



よりよい明日を、世界の人々と。

都市の発展と環境

—行政・社会ファクターの観点から—

—タイ国バンコクの事例—

2005年11月25日

独立行政法人 国際協力機構
地球環境部 第三グループ(水資源・防災)
安達 —

I. バンコク首都圏の都市変化

1-1 バンコクの都市化傾向(1971-1991)

- 北部、東部、南部方向への拡大
- 中央地区より幹線道路沿いに都市化拡大 「アーバンスプロール」「リボン型」

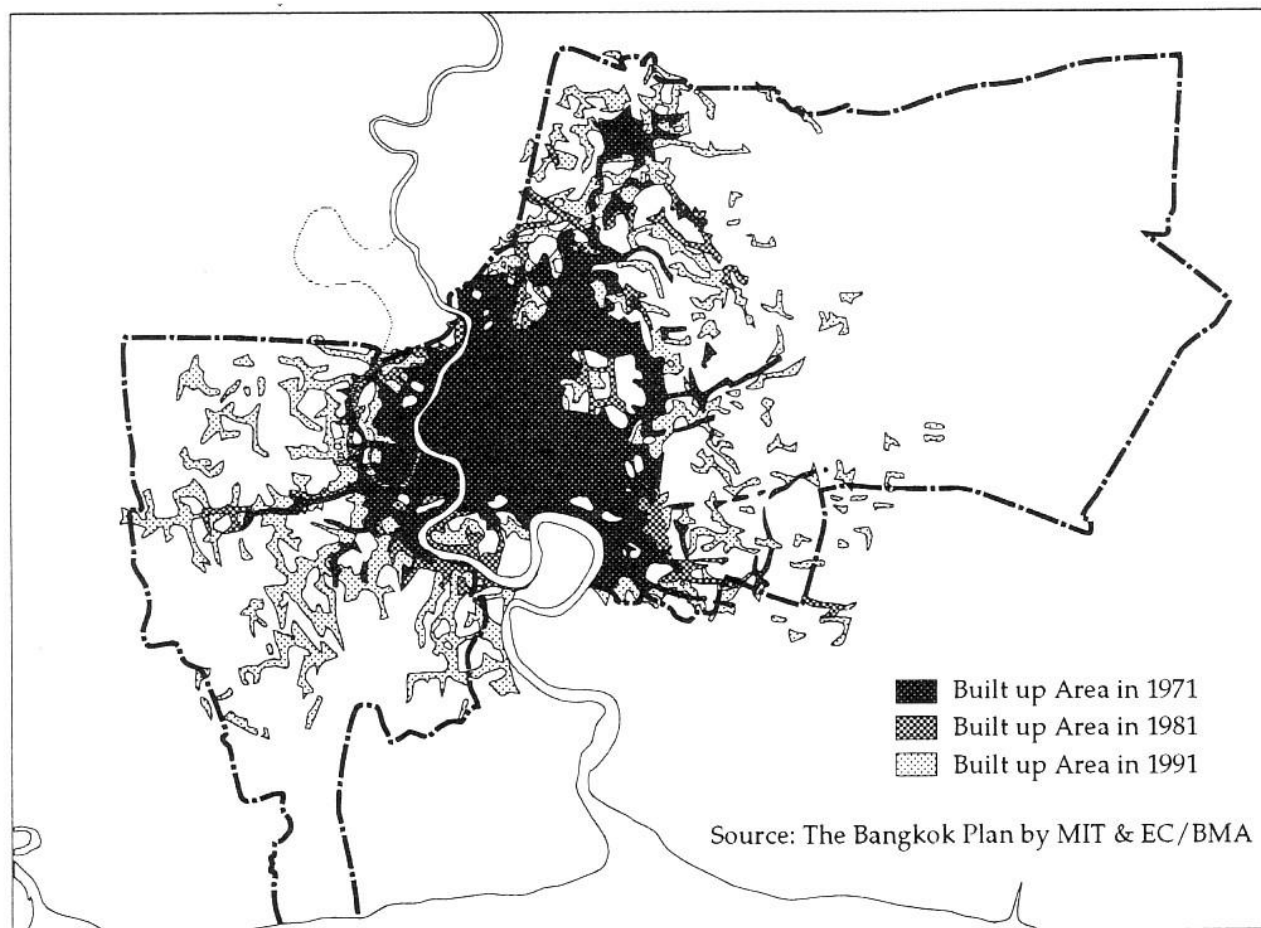


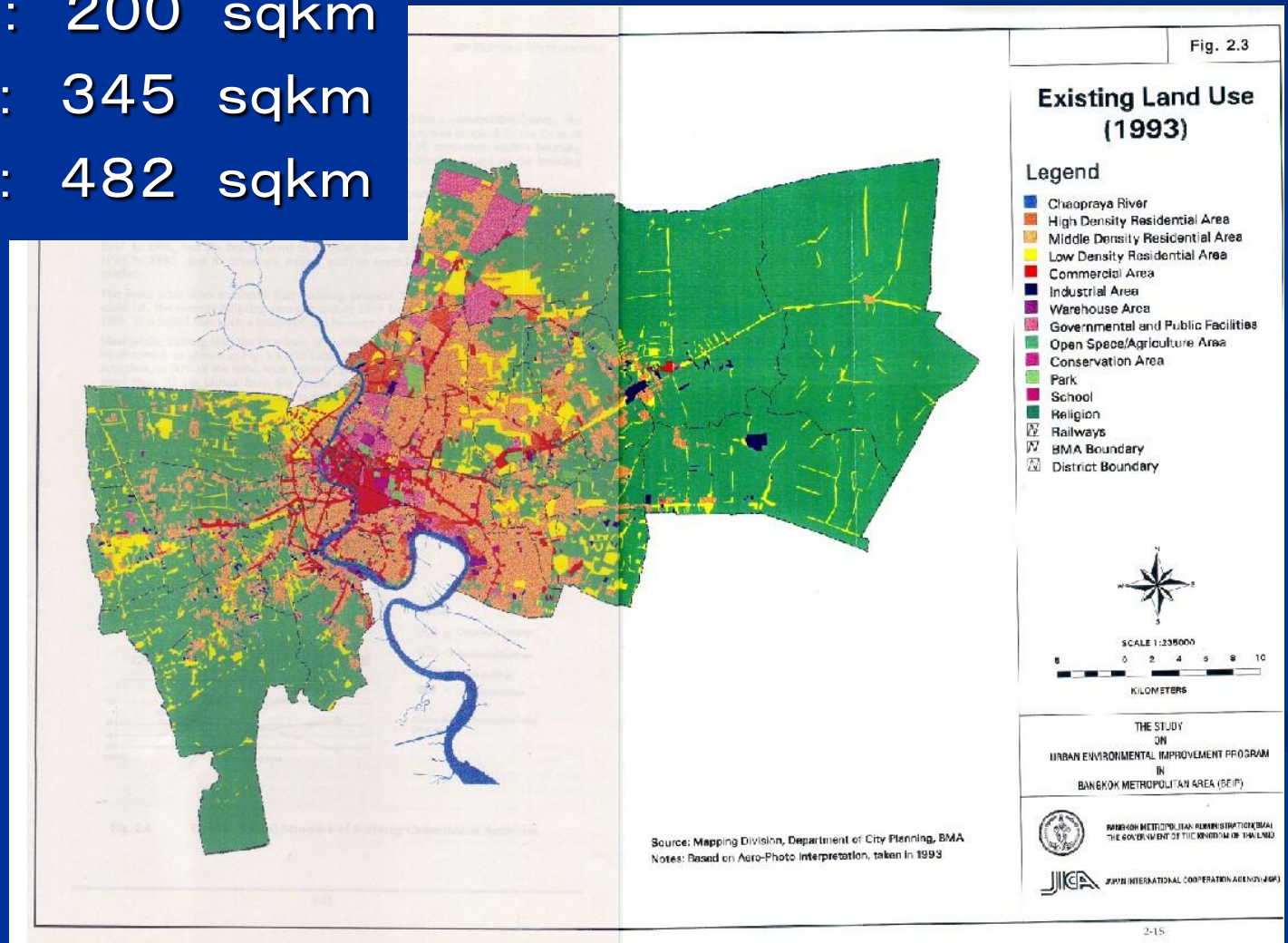
Fig. 2.2

Bangkok Urbanization Process From 1971 to 1991

I. バンコク首都圏の都市変化

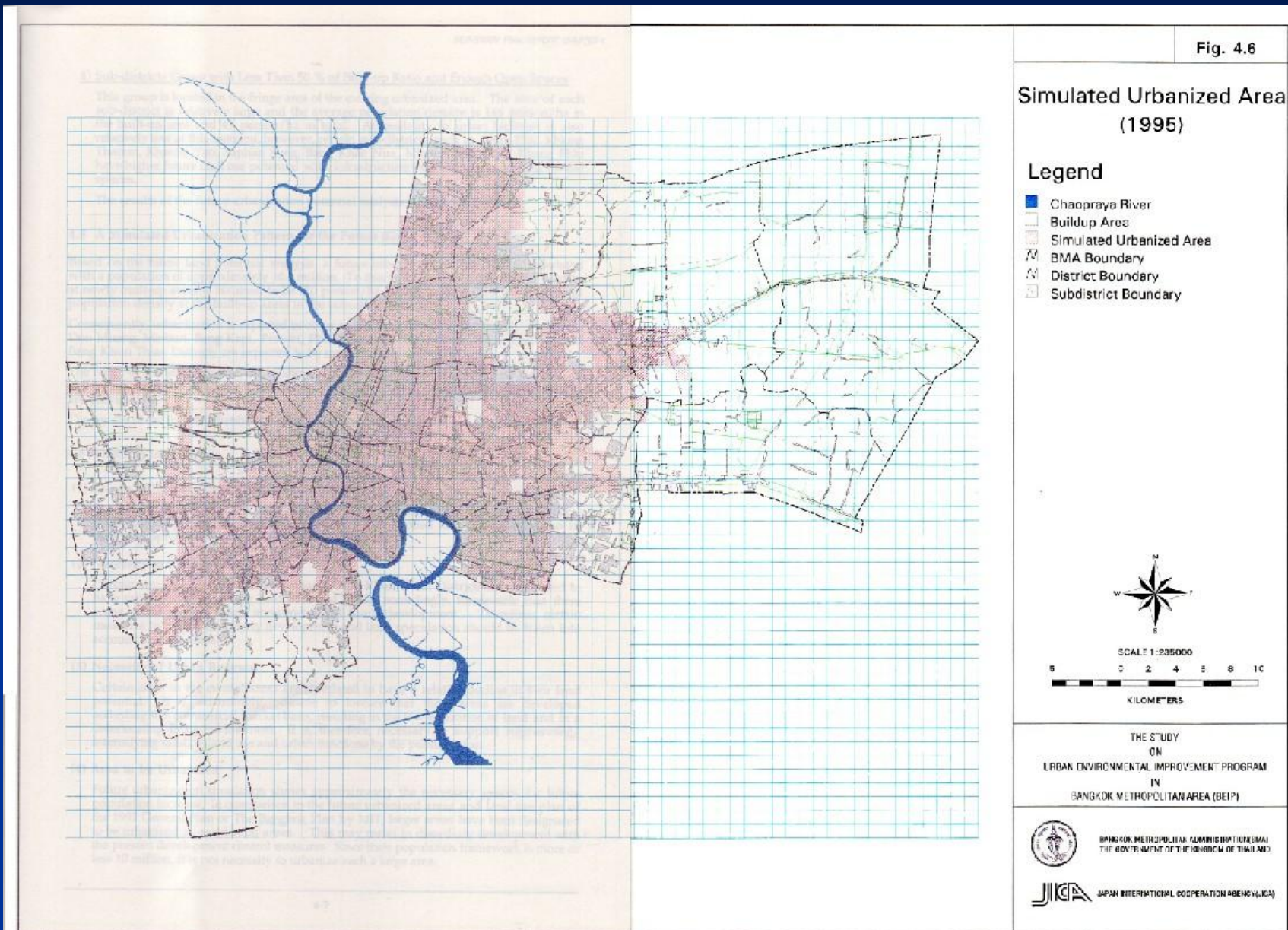
1-2 バンコクの市街化区域の拡大

- 1950年代: 100 sqkm
