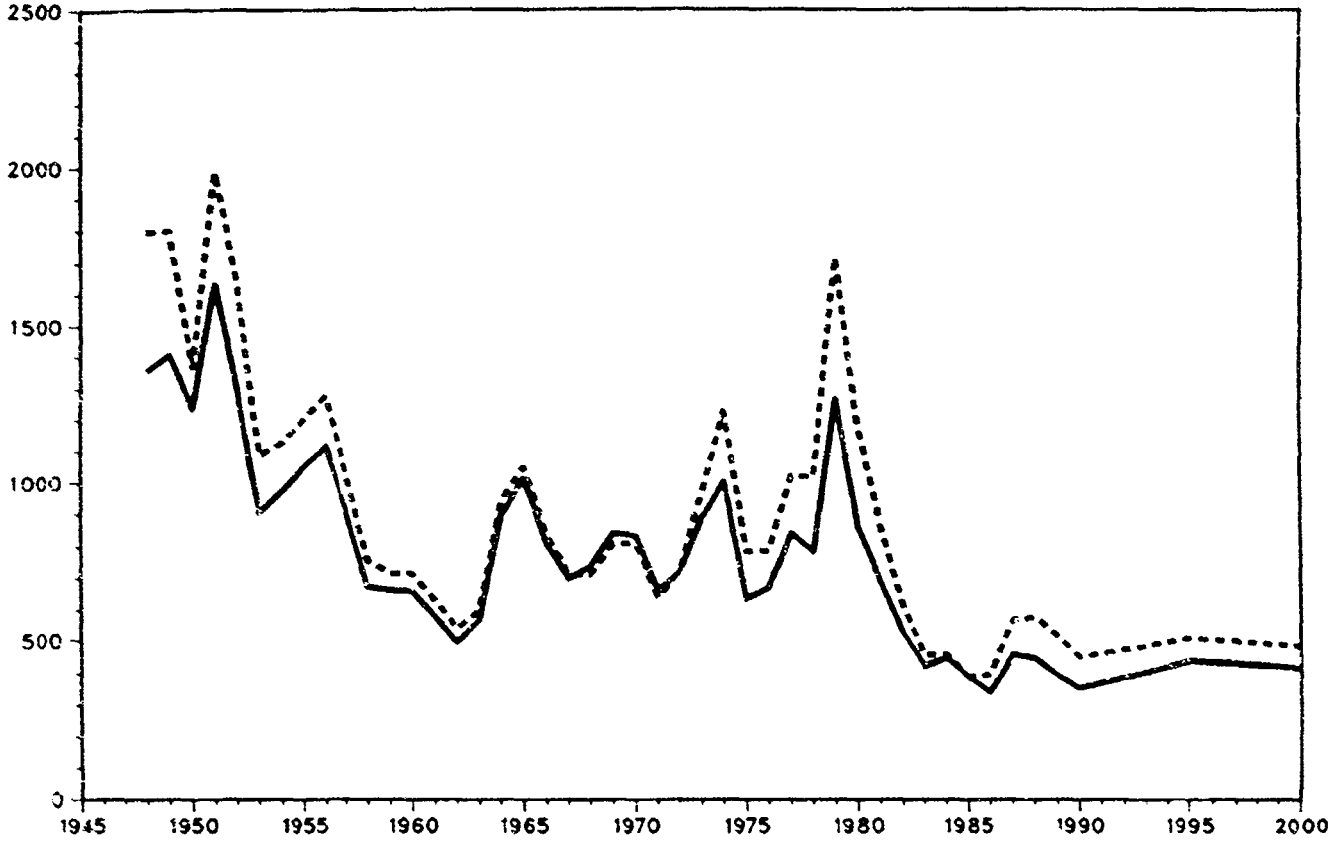
	($/Ton)		($/Ton)			
	Current $		1985 Constant $			
			$ MUV a/		US GNP b/	
	US Producer Price c/	LME d/	US Producer Price c/	LME d/	US Producer Price c/	LME d/
Actual						
1950	293	293	1,238	1,238	1,369	1,369
1951	386	446	1,414	1,634	1,720	1,988
1952	363	372	1,269	1,301	1,594	1,633
1953	297	252	1,068	906	1,283	1,089
1954	310	265	1,140	975	1,319	1,127
1955	334	292	1,206	1,054	1,376	1,203
1956	353	321	1,230	1,118	1,407	1,279
1957	323	266	1,102	908	1,243	1,023
1958	267	201	896	674	1,006	758
1959	269	195	916	664	989	717
1960	263	198	877	660	950	716
1961	240	176	787	577	859	630
1962	212	154	681	495	743	539
1963	245	174	802	570	846	601
1964	300	278	966	895	1,019	944
1965	353	318	1,128	1,016	1,169	1,053
1966	333	262	1,028	809	1,066	838
1967	309	229	943	699	962	713
1968	291	240	897	740	863	712
1969	328	289	959	845	922	813
1970	344	304	946	836	916	809
1971	305	254	796	663	769	640
1972	331	302	793	723	796	727
1973	359	430	742	889	811	971
1974	497	593	843	1,006	1,030	1,229
1975	474	417	723	636	894	786
1976	509	445	766	670	903	789
1977	677	617	928	845	1,126	1,026
1978	742	661	884	787	1,149	1,024
1979	1,160	1,208	1,220	1,270	1,651	1,720
1980	936	906	897	869	1,221	1,182
1981	805	727	768	693	958	865
1982	562	546	543	528	629	611
1983	478	425	475	423	515	458
1984	563	443	569	448	584	459
1985	420	391	420	391	420	391
1986	486	406	411	343	477	398
1987	792	597	605	459	754	569
Projected						
1988		630		448		577
1989		590		395		517
1990		540		356		450
1995		795		439		510
2000		950		419		486

a/ Deflated by Manufacturing Unit Value (MUV) Index.
b/ Deflated by US$ GNP Deflator.
c/ Lead, common grade, New York. According to Engineering and Mining Journal to 1966; Metals Week from 1967 on. Also Metallgesellschaft, Metal Statistics.
d/ Refined PIG Lead, London Metal Exchange.

Sources: See c/ and d/ for (actual); World Bank, International Economics Department (projected).

LEAD

(CONSTANT 1985 DOLLAR PRICES *)



——————— DEFLATED BY MANUFACTURING UNIT VALUE (MUV) INDEX

- - - - - - - - - - - DEFLATED BY U.S. GNP DEFLATOR.

* 1948 – 87 ACTUAL ; 1988 – 2000 PROJECTED .

SOURCE : WORLD BANK , INTERNATIONAL ECONOMICS DEPARTMENT .

ZINC

Summary

1. World zinc consumption during the 1961-86 period increased 2.6% p.a., but demand slowed markedly in the 1970s due to lower economic growth and material substitution. The recession of 1981-82 exacerbated the decline. However, zinc demand has increased steadily since 1983. Consumption reached 6.68 million tons during 1986--a record high. Although zinc demand has been relatively strong during the mid- and late-1980s, consumption is projected to increase only 1.5% p.a. during the 1987-2000 period. Slow anticipated growth in major markets, such as construction and a continued trend toward thinner zinc coatings and lighter diecasts, will restrict consumption growth.

2. After stagnating through most of the 1980s, zinc mine capacity expanded by approximately 750,000 tons during the period 1985-87. The increase in industrial and developing country zinc mine capacity to approximately 6.8 million tons was the result of improved market conditions and the subsequent reopening of a major Canadian mine and the start-up of several new units. During the 1987-2000 period, zinc mine capacity is expected to expand by approximately 900,000 tons with greenfield mines playing an important role. The most prominent new operation will be the Red Dog mine in Alaska which should come on-stream in the early 1990s with a zinc capacity of 314,000 tpy.

3. World zinc smelter capacity was 6.5 million tons in 1987--an increase of only 150,000 tons since 1985. Expansions were limited to developing countries. High costs (particularly energy and labor) have resulted in declining capacity in Japan and Europe. This trend in the industrial countries is expected to continue and may accelerate if recently announced mergers prompt additional rationalization. Consequently, the 730,000 ton increase expected in zinc smelter capacity during the 1987-2000 period will be the result of expansions in developing countries which will then account for 40% of smelter capacity in the year 2000 compared to only 31% in 1987.

4. World mine production is projected to increase 1.4% p.a. during the 1987-2000 period. Mine depletion will reduce output in Japan and Europe. A large increase in North American production is expected from the opening of the Red Dog mine. World smelter production should also increase 1.4% p.a. Capacity contraction in Europe and Japan will limit industrial country output to a 0.6% p.a. increase, while developing country production is expected to expand 3.1% p.a.

5. Exports of zinc ores/concentrates should increase 2.3% p.a. during the 1987-2000 period--somewhat faster than production. Decreasing mine output in Japan and Europe and the rise in metal production in developing countries with limited mine output should account for the moderate rise in exports. Zinc metal exports through 2000 are expected to increase at the same rate as output--1.4% p.a. Several contrasting trends are apparent. Higher smelter capacity in Asia will reduce metal import requirements, but stagnant demand in North America and Asia is expected to minimize import requirements in these regions.