- 1970年代: 200 sqkm
- 1980年 : 345 sqkm
- 1993年 : 482 sqkm



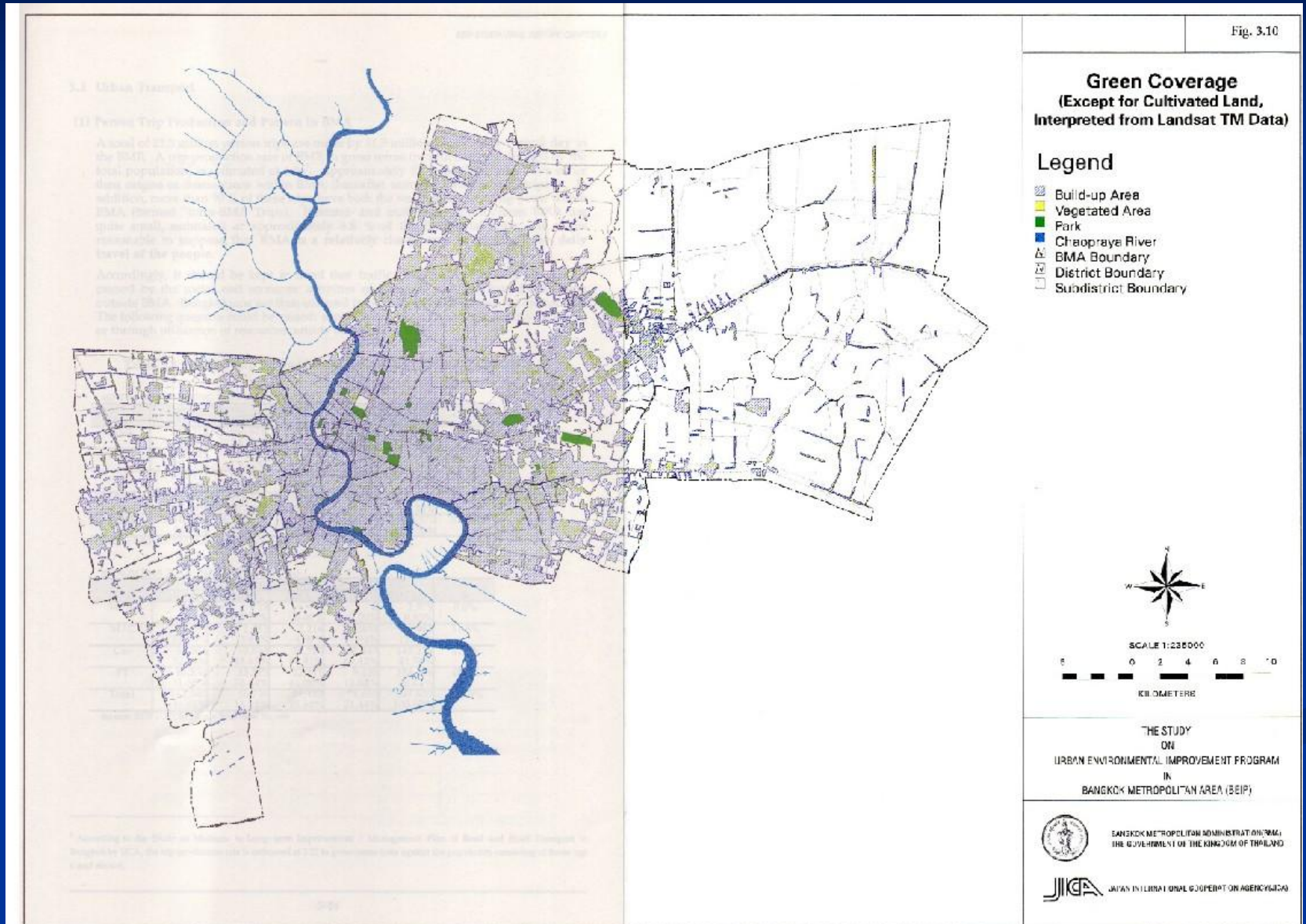
I. バンコク首都圏の都市変化

1-3 都市化地域(1995年推定)



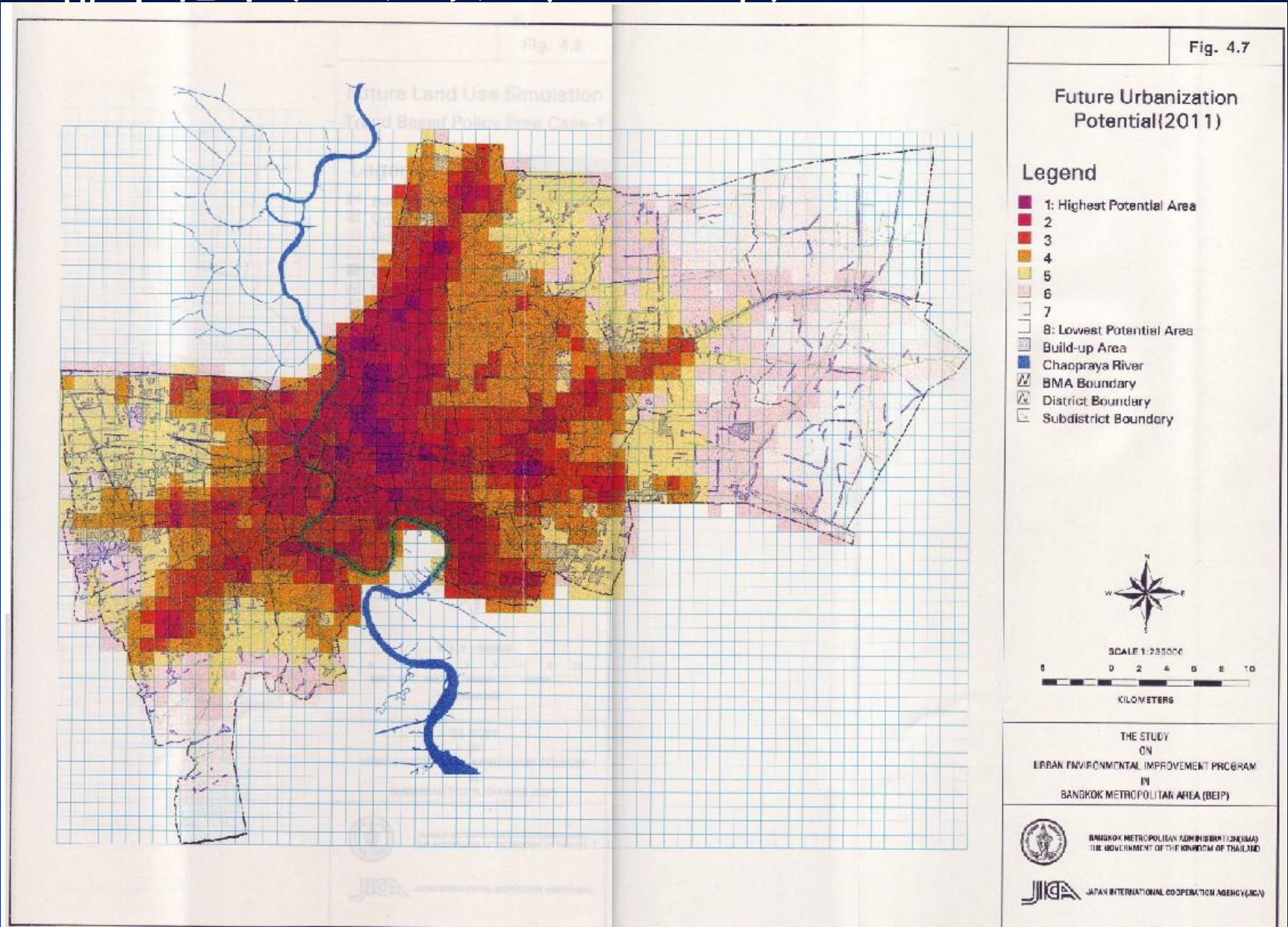
I. バンコク首都圏の都市変化

1-4 緑化地域(1995年)



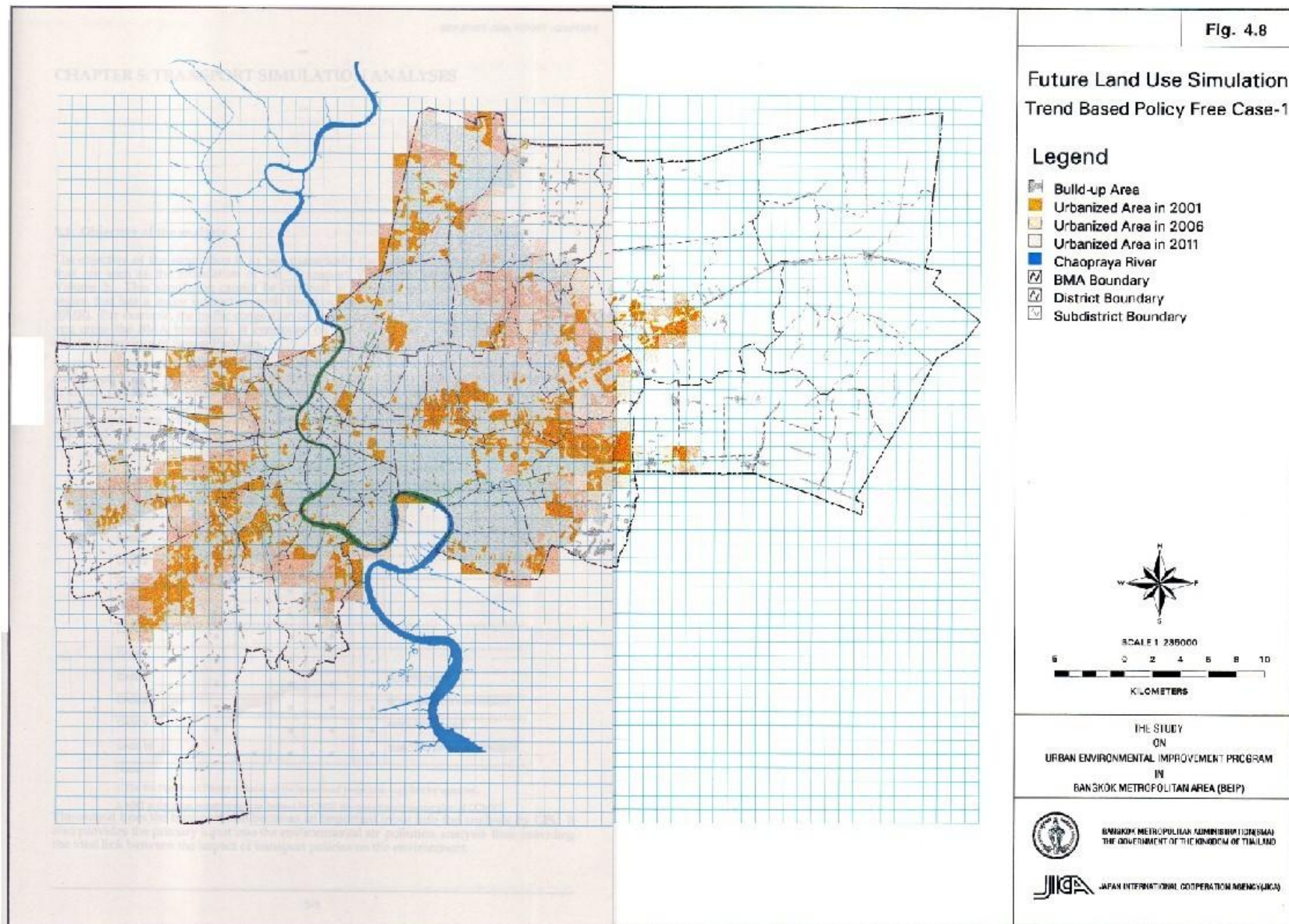
I. バンコク首都圏の都市変化

1-5 都市化ポテンシャル(2011年)



I. バンコク首都圏の都市変化

1-6 土地利用シミュレーション(~2011年)



I. バンコク首都圏の都市変化

1-7 タイ政府の都市拡大構想

★Decentralization
Chao Phraya Multipolis
Structure Plan (NESDB, 1994)

・3 New Center:

- Lat Krabang Center,
- NHA New Town,
- Chachaengsao West Complex

★Re-allocation

★Re-distribution

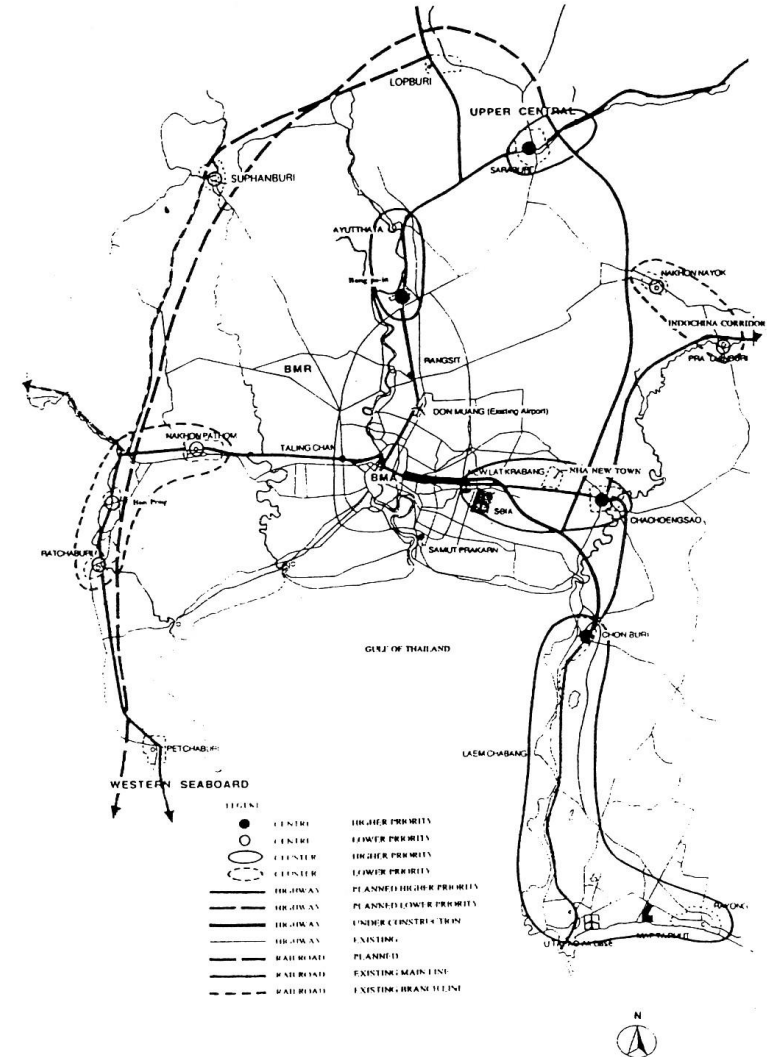
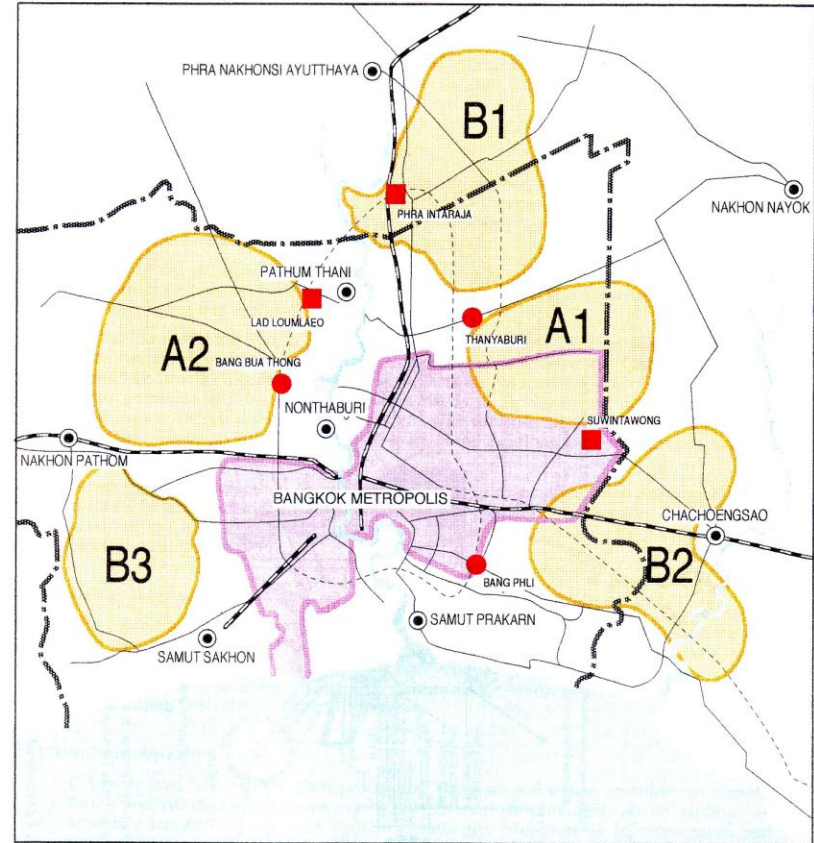