6. Zinc prices are expected to average US$1,109/ton in 1988, up from US$799/ton in 1987. The rapid price increase reflects declining stocks and tight market conditions brought on by strong demand and supply disruptions. It is estimated that production losses at zinc smelters amounted to a combined total of over 270,000 tons in 1986/87. Prices are expected to moderate over the short term as demand slows and increasing output permits stocks to rise. By 1990, zinc prices are expected to average US$895/ton. Prices are projected to average US$1,140 and US$1,799/ton in 1995 and 2000, respectively, and should mirror underlying cost changes. Prices in real (constant 1985 dollars) terms will increase from US$590/ton in 1990 to US$794/ton in 2000.

Introduction

7. The performance of the world zinc industry during the mid- and late-1980s--by most measures--has been reasonably good. As has been the case with other metals such as aluminum and copper, demand has been buoyant. World consumption in 1986 surpassed the previous high attained in 1973. Prices soared to US$922/ton in 1984 while the ensuing downward price correction in 1985 to US$783/ton was relatively moderate. Prices remained in the US$730-830/ton range through 1987. However, the market became increasingly tight during the latter part of 1987. Zinc prices have risen dramatically during 1988, averaging US$1,058/ton for the first half of the year.

8. Recently the market has been typified by declining inventories which are now at historically low levels. The tight supply situation is the result of several factors. The generally poor markets and excess capacity which typified much of the late 1970s and early 1980s curtailed investment spending; world smelting capacity stagnated during the 1980s, and utilization rates increased. In addition, demand has been unexpectedly strong, particularly in some developing countries. A third factor--unanticipated supply disruptions--has also contributed. Although strikes and technical difficulties have occurred with considerable frequency in the zinc industry, the magnitude of the supply disruptions during the past several years has been particularly large.

9. Structural changes, including plant closures, mergers, and rationalizations, have typified many base metal industries during the mid-1980s, but were noticeably absent in zinc until recently. Since 1987 four new operating groups/companies have been formed. These new units could lead to capacity rationalizations and could serve to raise the degree of production concentration. The structural shifts may also lead to lower world capacity levels and higher utilization rates and price levels--at least in the medium term.

Demand Outlook

10. Zinc demand during the 1961-86 period increased at 2.6% p.a. However, this average rate masks several distinct trends. Zinc consumption expanded at a 5.4% p.a. rate in the 1960s, but lower economic growth and material substitution led to a precipitous decline during the 1970s. The 1981-82 recession resulted in further contraction. Zinc demand has increased

steadily since 1983, and 1987 marked the fifth consecutive year of higher demand. The strong increases recorded in 1983-84 were typical of the early phases of a recovery, but demand has risen further since then as pent-up demand for consumer durables was reinforced by rising output in the metal-intensive capital goods sector. The 1% increase in demand during 1986 to 6.58 million tons was an all-time high. A modest increase in demand was recorded in 1987, and preliminary data indicate that zinc demand expanded during the first half of 1988.

11. An important feature of the zinc market during the 1970s and early 1980s was the decline of most traditional markets due partly to disappointing economic conditions, but also as the result of material substitution, less intensive zinc use, downsizing of products, and various technological innovations. These trends were particularly evident in the industrial countries. Although the recent general improvement in demand raises the question of whether some of the changes have run their course, a clear trend does not appear to have emerged. US zinc demand, for example, has increased by 31% since 1982, but much of this recovery reflects the depressed state of major markets such as automobiles and construction during the early 1980s. European consumption has generally stagnated since the early 1980s, while Japanese consumption has declined over the past several years. The mixed performance of industrial country demand can be further highlighted by a review of trends in major intermediate uses.

12. Table 1 contains data for most industrial countries on the principal end-uses of zinc during the 1979-86 period. All major applications have declined since 1979, and only marginal improvement in most applications has been observed since 1982. The three largest end-uses remain galvanizing, zinc alloys, and bronze/brass. Galvanizing has increased its share of demand and accounted for 41% of consumption in 1986, while zinc alloy markets (primarily diecasts) have continued a downward spiral that started in the early 1970s. Bronze/brass markets appear to be weakening once again. Despite the lack of a dramatic turnaround in any of the major zinc markets in the industrial countries, there are indications that several applications such as galvanizing and diecasts may not be subjected during the 1990s to the intense substitution and technological pressures which characterized these markets during the 1970s.

13. Galvanizing, which is used to protect iron and steel against corrosion, has been primarily associated with construction markets. Although hot dipping remains an important galvanizing method, electrolytic deposition has become increasingly popular because it permits a more uniform and thinner coating. The progressively thinner zinc coatings introduced had a deleterious effect on zinc use. One study estimated that in the United States the average use of zinc per ton of galvanized sheet declined from 92 lb/ton in 1967 to approximately 84 lb/ton in the early 1980s. 1/ However, over the past several years electrogalvanized sheet used in the automotive sector increased

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1/ ECAR Associates, "Slab Zinc-U.S. Markets and Growth Prospects, 1967-85," Bethesda, Maryland, 1983.

markedly. 2/ By 1986 the average US car contained 13.83 lb of zinc for corrosion resistance--an increase of approximately 45% since 1982. The development and expansion of this relatively new market should serve to cushion industrial demand against further large declines, but it is doubtful that galvanizing demand can increase since further declines in zinc coating thickness can be expected and galvalume--a competing corrosion resistant coating (55% aluminum-45% zinc)--continues to expand its market.

14. Competition from plastics and aluminum resulted in substitution and the loss of key diecast markets in the construction and automotive markets. Competitive pressure also resulted in the development of lighter, less metal-intensive "thin-walled" diecasts. Substitution and new material-saving technology resulted in a rapid decline in zinc use. For example, the amount of zinc diecasts per auto in the United States declined from 64 lb per auto in 1967 to 19.7 lb in 1986. 3/ However, the decline in zinc use per auto has moderated, and many observers believe it will remain steady in the near and medium term.

15. In contrast to the guarded outlook for galvanizing and diecasting, the outlook for brass remains generally pessimistic. Brass--an alloy of copper and zinc--is a mature product with a large number of diverse applications based on its qualities of formability, corrosion resistance, and decorative appearance. Brass consumption continues to decline and substitution pressures are likely to continue. For example, construction uses, particularly for plumbing, are likely to decrease further as plastics expand market share. The continued replacement of aluminum radiators for copper/brass units should place downward pressure on automotive markets.

16. In addition to the stabilization of industrial country demand, zinc markets have been aided by the 5% p.a. increase in developing country consumption during the 1980-87 period. Comprehensive end use data does not exist for developing countries, but it appears that consumption of all major zinc applications expanded. As is the case in the industrial countries galvanizing is the largest single application (52% in 1986). Asian and Latin American consumption during the 1980-87 period increased by 6.6% p.a. and 4.1% p.a., respectively. The rapid industrialization, large infrastructure requirements, and generally stronger economic growth of the developing countries largely explains their superior performance. In addition, the substitution and material-saving technology which has acted as a drag on industrial country demand has had limited impact on the smaller and less mature markets typical of the developing countries.

2/ In 1986 nearly 3 million tons of new electrogalvanizing capacity was added in the world outside of the CPEs and China. Most of this capacity was to serve projected automotive requirements.

3/ "U.S. Automotive Market for Zinc Die Casting 1984-86", The Zinc Institute, 1986. Efforts to reduce vehicle weight and improve gasoline mileage also contributed to the decline in zinc diecasts.

TABLE 1: ZINC CONSUMPTION TRENDS BY MAIN USES IN SELECTED COUNTRIES, 1979-86

	1979	1980	1981	1982	1983	1984	1985	1986	Average Annual Rate of Change
	('000 tons)								
Galvanizing	1,730	1,592	1,562	1,487	1,577	1,624	1,587	1,574	-1.3%
Zinc Alloys	752	647	650	583	634	636	642	606	-3.3%
Brass & Bronze	1,042	970	874	751	852	971	868	873	-2.5%
Semi-manufactures	302	308	336	331	347	332	318	302	-
Chemicals	393	352	336	305	320	356	364	337	-2.2%
Others	164	159	179	150	151	166	168	155	-0.8%
Total	4,383	4,028	3,937	3,937	3,881	4,085	3,947	3,847	-1.8%

Source: International Lead and Zinc Study Group, Principal Uses of Lead and Zinc, various issues.

17. The outlook for zinc consumption through 2000 is mixed. Total consumption is expected to increase 1.5% p.a. during the 1987-2000 period, which contrasts to the 0.9% p.a. rate exhibited during the 1970-86 period. Our current forecast reflects a slight upward revision from the 1.3% p.a. increase anticipated several years ago. Industrial country consumption is expected to increase modestly. Although expanding galvanizing markets and renewed competitiveness of diecasts should arrest the declines experienced previously--1% p.a. during the 1970-86 period--several trends should restrict industrial country consumption growth to 0.6% p.a. through 2000. Continued keen competition should lead to further reductions in zinc coating thickness and lighter diecastings. Moreover, a major end use market for zinc--construction--is expected to expand at only 0.5% p.a. in the industrial economies through 2000. In contrast, consumption in the developing countries is forecast to increase by 3.2% p.a. during the 1987-2000 period.