Fig. 9.1 A General Spatial Framework of the Extended BMR (NESDB)

I. バンコク首都圏の都市変化

1-8 タイ政府機関によるNew Town計画



LEGEND :

DTCP Proposal New Cities

■ Most recently proposed new city development

● Previously proposed and / or under-considering location of satellite town / new city development

NHA Proposal New Towns

Area "A" : Suitable Location For Semi-self Contained New Town & Self-contained New Towns

Area "B" : Suitable Location for self-contained New Town

Source : "City Planning As A Method to Solve Traffic Problem, 1995", Department of City & Country Planning (DTCP), and National Housing Authority (NHA)

Fig. 9.4 Proposed New Cities and New Towns by NHA and DTCP

I. バンコク首都圏の都市変化

1-9 BMA's 3 Sub-center zoning Plan

①Lat Krabang Center, ②NHA New Town, ③Chachaengsao West Complex

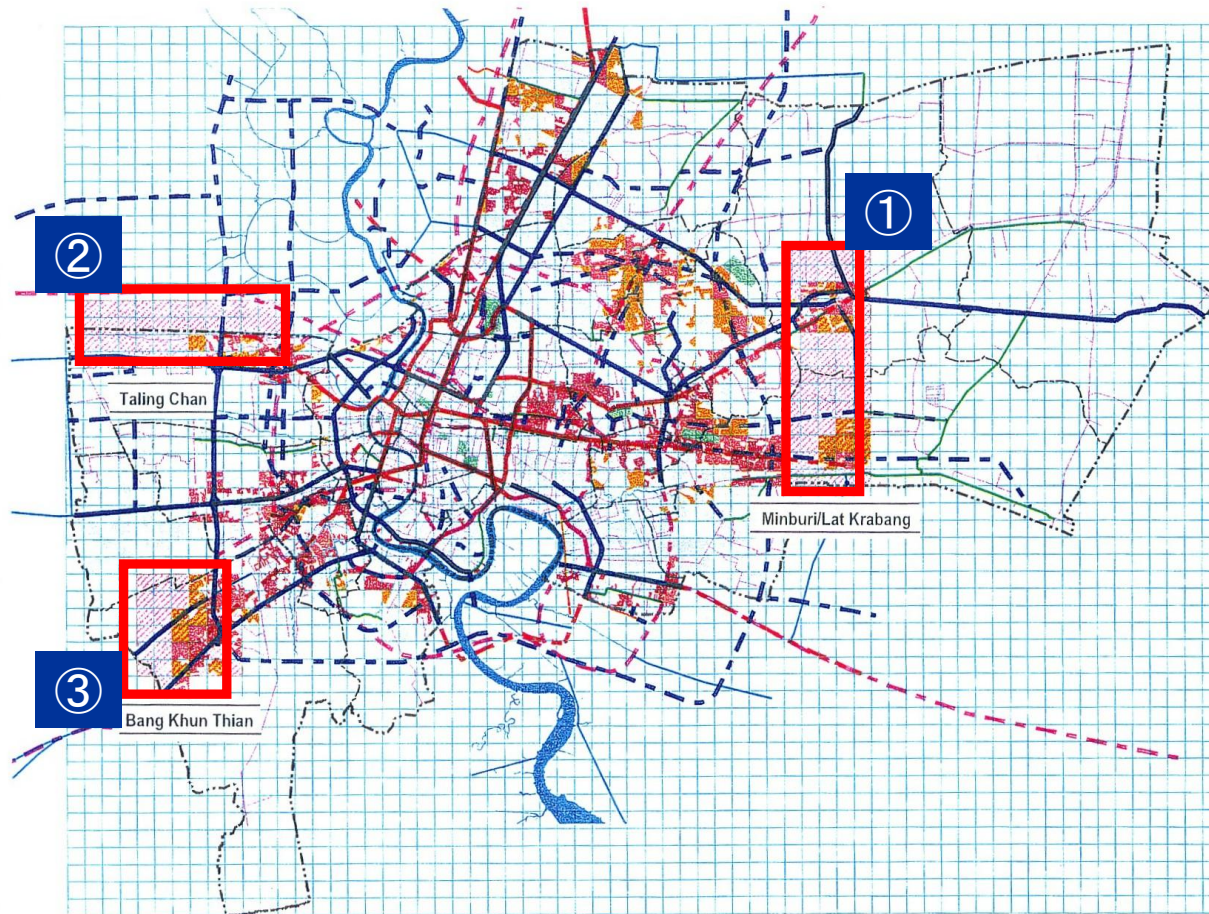


Fig. 9.7

Proposed Locations of
Development of Three
Subcenter Zones

Legend

- Current Buildup Area
- Park
- Urbanized Area in 2001
- Urbanized Area in 2006
- Urbanized Area in 2011
- Existing Road (Class 1, 2)
- Existing Road (Class 3)
- Existing Expressway
- MRT Systems
- MRT Systems Expansion
- Expressway in 2000
- Improvement of Existing Road (DOH)
- New Road in 2000 (DOH)
- Improvement of Existing Road (BMA)
- New Road in 2000 (BMA)
- Improvement of Existing Road (PWD)
- New Road in 2000 (PWD)
- BMA Boundary
- District Boundary
- Chaopraya River



SCALE 1:235000

5 0 2 4 6 8 10

KILOMETERS

THE STUDY
ON
URBAN ENVIRONMENTAL IMPROVEMENT PROGRAM
IN
BANGKOK METROPOLITAN AREA (BEIP)



BANGKOK METROPOLITAN ADMINISTRATION (BMA)
THE GOVERNMENT OF THE KINGDOM OF THAILAND



JICA JAPAN INTERNATIONAL COOPERATION AGENCY (JICA)

I. バンコク首都圏の都市変化

1-10 バンコク首都圏拡大空間構造コンセプト(JICA提案)

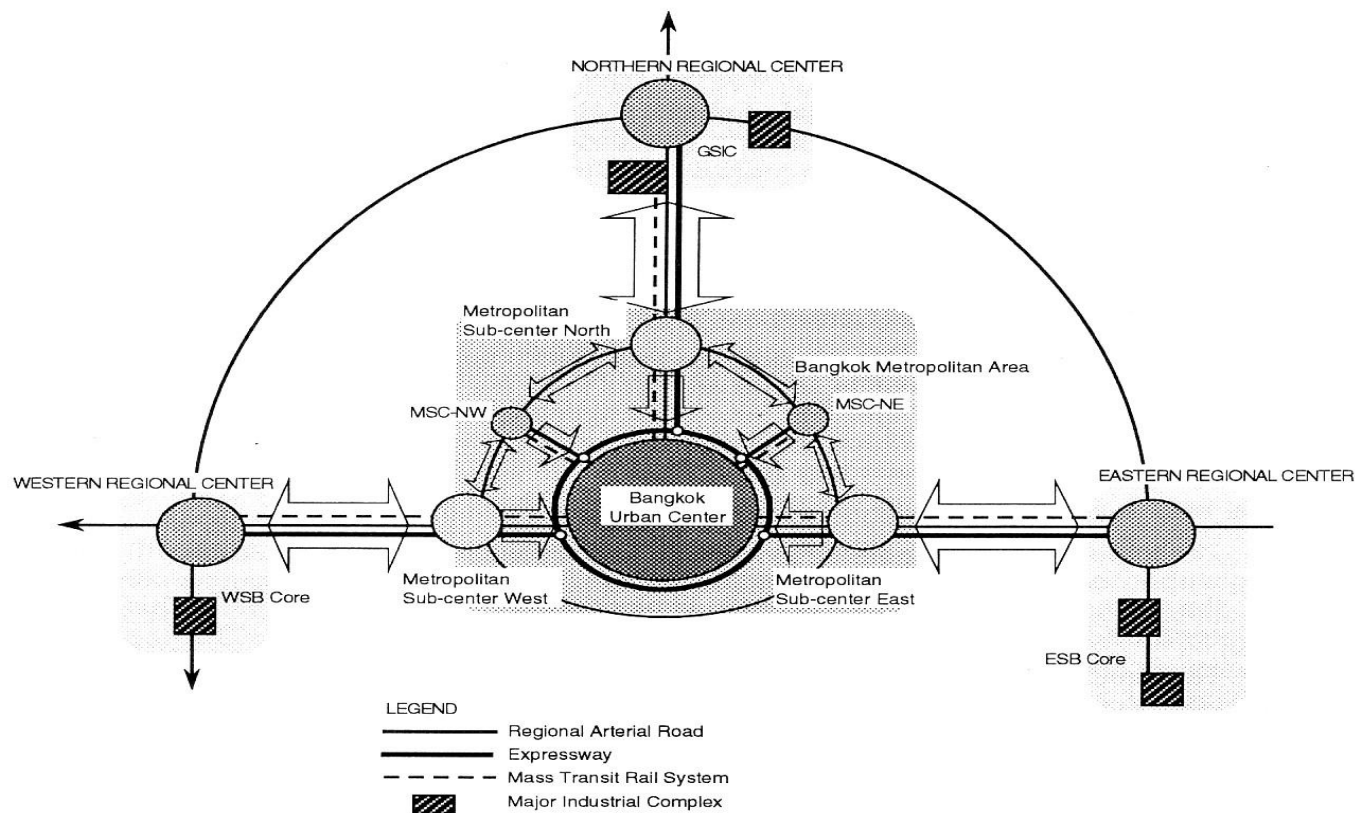
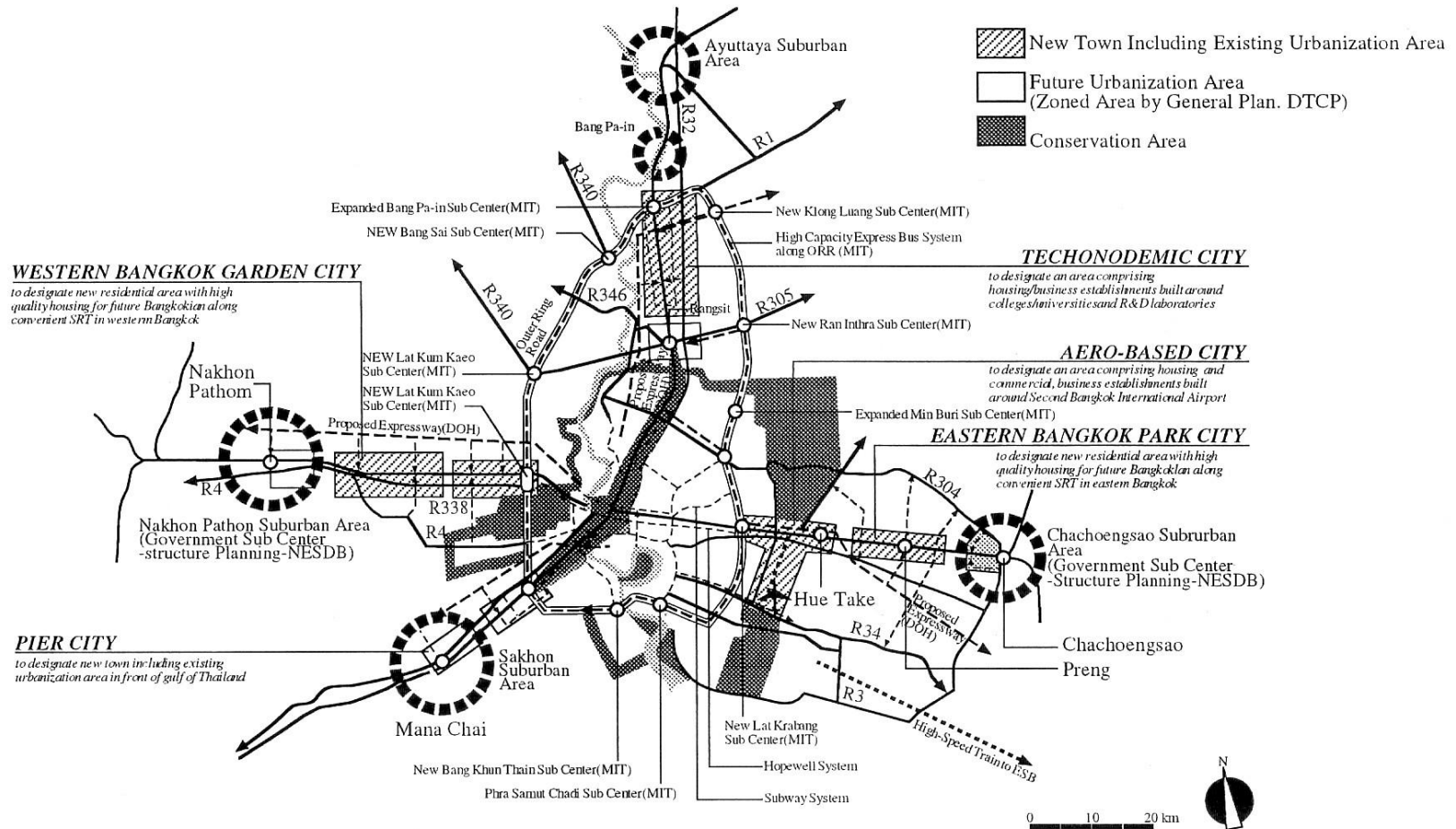


Fig. 9.2 A Conceptual Regional Structure for the Greater Bangkok Metropolis

I. バンコク首都圏の都市変化

1-11 鉄道モードによる首都圏再編フレーム (JICA提案)



Source: "An Improvement Plan for Railway Transport in and Around the Bangkok Metropolis in Consideration of Urban Development, 1995", NESDB-SRT (JICA STUDY)