Supply Outlook

18. By 1987 industrial and developing country zinc mine capacity totaled approximately 6.8 million tons, an increase of 750,000 tons over estimated 1985 capacity (see Table 2). The increase reflected improved market conditions and the subsequent reopening of a major mine as well as the start-up of several new units. In Canada, the Faro mine was reopened by Curragh Resources, and the Montana Tunnels unit commenced operations in the United States. Aberfoyle's Heller mine also came on-stream in Australia. Mine expansions were undertaken in China and Thailand. South African capacity increased with the opening of the Pering mine, but will shortly decline with the closure of the Prieska unit. Although a number of new mines are expected to open over the next several years total capacity is expected to be largely unchanged in 1990. Among those mines closed by mid-1988 or scheduled shortly for shutdown are Pine Point (Canada) and several European mines including Bad Grund, Rammelsburg, and Black Angel. Capacity expected on-stream by 1990 will be concentrated in Canada (Winston Lake, Mines Selbaie, and Caribou), the United States (Greens Creek, Ward) and in Australia (Cadjebut, Lady Loretta).

19. A large proportion of the additions to capacity during the early and mid-1980s consisted of mine expansions. However, through 1990 greenfield projects rather than expansions will be the preferred type of investment. The new lead-zinc mines planned for the next several years also are predominantly zinc. Recent exploration and development activity has emphasized zinc (and by-products such as silver) with minimal consideration to lead content. These two trends reflect the more sanguine outlook for zinc vis-a-vis lead and are illustrated particularly by investment activity in Australia and Canada.

20. During the 1987-2000 period, zinc mine capacity will expand by approximately 900,000 tons. Industrial countries will continue to account for the majority of capacity, but their proportion should decline slightly from 60% in 1987 to 56% in 2000. The continued expansion in industrial countries during the 1990s is dominated by the anticipated opening of Alaska's Red Dog mine in 1991 (314,000 tpy of zinc). 4/

4/ The Red Dog deposit (17.1% zinc, 5% lead, and 2.6 oz. silver/ton) is consistent with the trend toward high zinc content and precious metal by-products.

TABLE 2: ZINC MINE CAPACITY

Countries/Economies a/	1980	1985	1987	1990	1995	2000
	('000 tons)					
Industrial	3,909	3,846	4,050	4,060	4,000	4,300
North America	1,850	1,720	1,890	1,860	2,100	
Canada	1,367	1,390	1,570	1,500		
United States	483	330	320	360		
Other Industrial	2,059	2,126	2,160	2,200	1,900	
EEC-10	909	771	720	700		
Other Western Europe	250	310	350	350		
Japan	337	260	200	160		
Oceania	563	785	890	990		
Developing	1,990	2,204	2,739	2,704	3,044	3,400
Asia	451	518	830	830	890	
China	123	170	250	320		
Africa	318	302	375	340	370	
South Africa	88	88	145	110		
Zaire	76	76	90	90		
Zambia	55	55	55	55		
Latin America	1,037	1,200	1,350	1,350	1,600	
Mexico	291	430	400	400		
Peru	586	610	630	630		
Southern Europe	184	184	184	184	184	
Industrial & Developing	5,899	6,050	6,789	6,764	7,044	7,700

a/ Excludes CPEs.

Sources: International Lead and Zinc Study Group and US Bureau of Mines, Minerals Yearbook (actual); World Bank (projected).

21. Smelter capacity in 1987 was 6.5 million tons, an increase of approximately 180,000 tons since 1985 (see Table 3). However, expansions were limited to developing countries, particularly China and Republic of Korea. The zinc smelting sector has long been characterized by independent "custom smelters" located primarily in Europe and Japan. The concentrate feed for these smelters is either purchased outright from mining companies or converted to metal on a toll basis. High energy and labor costs have resulted in declining capacity in both Japan and Europe over the past decade. This trend is expected to continue and could accelerate given recent merger announcements (see section on policy issues and investment climate). Consequently, industrial country capacity will stagnate during the 1987-2000 period; the 730,000 ton capacity increase expected over the period is the result of investment activity in developing countries. Both Asia and Latin America should experience significant increases. By 2000 loping countries are expected to account for approximately 40% of smelter ity compared with only 31% in 1987.

22. World mine production is expect increase 1.4% p.a. during the 1987-2000 period. Regional production should parallel capacity trends. Output expansions will be concentrated in those countries/regions with relatively low costs and substantial by-product credits. Japanese and European output should decline during the period. The North American increase is due to expected production from the Red Dog mine in Alaska. Australian mine output will also rise. In the developing countries, the relatively high silver values in both Peru and Mexico should encourage expanded output. In general, industrial and developing country output should increase 0.6% and 2.5% p.a., respectively, during the 1987-2000 period.

23. Zinc metal production is projected to increase 1.4% p.a. during the forecast period. Developing country output should increase 3.1% p.a. while industrial country production is expected to expand a modest 0.6% p.a. and is expected to be constrained by the contraction of smelting capacity in Europe and Japan. The more robust 3.1% p.a. expansion of developing country output reflects increasing zinc consumption and the desire of many developing countries to increase the value-added of mining by expanding smelting activities.

Trade Outlook

24. International trade in zinc ores/concentrates reflects the fact that mining and smelting/refining often occur in different countries, and trends in the location of these activities will largely dictate trade patterns and volume. The tendency for increased smelting in mining countries argues for a decline in concentrate trade. In contrast, decreasing mine output in Japan and Europe indicates that import requirements should remain strong. North

TABLE 3: ZINC SMELTER CAPACITY

Countries/Economies a/	1980	1985	1987	1990	1995	2000
	('000 tons)					
Industrial	4,712	4,537	4,455	4,380	4,400	4,400
North America	1,159	1,089	1,089	1,089	1,100	
Canada	644	699	699	699		
United States	515	390	390	390		
Other Industrial	3,553	3,448	3,366	3,291	3,300	
EEC-10	1,980	1,871	1,871	1,871		
Germany, Fed. Rep of	474	415	415	415		
Belgium-Luxembourg	423	325	325	325		
France	360	310	310	310		
Italy	170	253	253	253		
Spain	268	268	268	268		
United Kingdom	100	100	100	100		
Netherlands	185	200	200	200		
Other Western Europe	275	275	315	270		
Japan	972	972	850	800		
Oceania	326	330	330	350		
Developing	1,295	1,750	2,011	2,091	2,550	2,800
Asia	490	700	890	950	1200	
Korea, Rep. of	100	100	200	200		
Africa	262	283	283	283	300	
Latin America	403	627	658	678	830	
Mexico	194	307	307	307		
Peru	70	170	170	170		
Southern Europe	140	140	180	180	220	
Yugoslavia	120	120	160	160		
Turkey	20	20	20	20		
Industrial & Developing	6,007	6,287	6,466	6,471	6,950	7,200

a/ Excludes CPEs.

Sources: International Lead and Zinc Study Group and US Bureau of Mines, Minerals Yearbook (actual); World Bank (projected).

American trade should expand with the opening of Alaska's Red Dog mine. 5/ The increase of developing country metal production in countries with little mine production such as Republic of Korea will also encourage ore/concentrate trade. On balance, we expect zinc ore exports to increase 2.3% p.a. during the 1987-2000 period or slightly faster than world mine output. Industrial country exports should increase 2% p.a. during the same period, while developing countries should experience a 2.9% p.a. growth. CPE exports will remain minimal throughout the period.

25. Exports of zinc metal increased at 3% p.a. during the 1970-86 period, compared to 1.4% p.a. growth in metal production. The relatively rapid growth of exports reflects the increased requirements of many countries, particularly in Asia. Export growth is projected to be 1.4% p.a. during the 1987-2000 period--equal to the expected rise in world production. The more modest expectations for metal trade relate directly to shifts in smelting capacity. Expanded smelter capacity in Asia will reduce import requirements, while stagnant consumption in North America and Europe should minimize import requirements in these regions.

Price Outlook

26. Zinc prices have continued to exhibit a marked degree of volatility during the 1980s. Prices reached US$846/ton in 1981, but the world recession resulted in a price decline to US$745/ton in 1982. The resulting cutback in production and the strong world recovery of zinc demand during 1983-84 (consumption expanded approximately 10% in these two years) precipitated a price surge to US$944/ton in 1984--the highest level since 1974. Once again, higher output, in conjunction with less vigorous (but still rising) demand, resulted in a price decline in 1985. Thus, a feature of the world zinc market during the 1980s has been the relatively rapid supply response to price fluctuations.

27. A second trend which has emerged, particularly since 1986, has been the prevalence of supply disruptions. Table 4 shows that production losses at zinc smelters during 1986 and 1987 totaled over 270,000 tons. During 1986, labor disputes in Canada and Peru accounted for most of the supply losses; Canadian labor disputes also accounted for most of the losses in 1987, although technical difficulties were significant in 1987. It is difficult to ascertain the reasons for the rise in labor difficulties, although one possibility may be the increased pressure on producers to reduce costs, particularly labor.

5/ This mine is being developed by the Canadian producer Cominco. A substantial amount of output from what is expected to be the world's largest zinc mine will be smelted at its Trail lead/zinc refinery complex in Canada.

TABLE 4: ESTIMATED OUTPUT LOSSES AT ZINC SMELTERS DURING 1986 AND 1987

Smelter (Operator)	Length (Cause)	Output Lost (Tons)
1986		
Valleyfield, Canada (Noranda)	June-November (Labor Dispute)	94,000
La Oroya, Peru (Centromin)	March-April (Strike)	10,000
Others	Various	40,000
Total		144,000
1987		
Trail, Canada (Cominco)	May-November (Strike)	76,000
Timmins, Canada (Kidd Creek)	Jananuary-December (Technical Difficulties)	13,000
Cajamarquilla, Peru (Minero Peru)	May-June (Technical Difficulties)	12,000
Others	Various	29,000
Total		130,000

Source: World Bank.

28. The combination of constrained production and the continued strength of demand has contributed to a dramatic price increase since the third quarter 1987 (see Table 5). Price increases during the second quarter of both 1986 and 1987 correspond with major supply disruptions. However, continued strong demand and record low stocks have led to further price increases in 1988.

TABLE 5: QUARTERLY ZINC PRICE FLUCTUATIONS, 1986(1) - 1988(2)

	(¢/kg)		
1986(1)	62.6	1987(2)	82.6
1986(2)	72.4	1987(3)	79.7
1986(3)	83.1	1987(4)	82.8
1986(4)	83.5	1988(1)	91.2
1987(1)	74.4	1988(2)	120.4

Note: LME High Grade settlement price.

Source: World Bank.

29. Price movements over the short run are largely the result of shifts in expectations and metal balances (inventory levels). Our outlook calls for an easing of the current tight supplies and a waning of the strongly positive expectations which now apparently dominate the market. Although demand will increase marginally through 1990, production should be more than adequate. 6/ Consequently, inventories and the critical consumption-inventory ratio will increase (see Table 6). Zinc prices are expected to average US$1,100/ton in 1988, implying a moderate decline from the high levels attained during the second quarter. Prices should continue to decline in 1989 (US$975/ton) and 1990 (US$895/ton) as stocks increase and sluggish demand negatively impacts speculative stock holdings. However, a price collapse is not expected for several reasons. First, demand will continue expanding albeit quite slowly, and second, both mine and smelter capacity are expected to decline slightly. 7/ These trends are illustrated in the rising mine and smelter utilization rates shown in Table 6.

30. Zinc operating costs in 1986 were estimated to be approximately 37.4¢/lb on a fully allocated basis. The costs of both mining/milling and smelting/refining have declined significantly since the early 1980s as producers struggled to improve productivity and profits. Although some additional cost reductions are likely, further large productivity improvements in the near term are unlikely. Real zinc production costs are likely to be in the 35-37c/lb range during the 1990s. Long-run prices are expected to parallel cost trends and should average US$1,140/ton and US$1,799/ton in 1995 and 2000, respectively (US$623 and US$794/ton in constant 1985 dollars).

6/ Labor disputes are expected to have a much smaller constraining influence on supply through 1990. Over the near term no major labor contracts are scheduled to expire.

7/ This comment refers to capacity exclusive of the CPEs, China, and the Democratic People's Republic of Korea.

TABLE 6: WORLD ZINC MARKET SUPPLY-DEMAND BALANCE, 1987-90 a/

	-Actual- 1987	Projected 1988	1989	1990
	('000 Tons)			
Refined Production	5,078	5,105	5,162	5,250
Refined Exports to Eastern Europe and China	40	20	20	20
Zinc Metal Available	5,023	5,180	5,305	5,265
Zinc Metal Consumption	4,982	5,160	5,212	5,240
Refined Metal Stocks	565	585	678	703
Months Consumption Covered by Inventory	1.4	1.4	1.6	1.6
Zinc Smelter Operating Rate b/	0.85	0.86	0.88	0.90
Zinc Mine Operating Rate b/	0.84	0.85	0.85	0.89

a/ Excluding CPEs, China, and the Democratic People's Republic of Korea.
b/ Industrial and developing countries.

Sources: International Lead and Zinc Study Group (actual); World Bank (projected).

Policy Issues and Investment Climate

31. In contrast to the performance of some other base metal industries, (e.g., copper and aluminum) during the early and mid-1980s, the zinc sector did not experience significant restructuring/merger activity. However, recent consolidations/mergers could have far-reaching effects on industry behavior and performance. US zinc mine output has been declining since the late-1970s and has prompted a number of closures/consolidations. One of the more significant was the consolidation of St. Joe Minerals' and New Jersey Zinc's mining properties into a new operating unit called Zinc Corporation of America which is, in turn, owned by Horsehead Industries. The US consolidation is small compared to the more recent and complex arrangement focusing on Canada, where Teck Corporation has joined forces with Metallgesellschaft and Mount Isa Mines to purchase a 31.3% share of Cominco. Cominco owns the huge Red Dog deposit, together with a 47% stake in Aberfoyle, which is developing the large Hellyer zinc-lead-silver deposit in Tasmania.

32. Excess zinc smelting capacity has typified the European industry for a number of years and prompted several unsuccessful attempts at European-wide rationalization. In April of 1988--and probably as an indirect result of the previous European discussions--Preussag and Penarroya reached agreement on merging their European lead and zinc operations. The new grouping will account for some 250,000 tpy of smelting capacity and will be the second largest European zinc producer (Union Miniere is the largest). In Australia--the remaining major zinc producing region--CRA and North Broken Hill recently announced plans to merge their lead and zinc operations. This action will result in Australia's largest zinc producer with refined zinc capacity in excess of 300,000 tpy.

33. The worldwide merger/consolidation activity significantly increases the horizontal integration and concentration in the industry and could lead to further mine and smelter rationalizations. Higher concentration ratios may also result in more disciplined investment schedules which could minimize the likelihood of excess capacity developing once again in the 1990s.

34. The joint production of lead and zinc in many mines has made the task of coordinating zinc mine supplies with demand particularly difficult. However, in recent years exploration and development has focused on zinc, and the generally more sanguine view of zinc markets (vis-a-vis lead) should continue this trend through the 1990s. The emphasis on zinc is likely to make the balancing of zinc mine supply with demand less problematic, thus reducing the likelihood of excess mine capacity. The development of the Red Dog mine (314,000 tpy zinc and only 64,000 tpy lead) is a prime example of this trend. 8/

8/ The large capacity of the Red Dog mine does raise questions concerning the ability of this facility to come on-stream without depressing prices--at least temporarily.

TABLE A1: ZINC ORE - PRODUCTION BY MAIN COUNTRIES AND ECONOMIC REGIONS

COUNTRIES/ ECONOMIES	ACTUAL				PROJECTED					GROWTH RATES A/		
	1969-71	1979-81	1986	1987/B	1988	1989	1990	1995	2000	1961-86	1970-86	1987 - 2000
	('000 TONS)									(% PER ANNUM)		
INDUSTRIAL	3,122	3,092	3,336	3,579	3,605	3,685	3,725	3,760	3,845	1.9	0.4	0.6
NORTH AMERICA	1,759	1,448	1,507	1,734	1,650	1,700	1,690	1,850	2,050	1.0	-1.7	1.3
CANADA	1,231	1,119	1,291	1,504	1,450	1,400	1,400	1,300	1,500	3.1	-0.6	0.0
UNITED STATES	528	328	216	230	250	300	290	550	550	-3.3	-5.1	6.9
EEC-10	458	648	652	658	725	710	730	660	595	3.5	3.3	-0.8
OTHER WESTERN EUROPE	180	277	322	326	350	375	390	370	350	3.5	4.0	0.5
JAPAN	281	241	222	166	160	160	155	105	55	0.7	-1.0	-8.1
OCEANIA	443	479	633	695	720	740	760	775	795	3.0	2.9	1.0
NON-MARKET	1,023	1,350	1,269	1,270	1,290	1,300	1,305	1,420	1,535	3.4	0.9	1.5
DEVELOPING	1,393	1,734	2,198	2,183	2,240	2,280	2,320	2,670	3,020	3.0	2.3	2.5
ASIA	305	431	642	627	660	690	710	840	975	4.7	3.3	3.5
AFRICA	265	255	301	317	320	320	320	350	375	0.3	0.6	1.3
ZAIRE	102	72	82	81	81	80	78	80	80	-2.0	-2.0	-0.1
AMERICA	691	901	1,096	1,094	1,110	1,120	1,135	1,322	1,510	3.3	2.6	2.5
PERU	318	492	598	588	600	601	605	715	830	4.1	3.9	2.7
MEXICO	261	233	285	304	305	308	310	345	380	0.5	0.3	1.7
SOUTHERN EUROPE	132	147	159	145	150	150	155	158	160	2.4	0.4	0.8
WORLD	5,538	6,176	6,803	7,032	7,135	7,265	7,350	7,850	8,400	2.5	1.0	1.4

A/ LEAST SQUARES TREND FOR HISTORICAL PERIODS (1961-86); END-POINT FOR PROJECTED PERIODS (1987-2000).
B/ ESTIMATE.

SOURCES: INTERNATIONAL LEAD AND ZINC STUDY GROUP, LEAD AND ZINC STATISTICS (ACTUAL);
WORLD BANK, INTERNATIONAL ECONOMICS DEPARTMENT (PROJECTED).