Fig. 9.5 A Framework Plan for Rail-oriented Urban Restructuring in Bangkok

II. バンコク首都圏の社会変化

2-1 タイ人の消費パターン変化

★収入増→飲食費支出割合の減少 交通費、通信費、衣料費支出の増加

Table 2.12 Change of Consumption Patterns of Thai People

	Unit	1986	Share	1992	Share	1992/1986
Average Size of Household	Person	3.8		3.3		
Household socio-economic features						
Average Monthly Income	Bath	6,949.0		16,748.0		2.41
Average Monthly Expenditure	Bath	6,561.9		14,271.7		2.17
Food and Beverages	Bath	2,369.0	36.10%	4,156.0	29.12%	1.75
Alcoholic Beverages and Tobacco Products	Bath	260.0	3.96%	581.0	4.07%	2.23
Apparel and Footware	Bath	300.7	4.58%	769.5	5.39%	2.56
Housing and Household Operation	Bath	1,645.3	25.07%	3,563.5	24.97%	2.17
Medical Care	Bath	166.7	2.54%	404.4	2.83%	2.43
Personal Care	Bath	173.5	2.64%	319.9	2.24%	1.84
Transport and Communication	Bath	638.0	9.72%	2,054.8	14.40%	3.22
Recreation and Reading	Bath	209.3	3.19%	435.1	3.05%	2.08
Education	Bath	161.3	2.46%	324.7	2.28%	2.01
Miscellaneous	Bath	68.8	1.05%	82.3	0.58%	1.20
Non-consumption Expenditures	Bath	569.4	8.68%	1,580.6	11.07%	2.78

Source: Household Socio-economic Survey, NSO, 1986,1992

II. バンコク首都圏の社会変化

2-2 バンコクのエネルギー消費及びユーティリティ・サービス変化

★水、電力、石油の使用量がGNP/人以上に高い伸びを示す

Table 2.14 Consumption of Energy and Utilities in Bangkok

	Unit	1987	1990	1993	Growth Rate (Annual)
Amount					
Water Supply	Million m3/Year	470.8	739.2	871.9	10.82%
Electricity*1	gWh	12,464.0	18,285.7	24,468.7	11.90%
Telephone*2	Telephne	622,973.0	820,321.0	1,177,894.0	13.59%
LPG	Million Litter	713.7	873.8	1,112.5	7.68%
Petroleum	Million Litter	6,557.5	10,890.2	13,600.9	12.93%
Solid Waste	Tonnes/day	4,190.1	4,551.8	5,857.9	5.74%
Amount per Person					
Water Supply		80.29	133.26	156.46	11.76%
Electricity	gWh/1,000person	2.13	3.30	4.39	12.85%
Telephone	Telephe/person	0.11	0.15	0.21	14.75%
LPG	Litter/person	121.71	157.53	199.63	8.60%
Petroleum	Litter/person	1,118.29	1,963.28	2,440.62	13.89%
Solid Waste	g/person	714.56	820.60	1,051.17	6.64%
GDP per Capita in BKK	Baht/person	86,009	139,077	185,725	10.12%
Population	Person	5,863,883	5,546,937	5,572,712	-0.85%

Note: *1 including Nontaburi and Samut Prakan

*2 Year 1887 dat is the data in 1988.

Source: Thailand Figures 1995-1996, Statistical Profile of BMA 1997,1990,1993,
Statistical Year Book 1990,1994

II. バンコク首都圏の社会変化

2-3 都市成長シナリオ (1/2)

バンコク首都圏都市化予測 (1996年)

	1995	2001 予測	2006 予測	2011 予測	1995-2011年 平均増加率
社会経済指標					
人口 ('000)	8,126	9,044	9,761	10,496	1.60
世帯数	2,037	2,316	2,578	2,870	2.20
労働者数 ('000)	4,338	4,757	5,222	5,681	1.70
GPP-BMA (Bill. Baht)	1,149	1,823	2,557	3,422	7.10
年収／人 ('000 Baht)-BMA	141.4	202	261	326	5.40
平均世帯月収 (Baht)-BMA	21,032	25,128	30,021	33,802	3.00

II. バンコク首都圏の社会変化

2-4 都市成長シナリオ (2/2)

バンコク首都圏都市化予測 (1996年)

	1995	2001 予測	2006 予測	2011 予測	1995-2011年 平均増加率
都市化					
市街化区域 (km ²)	541	606	719	884	3.10
都市化率	34	38	46	56	
人口密度 (prs/ha)	150	149	136	119	
Motorization					
車両登録台数 (' 000) - BMA	1,911	2,773	3,406	4,065	4.80
バイク登録台数 (' 000) - BMA	1,335	1,936	2,355	2,730	4.60
世帯当り車両保有	0.9	1.2	1.3	1.4	