TABLE A2: ZINC ORE - GROSS EXPORTS BY MAIN COUNTRIES AND ECONOMIC REGIONS

COUNTRIES/ ECONOMIES	ACTUAL				PROJECTED					GROWTH RATES A/		
	1969-71	1979-81	1986	1987/B	1988	1989	1990	1995	2000	1961-86	1971-86	1987 - 2000
	('000 TONS)									(% PER ANNUM)		
INDUSTRIAL	1,347	1,347	1,374	1,583	1,590	1,620	1,625	1,940	2,060	3.1	0.8	2.0
NORTH AMERICA	762	556	397	627	657	667	670	1,110	1,230	2.2	-3.6	5.3
CANADA	762	516	394	623	655	655	655	690	790	1.8	-4.2	1.8
EEC-10	254	381	322	320	310	320	325	300	295	5.1	4.0	-0.6
OTHER WESTERN EUROPE	119	185	222	235	225	225	220	150	130	2.2	5.3	-4.5
OCEANIA	211	225	433	401	398	408	410	380	405	4.6	5.4	0.1
NON-MARKET	0	3	6	6	5	5	5	5	10	...	...	4.0
DEVELOPING	740	680	602	789	795	800	810	975	1,140	0.1	-0.3	2.9
AFRICA	125	67	91	95	96	95	93	85	90	-4.9	-3.0	-0.4
AMERICA	475	512	413	594	600	603	610	730	1,020	1.4	0.6	4.2
PERU	262	376	248	444	448	449	452	540	630	3.9	2.2	2.7
MEXICO	151	65	109	118	119	120	122	135	150	-4.6	-3.9	1.9
WORLD	2,087	2,030	1,982	2,378	2,390	2,425	2,440	2,920	3,210	1.9	0.4	2.3

A/ LEAST SQUARES TREND FOR HISTORICAL PERIODS (1961-86); END-POINT FOR PROJECTED PERIODS (1987-2000).
B/ ESTIMATE.

SOURCES: INTERNATIONAL LEAD AND ZINC STUDY GROUPS, LEAD AND ZINC STATISTICS (ACTUAL);
WORLD BANK, INTERNATIONAL ECONOMICS DEPARTMENT (PROJECTED).

TABLE A3: ZINC ORE - GROSS IMPORTS BY MAIN COUNTRIES AND ECONOMIC REGIONS

COUNTRIES/ ECONOMIES	ACTUAL				PROJECTED					GROWTH RATES A/		
	1969-71	1979-81	1986	1987/B	1988	1989	1990	1995	2000	1961-86	1970-86	1987 - 2000
	('000 TONS)									(% PER ANNUM)		
INDUSTRIAL	1,792	1,876	1,958	1,987	1,990	2,045	2,060	2,455	2,620	2.4	0.7	2.2
NORTH AMERICA	445	205	108	79	52	62	70	315	370	-6.3	-6.1	12.6
UNITED STATES	445	158	72	47	35	42	55	50	50	-8.3	-9.7	0.5
EEC-10	850	1,110	1,237	1,230	1,235	1,335	1,370	1,390	1,500	3.5	2.4	1.5
OTHER WESTERN EUROPE	41	129	177	200	185	175	170	155	180	9.5	8.6	-0.8
JAPAN	457	432	436	478	518	473	450	595	570	5.8	-1.6	1.4
NON-MARKET	0	42	107	107	95	105	100	85	140	...	...	2.1
DEVELOPING	57	111	200	240	275	275	280	380	450	18.5 C/	14.5	5.0
WORLD	1,849	2,029	2,265	2,334	2,360	2,425	2,440	2,920	3,210	3.1	1.8	2.5

A/ LEAST SQUARES TREND FOR HISTORICAL PERIODS (1961-86); END-POINT FOR PROJECTED PERIODS (1987-2000).
B/ ESTIMATE.
C/ GROWTH RATE FOR 1965-86 PERIOD.

SOURCES: INTERNATIONAL LEAD AND ZINC STUDY GROUPS, LEAD AND ZINC STATISTICS (ACTUAL);
WORLD BANK, INTERNATIONAL ECONOMICS DEPARTMENT (PROJECTED).

TABLE A4: ZINC METAL - PRODUCTION BY MAIN COUNTRIES AND ECONOMIC REGIONS

COUNTRIES/ ECONOMIES	ACTUAL				PROJECTED					GROWTH RATES A/		
	1969-71	1979-81	1986	1987/B	1988	1989	1990	1995	2000	1961-86	1970-86	1987 - 2000
	('000 TONS)									(% PER ANNUM)		
INDUSTRIAL	3,519	3,795	3,801	3,884	3,960	4,070	4,040	4,110	4,185	1.7	0.6	0.6
NORTH AMERICA	1,284	1,027	887	944	1,000	1,035	1,040	1,055	1,070	-1.4	-1.4	1.0
UNITED STATES	881	430	316	334	375	375	370	360	350	-5.1	-5.9	0.4
CANADA	403	597	571	610	675	680	670	695	720	3.8	3.0	1.3
EEC-10	1,150	1,485	1,627	1,668	1,700	1,725	1,725	1,735	1,750	2.9	2.0	0.4
OTHER WESTERN EUROPE	217	246	269	293	310	325	320	350	380	8.0	4.4	2.0
JAPAN	706	731	708	664	625	625	615	595	575	3.9	-0.5	-1.1
OCEANIA	262	306	310	313	325	340	340	375	410	2.5	0.9	2.1
NON-MARKET	1,070	1,421	1,359	1,360	1,380	1,400	1,400	1,500	1,625	3.4	1.1	1.4
USSR	722	1,068	1,030	1,030	1,050	1,060	1,060	1,140	1,225	4.4	1.9	1.3
EASTERN EUROPE	348	353	329	330	330	340	340	360	400	1.1	-1.0	1.9
DEVELOPING	612	1,056	1,504	1,639	1,720	1,755	1,755	2,075	2,440	5.7	5.4	3.1
ASIA	217	413	699	782	832	850	860	1,020	1,110	6.2	6.3	2.7
KOREA, REPUBLIC OF	4	79	126	186	195	195	195	210	250	...	24.7	2.3
AFRICA	144	191	197	202	205	210	205	225	250	3.8	1.9	1.7
AMERICA	185	341	491	501	525	535	535	640	750	6.4	6.6	3.2
MEXICO	84	144	176	186	195	195	210	230	270	5.5	4.8	2.9
PERU	63	87	156	144	160	165	165	195	230	5.0	7.2	3.7
SOUTHERN EUROPE	66	112	117	154	158	160	153	190	230	5.2	4.9	3.1
YUGOSLAVIA	66	94	102	130	133	140	135	160	180	4.2	3.5	2.5
WORLD	5,201	6,272	6,664	6,883	7,060	7,225	7,195	7,685	8,250	2.7	1.4	1.4

A/ LEAST SQUARES TREND FOR HISTORICAL PERIODS (1961-86); END-POINT FOR PROJECTED PERIODS (1987-2000).
B/ ESTIMATE.

SOURCES: INTERNATIONAL LEAD AND ZINC STUDY GROUP, LEAD AND ZINC STATISTICS (ACTUAL);
WORLD BANK, INTERNATIONAL ECONOMICS DEPARTMENT (PROJECTED).

TABLE A5: ZINC METAL - APPARENT CONSUMPTION BY MAIN COUNTRIES AND ECONOMIC REGIONS

COUNTRIES/ ECONOMIES	ACTUAL				PROJECTED					GROWTH RATES A/		
	1969-71	1979-81	1986	1987/B	1988	1989	1990	1995	2000	1961-86	1970-86	1987 - 2000
	('000 TONS)									(% PER ANNUM)		
INDUSTRIAL	3,839	3,522	3,608	3,645	3,735	3,760	3,750	3,850	3,950	1.1	-1.0	0.6
NORTH AMERICA	1,625	1,096	1,152	1,212	1,265	1,270	1,250	1,280	1,304	-0.5	-3.2	0.6
UNITED STATES	1,523	957	999	1,052	1,100	1,100	1,080	1,100	1,120	-0.9	-3.8	0.5
EEC-10	1,339	1,438	1,457	1,455	1,480	1,490	1,490	1,535	1,585	1.3	0.1	0.7
GERMANY, FED. REP.	394	399	434	452	460	465	468	490	510	1.3	0.5	0.9
FRANCE	228	296	260	247	250	251	245	255	265	1.8	0.6	0.5
UNITED KINGDOM	280	203	182	186	190	188	189	190	195	-1.9	-3.3	0.4
ITALY	172	225	232	245	247	250	252	255	260	3.4	1.3	0.5
JAPAN	631	743	753	728	740	750	760	780	795	4.3	0.9	0.7
NON-MARKET	988	1,484	1,426	1,426	1,440	1,450	1,455	1,570	1,690	4.2	2.3	1.3
USSR	680	1,023	990	990	1,000	1,010	1,010	1,090	1,170	4.6	2.4	1.3
EASTERN EUROPE	308	460	436	436	440	440	445	480	520	3.3	2.1	1.4
DEVELOPING	620	1,224	1,644	1,727	1,815	1,862	1,915	2,265	2,610	6.7	6.2	3.2
ASIA	299	618	929	964	1,010	1,035	1,070	1,285	1,500	6.9	7.6	3.5
AMERICA	166	319	383	423	445	455	470	550	630	6.3	4.6	3.1
SOUTHERN EUROPE	81	132	168	167	170	175	180	200	225	5.9	4.5	2.3
WORLD	5,447	6,230	6,678	6,798	6,990	7,072	7,120	7,685	8,250	2.6	0.9	1.5

A/ LEAST SQUARES TREND FOR HISTORICAL PERIODS (1961-86); END-POINT FOR PROJECTED PERIODS (1987-2000).
B/ ESTIMATE.

SOURCES: INTERNATIONAL LEAD AND ZINC STUDY GROUPS, LEAD AND ZINC STATISTICS (ACTUAL);
WORLD BANK, INTERNATIONAL ECONOMICS DEPARTMENT (PROJECTED).

TABLE A6: ZINC METAL - GROSS EXPORTS BY MAIN COUNTRIES AND ECONOMIC REGIONS

COUNTRIES/ ECONOMIES	ACTUAL				PROJECTED					GROWTH RATES A/		
	1969-71	1979-81	1986	1987/B	1988	1989	1990	1995	2000	1961-86	1970-86	1987 - 2000
	('000 TONS)									(% PER ANNUM)		
INDUSTRIAL	863	1,512	1,636	1,723	1,735	1,770	1,760	1,841	1,941	5.3	4.2	0.9
NORTH AMERICA	302	452	431	445	460	485	480	510	541	3.6	3.4	1.5
CANADA	294	452	427	440	455	480	475	507	539	4.2	3.7	1.6
EEC-10	259	623	733	760	755	760	755	765	780	6.4	6.3	0.2
BELGIUM-LUXEMBOURG	140	170	186	210	212	215	217	217	218	1.7	0.7	0.3
NETHERLANDS	29	154	182	177	175	175	176	178	180	11.7	12.9	0.1
OTHER WESTERN EUROPE	80	189	210	240	240	250	245	270	300	9.0	5.3	1.7
OCEANIA	150	204	237	243	245	245	240	275	310	5.0	2.9	1.9
NON-MARKET	124	82	30	24	24	25	24	24	25	-4.1	-8.9	0.3
USSR	42	45	16	10	10	10	10	10	10	-3.7	-9.4	0.0
EASTERN EUROPE	83	37	14	14	14	15	14	14	15	-4.5	-8.5	0.5
DEVELOPING	311	342	438	447	453	455	450	560	673	2.9	1.8	3.2
AFRICA	111	94	94	83	85	85	86	92	93	0.6	-1.2	0.9
AMERICA	99	124	191	185	195	190	180	210	275	4.7	6.2	3.1
MEXICO	40	53	81	89	95	92	89	111	135	4.4	3.9	3.3
PERU	57	70	105	87	90	89	81	99	140	4.3	7.7	3.9
SOUTHERN EUROPE	24	27	23	39	40	39	40	41	40	6.8	-2.1	0.2
WORLD	1,298	1,936	2,104	2,194	2,212	2,250	2,234	2,425	2,639	4.1	3.0	1.4

A/ LEAST SQUARES TREND FOR HISTORICAL PERIODS (1961-86); END-POINT FOR PROJECTED PERIODS (1987-2000).
B/ ESTIMATE.

SOURCES: INTERNATIONAL LEAD AND ZINC STUDY GROUPS, LEAD AND ZINC STATISTICS (ACTUAL);
WORLD BANK, INTERNATIONAL ECONOMICS DEPARTMENT (PROJECTED).

TABLE A7: ZINC METAL - GROSS IMPORTS BY MAIN COUNTRIES AND ECONOMIC REGIONS

COUNTRIES/ ECONOMIES	ACTUAL				PROJECTED					GROWTH RATES A/		
	1969-71	1979-81	1986	1987/B	1988	1989	1990	1995	2000	1961-86	1970-86	1987 - 2000
	('000 TONS)									(% PER ANNUM)		
INDUSTRIAL	880	1,188	1,412	1,450	1,540	1,500	1,470	1,581	1,706	3.4	1.5	1.3
NORTH AMERICA	280	518	674	712	740	740	690	735	775	7.5	3.3	0.7
UNITED STATES	279	514	666	706	735	735	685	732	772	7.5	3.3	0.7
EEC-10	489	546	541	545	535	525	520	565	615	1.3	-0.1	0.9
OTHER WESTERN EUROPE	82	65	78	80	100	100	95	100	100	-0.2	-1.8	1.7
NON-MARKET	88	126	126	126	84	75	79	94	90	2.9	2.9	-2.6
DEVELOPING	347	490	625	658	630	675	685	750	843	5.6	4.7	1.9
ASIA	212	323	446	460	440	460	465	530	600	7.5	7.9	2.1
AMERICA	47	96	60	82	95	110	115	120	125	1.8	0.4	3.3
SOUTHERN EUROPE	69	50	91	91	70	70	80	85	90	6.4	-2.4	-0.1
WORLD	1,315	1,804	2,163	2,234	2,254	2,250	2,234	2,425	2,639	3.9	2.4	1.3

A/ LEAST SQUARES TREND FOR HISTORICAL PERIODS (1961-86); END-POINT FOR PROJECTED PERIODS (1987-2000).
B/ ESTIMATE.

SOURCES: INTERNATIONAL LEAD AND ZINC STUDY GROUPS, LEAD AND ZINC STATISTICS (ACTUAL);
WORLD BANK, INTERNATIONAL ECONOMICS DEPARTMENT (PROJECTED).

TABLE A8: ZINC - PRICES, 1950-87 (ACTUAL) AND 1988-2000 (PROJECTED)

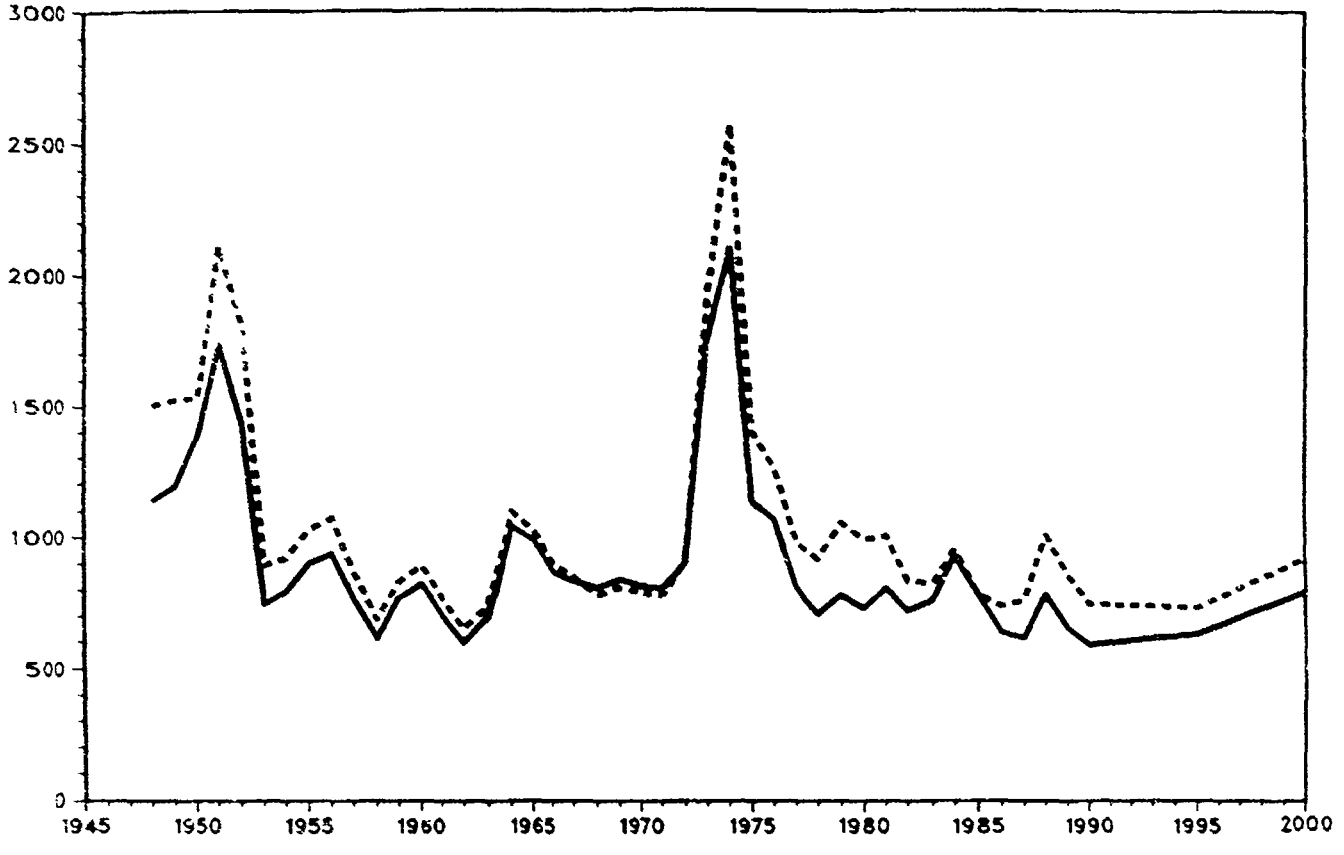
	($/Ton)		($/Ton)			
	Current $		1985 Constant $ MUV a/		1985 Constant $ US GNP b/	
	US Producer Price c/	LME Settlement d/	US Producer Price c/	LME Settlement d/	US Producer Price c/	LME Settlement d/
Actual						
1950	306	328	1,293	1,386	1,429	1,532
1951	397	473	1,455	1,733	1,769	2,108
1952	357	412	1,248	1,441	1,567	1,809
1953	239	207	860	745	1,033	895
1954	235	216	864	794	1,000	919
1955	271	250	978	902	1,116	1,030
1956	297	269	1,035	937	1,184	1,072
1957	251	225	857	768	966	866
1958	227	182	762	611	856	686
1959	252	226	858	769	926	831
1960	285	247	950	823	1,030	893
1961	254	214	833	701	909	766
1962	256	185	823	594	897	648
1963	264	212	865	694	912	732
1964	299	324	963	1,043	1,016	1,101
1965	320	311	1,023	994	1,060	1,030
1966	320	282	988	871	1,024	902
1967	305	273	931	833	949	850
1968	298	262	918	807	883	777
1969	322	287	942	839	906	807
1970	337	295	927	805	897	785
1971	355	309	927	807	895	779
1972	391	377	937	903	941	907
1973	455	851	941	1,759	1,027	1,921
1974	792	1,239	1,344	2,102	1,642	2,568
1975	859	743	1,311	1,134	1,620	1,401
1976	816	712	1,229	1,072	1,447	1,263
1977	758	591	1,039	810	1,260	983
1978	683	593	813	706	1,056	919
1979	822	742	864	780	1,170	1,056
1980	825	761	791	730	1,077	993
1981	982	846	936	807	1,169	1,007
1982	848	745	820	720	949	833
1983	912	764	906	759	982	823
1984	1,072	922	1,082	932	1,110	956
1985	890	783	890	783	890	783
1986	838	754	708	637	822	739
1987	924	799	711	615	880	761
Projected						
1988		1,100		782		1,008
1989		975		652		854
1990		895		590		746
1995		1,140		630		732
2000		1,800		794		922

a/ Deflated by Manufacturing Unit Value (MUV) Index.
b/ Deflated by US GNP deflator.
c/ Prime Western Zinc, East St. Louis. Beginning January 1971 delivered consumer plant. Beginning September 1980 high grade. According to Engineering and Mining Journal to 1966; Metals Week from 1967 on. Also Metallgesellschaft, Metal Statistics.
d/ Metals Week and Metallgesellschaft, Metal Statistics. Beginning September 1984, high grade, previously GOB.

Sources: See footnotes for actual; World Bank, International Economics Department (projected).

ZINC

(CONSTANT 1985 DOLLAR PRICES *)



——— DEFLATED BY MANUFACTURING UNIT VALUE (MUV) INDEX

- - - - - - - - - - DEFLATED BY U.S. GNP DEFLATOR.

* 1948 – 87 ACTUAL ; 1988 – 2000 PROJECTED .

SOURCE : WORLD BANK , INTERNATIONAL ECONOMICS DEPARTMENT .

GOLD

1. Diminishing fears of inflation, declining petroleum prices, and improvements in the US balance of trade have pushed gold prices downward throughout most of 1988. Still, average gold prices for the first half (US$452.70/troy ounce) were higher than the annual average for 1987 (US$446.50/troy ounce). Downward pressures became much more dominant in the third quarter, and gold prices sustained a substantial decline to an estimated third-quarter average of US$430/troy ounce. Gold fell below the US$400/troy ounce level in mid-September, a level not experienced since February 1987.

2. The weakness in petroleum prices seems to have been an important factor in the slide in gold prices. Indirectly, the lower petroleum prices have offset other inflationary forces. Directly, the lower oil prices have reduced Middle East demand for gold. As well, they have induced the USSR to sell more gold and other commodities to counter the decline in its oil export revenues. If, as reported, the USSR intends to purchase additional large quantities of grains in the near term, this should lead to increased gold sales by the USSR.

3. World gold production continues to grow, and the strong demand from the Far East experienced in the first half of 1988 seems to be weakening. Taiwan, China, imported 268 tons of gold bars and coins during the first seven months of 1988 but its demand for the remainder of the year should be significantly smaller (about 55 tons) as Taiwan, China, gets closer to its goal of diversifying its official reserves out of US dollars. This activity by Taiwan, China, illustrates the point that central banks can have a significant impact on the market as their net activities determine how much gold will be available to the investor.

Supply

4. Gold production has been expanding rapidly in recent years, largely in response to the shift in relative metals prices in favor of gold. 1/ Expansion and exploration activities continue, in particular in North America and Australia. South African production declined in 1987 due to a combination of lower grades and the failure of the industry to increase the volume of ores mined. The South African decline was more than offset by other major producers, in particular in the United States, Canada, Australia, and Brazil. Other smaller, but still important, producers are the Philippines, Papua New Guinea, Colombia, Chile, and Venezuela. In the United States and Canada gold output surpassed 3.8 million ounces in 1987, and the intensive exploration activity is expected to continue because prices are high relative to average production costs. Australian output increased not only because of

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1/ The index of the ratio of gold prices to the average of the prices of nonferrous base metals increased from around 100 in the 1981-84 period to 112 in 1986 and 117 in 1987.

higher gold prices but also because of more favorable tax laws. Since 1980 its output has increased fivefold. Brazil's output has doubled over the same period.

5. The USSR and China are major producers of gold, though their supplies fluctuate considerably. For the USSR the sale of gold is an important means of obtaining foreign exchange in order to finance its imports--in particular agricultural imports. Both China and the USSR are expected to increase their mine production, and total production in the CPEs is expected to reach about 15.5 million ounces by 1990.

6. Other sources of gold supplies are secondary supply and official transactions. Secondary supply from recycling has increased since 1981 as it is price sensitive. It is also governed by a combination of changing economic circumstances which at times can lead to distress selling. In the past few years supplies from this source have been governed mostly by profit taking as prices have risen. Net official transactions (outisde the CPEs) in 1987 forced down market supplies though to a lesser extent than in 1985 and 1986.

Demand

7. Demand for gold is made up of fabricated demand (jewelry, electronics, dentistry, and other industrial uses) and investment demand (officially issued coins, bullion, and medallions). Fabricated demand has increased in this decade, though it has declined in the past two years. Jewelry accounts for nearly 82% of total fabricated gold. Since the drop in jewelry consumption in 1979-80, when gold prices rose dramatically, jewelry demand has risen by 4.7% p.a. The Middle East and Far East, in particular India and Japan, have increased their share of jewelry consumption in this decade--growing from less than one-third to almost one-half of total demand. Jewelry sales are a function of net disposable income. Even though we expect in the short term a slower industrial growth rate, the demand for jewelry should increase--in particular in light of lower gold prices in most of the currencies other than the US dollar.

8. The use of gold in electronics is around 9% of total fabricated demand. The major users are Japan, the United States, and the Federal Republic of Germany. The use of gold in dentistry accounts for about 3.5% of total fabricated demand.

9. The demand for gold in official coins and medallions fluctuates. The year 1986 saw a peak in demand for coinage with consumption of 10.9 million ounces. Demand fell to about 7.2 million ounces in 1987.

Price Outlook

10. The forecasts of gold (and silver) prices have been made on the basis of our understanding of the cycles inherent in the historical price series, the relationship between inflation rate and exchange rate movements and gold and silver prices, and expected changes in the supply and demand for the metals.

11. The decline in gold prices in the first quarter of 1988 interrupted an upward trend experienced since February 1985. We expect the gold price to begin to increase towards the end of the year as inflation is expected to strengthen. The slower industrial growth rate expected in the industrial countries and the increased exploration and production activity as a result of the higher relative prices for gold will have a dampening effect in 1989, which should become more dominant in 1990. With the dollar expected to appreciate in the early 1990s, price increases in the United States are expected to be relatively low in the early 1990s. The combination of these factors point to a lower gold price in 1990 and 1991 and a slow rebound in 1992. For the longer term, gold prices should advance slowly from 1992 to 1995 with inflation continuing at a moderate pace. In the 1995-2000 period, with the value of the US dollar declining and the US inflation rate at a higher level, we should see gold prices increasing at a faster pace. The price forecasts are set out in the table below.

PRICE FORECASTS FOR GOLD

Year	(US$/Troy Ounce) Current $	1985 Constant $ a/
1987	446.6	344.0
1988	440.0	313.0
1989	430.0	288.0
1990	380.0	250.0
1991	360.0	234.0
1992	368.0	234.0
1995	420.0	232.0
2000	520.0	229.0

a/ Deflated by the Manufacturing Unit Value (MUV) Index.

SILVER

1. Unlike gold prices, silver prices do not seem to have benefited from the devaluation of the US dollar since early 1985. For the period 1984-86 fundamentals in the silver market seemed to be a more dominant factor in silver price determination than speculative inventory investment. As inflationary expectations built up in the first half of 1987, however, the speculative aspects of precious metals asserted themselves; silver prices in 1987 averaged 28% higher than in 1986. During the first half of 1988, the silver price averaged US$6.60/ounce--below the average for 1987 (US$7.01/ounce). Since February, 1988 silver has had an upward trend. It surged in June/July to levels above US$7/ounce as it responded strongly to the increase in agricultural commodity prices in the wake of the US drought.

2. Observation of the gold/silver price ratio (see Figure 1) shows that silver prices have generally been declining relative to the gold price since around 1981. In 1986 the ratio was above 70:1. It is believed that the ratio will fluctuate around 60:1, a significantly higher ratio than in the 1970s. Even though this increase in the ratio might be an indication that silver is losing its precious metals characteristics and becoming more like the base metals, silver remains sensitive to changes in the economic environment, inflationary expectations, and political unrest. Therefore, its link to gold will continue.

Supply

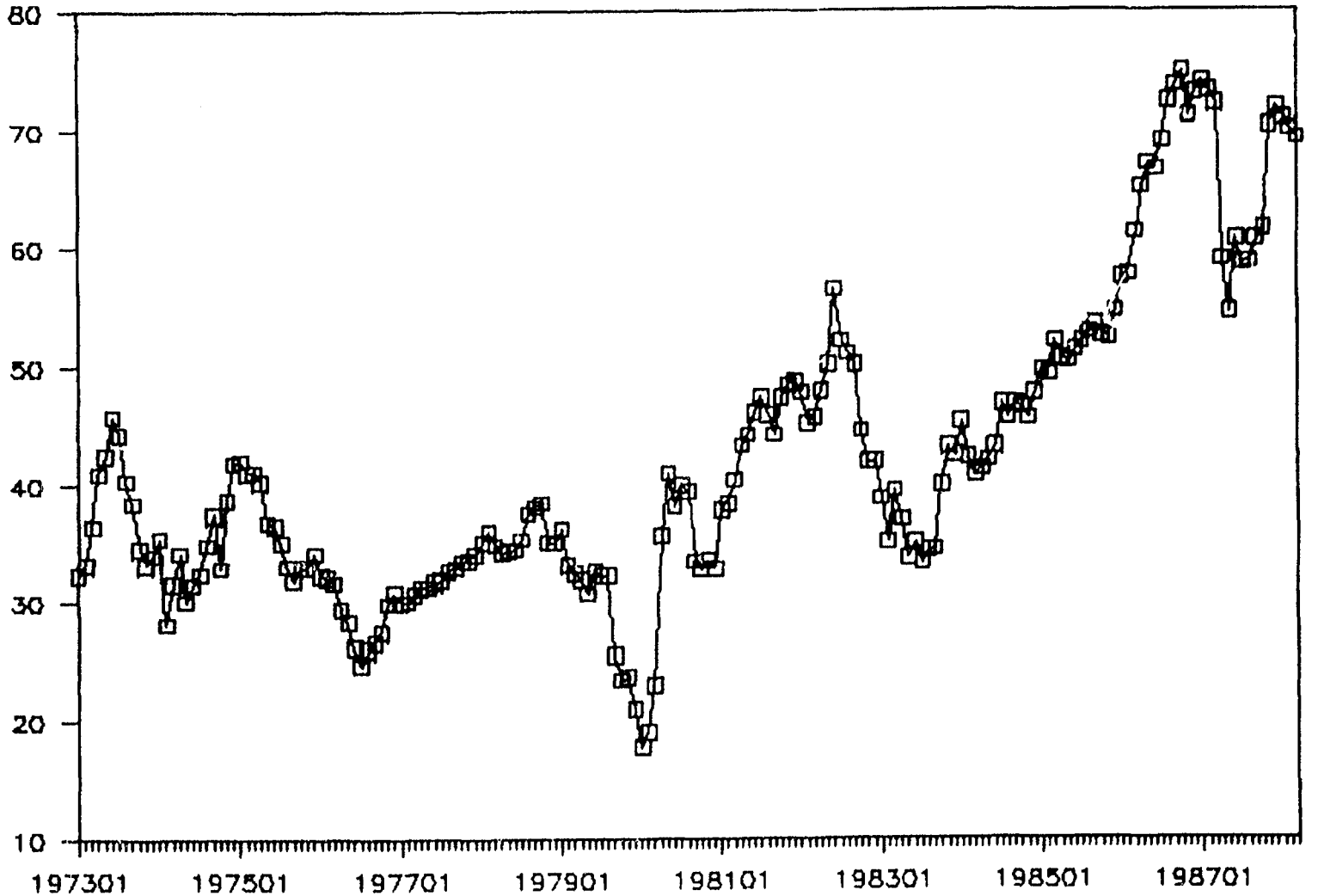
3. Silver is a by-product or coproduct of other metals. Some two-thirds of silver reserves are contained in lead, zinc, and copper sulfides, while only about 25% originates from pure silver mines. Mine production is the largest source of supply. It has accounted for nearly 70% of total supply over the past few years. Other sources of supply are: secondary recovery, coin melt, South Asian dishoarding, and sales from government stocks. The supply of the secondary source is price sensitive, in particular the recovery of scrap. Scrap supplies peaked in 1980 when silver prices peaked. The coin melt and South Asian dishoarding have lost importance as sources of supply in the past few years. Under our price scenario their share of secondary supplies remains relatively small.

4. Since 1976 world mine production has increased at an average annual growth rate of 2.9%. 1/ World mine production peaked in 1984, declined slightly in 1985 and 1986, but recovered in 1987 when the silver price recovered. The major producing countries are Mexico (17.2%), Peru (14.3%), Canada (9.1%), United States (7.9%), Australia (7.5%), and the USSR (11.9%). 2/ Smaller producers are Chile, Japan, Spain, and South Africa.

1/ Metallgesellschaft.

2/ Ibid.

FIGURE 1: GOLD/SILVER RATIO



Source: World Bank.

Because of their low-cost production, Mexico and Peru are expected to maintain, if not increase, their current level of mine production. Moreover, they are increasingly using their silver as a means of obtaining hard currency.

5. In 1987 mine production picked up in North America and Australia, due to increased production of base metals and also because of the start-up of new silver mining capacity as silver prices increased. As long as prices remain above US$5.50/ounce (the level of average production costs for a range of mines in the United States for mid-1986) it seems unlikely that production will drop.

6. Though the USSR is one of the major silver producers, the USSR and other CPEs have been either almost nonactive in world trade or net importers in the 1980s. In previous periods they had been net exporters. Judging from the incomplete data available it seems that their consumption has grown while their production has remained static. However, as oil prices were much higher prior to 1986, they may not have needed to produce silver for foreign exchange purposes. Moreover, it is unclear to what extent they built up stocks during this period.

Consumption

7. World consumption of silver has increased modestly since 1983, though the level of consumption is significantly smaller than it was ten years ago. Reduced jewelry demand and more efficient use of silver in photography after the 1979-80 high-price period appear to be the main reasons for the reduction in consumption since 1977.

8. The major users of silver are the United States, the major countries in Europe (France, the Federal Republic of Germany, the United Kingdom, and Italy), and Japan. The major EEC countries as a group have experienced modest growth rates over the past five years, and their level of consumption is still much lower than it was ten years ago; so, too, is the consumption of the United States. Japan's consumption has maintained its general upward trend and its consumption level in the mid-1980s was higher than ever.

9. The composition of world silver consumption is as follows: photography (45%), currently the dominant user of silver; electronics, about 17%; jewelry and silverware, 14%. The end-use composition in the United States is photography 50%, electronics 22%, and jewelry and silverware 10%. In the major European countries photography has 35%, electronics 21%, and jewelry and silverware 25%. The composition of end-use in Japan is photography 60%, electronics 10%, and jewelry and silverware 1%. As can be seen, for the industrial countries the photographic sector is the largest industrial consumer of silver with the main uses in x-rays, photography, and graphic arts.

10. In the absence of improved efficiency in use, the consumption of the major European countries for photographic purposes has the potential to increase—perhaps reaching a share close to that of the United States. There is also potential for higher demand by the photography sector, both in the

United States and in Japan, through a combination of an increase in the number of photographs taken by individuals as well as by industrial and medical users. There is also potential for increased demand by the developing countries as the standard of living increases and medical services improve.

11. The electronics sector also has potential for growth in silver consumption. In Japan in recent years there has been a shift from consumer goods such as televisions and stereo equipment towards industrial products--robots and office equipment (microchips and circuit boards)--which are greater users of silver.

12. However, the intensity of use of silver in industry will be subject to continuing technological innovation. In the industrial countries there will continue to be a trend towards replacing electromechanical switching systems in telephone exchanges with electronic devices, more widespread use of miniaturization, new manufacturing processes, and improved contact lifetime. All these improvements in efficiency will have a negative impact on silver consumption.

13. The jewelry and silverware industry has suffered a general decline in its consumption level as compared to the level experienced ten years ago. The demand for costume jewelry, which is a cheap substitute for silver jewelry, has increased (stainless steel, brass, and wood). Silver is at a disadvantage; it has an image of being cheap relative to other precious metals such as gold and platinum and it tarnishes on exposure. However, the current lower silver prices might encourage consumers' interest in silver as jewelry.

Price Outlook

14. Silver prices averaged US$6.60/ounce in the first half of 1988. The surge in agricultural prices generated substantial activity in silver, leading to a better performance than gold over the summer months. We expect the silver price to average US$6.65/ounce in 1988. In 1989 the price of silver should move up as we expect relatively healthy demand and sustained inflationary concerns.

15. By 1990 the fundamentals point to downwards pressure on the price; industrial demand is expected to be weak and mining output is expected to increase. Inflation should be moderating, and the gold price should be weakening. Therefore, prices are projected to decline in 1990 and 1991 but begin to move upward again in 1992. The long-term silver price cycles we have identified are similar to those for gold, so we have adopted much the same rate of change for silver prices for the period 1992-2000 as for gold. The silver price forecasts are shown in the following table.

PRICE FORECASTS FOR SILVER

Year	(US$/Troy Ounce) Current $	1985 Constant $ a/
1987	7.01	5.40
1988	6.60	4.70
1989	7.20	4.80
1990	6.90	4.50
1991	6.70	4.30
1992	6.90	4.40
1995	7.80	4.30
2000	9.70	4.30

a/ Deflated by the Manufacturing Unit Value (MUV) Index.

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