II. バンコク首都圏の社会変化

2-5 人口推定

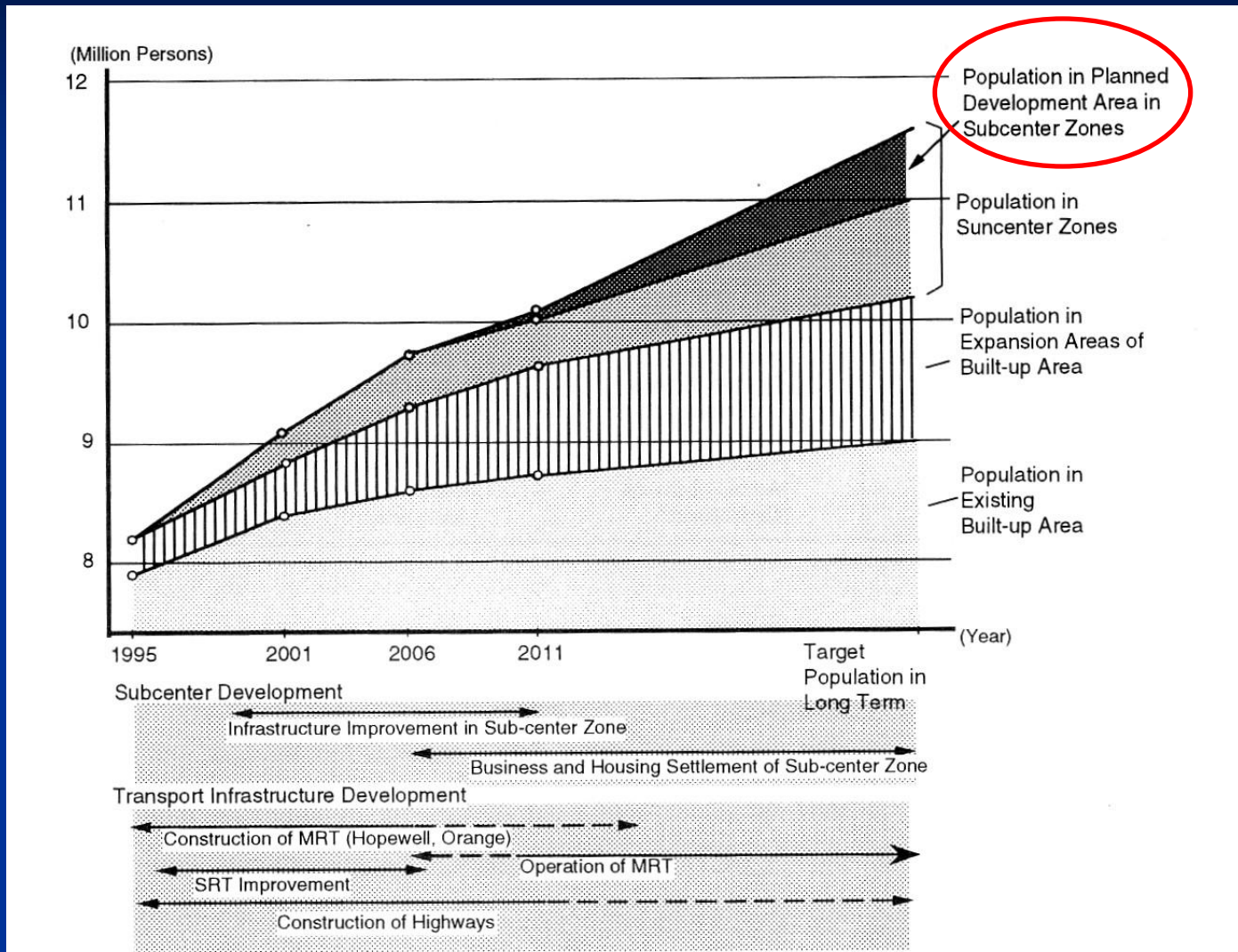


Fig. 9.7 Long-term Future Population Allocation in 2011 and Over

II. バンコク首都圏の社会変化

2-6 エネルギー消費と経済成長(GDP)との関係性

★ GDP当りのエネルギー

消費:

高所得国 < 低所得国

● 1993年時点GDP/Capita:

日本 15倍 > タイ

● エネルギー消費/Capita:

日本 5倍 > タイ

● TOE(Ton oil equivalent)/
unit GDP:

日本:0.5 タイ:2.55

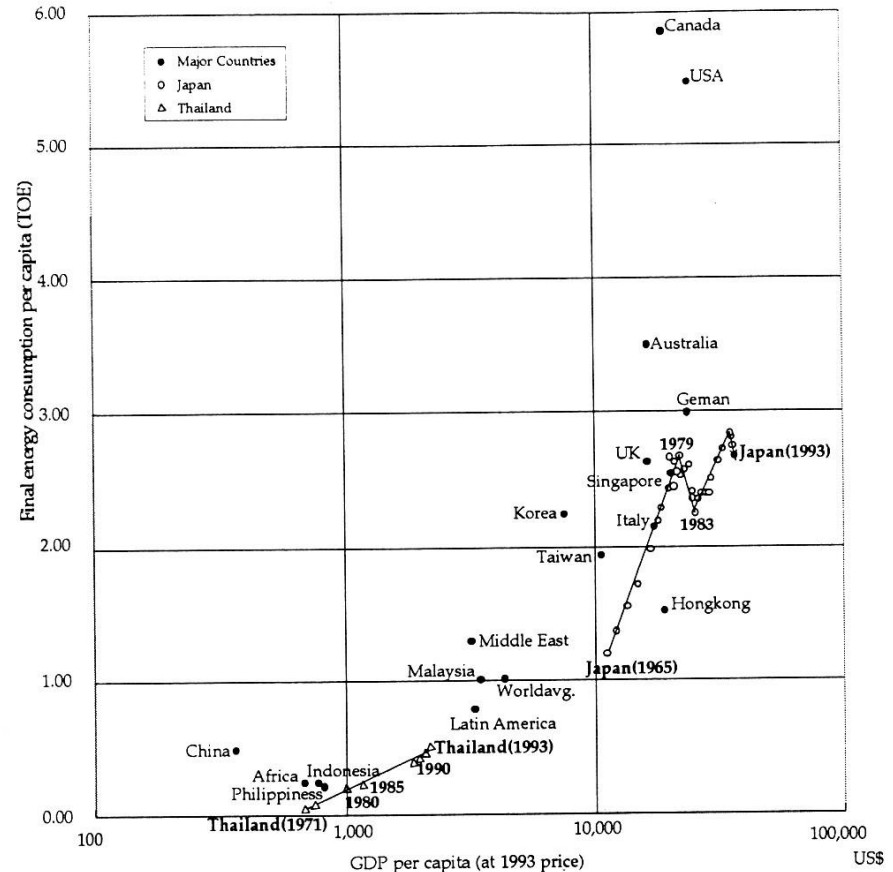


Fig. 8.1 Correlation between Per Capita Final Energy Consumption and Per Capita GDP Growth

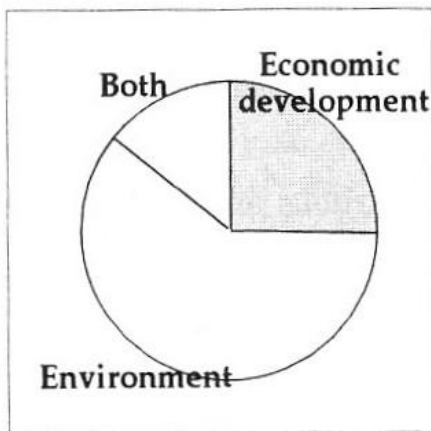
V. バンコク首都圏の住民意識

5-1 環境に対する住民意識

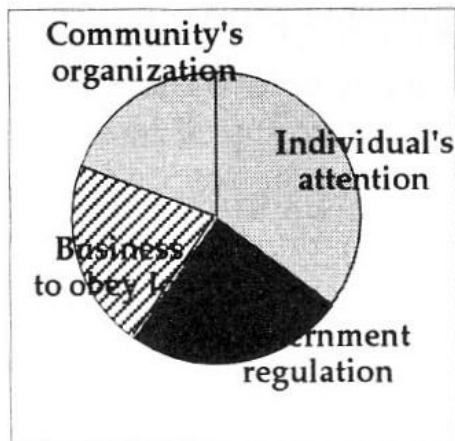
実施時期: 1994年12月 サンプル数: 3000人(うちバンコク1000人)

- 59%のバンコク市民が経済成長よりも環境保全を優先
- 優先課題: 大気汚染(44%)、森林破壊(28%)、水質汚染(14%)
- 最も深刻な社会問題: 環境悪化(41%)、汚職の蔓延(25%)
- 環境悪化に伴う健康への影響: 懸念(69%)

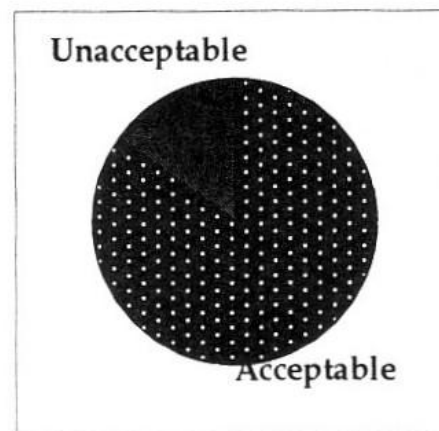
Environmental Protection VS. Economic Growth Trade Off:



Best Way to Solve Environmental Programs:



Pay A Little More Tax To Manage Environment:



Source: Environmental Awareness Survey, IDE

Fig. 14.2: Community's Awareness of Environment in BMA

Ⅲ. バンコク首都圏の環境変化

3-1 都市環境問題発生原因の相関関係

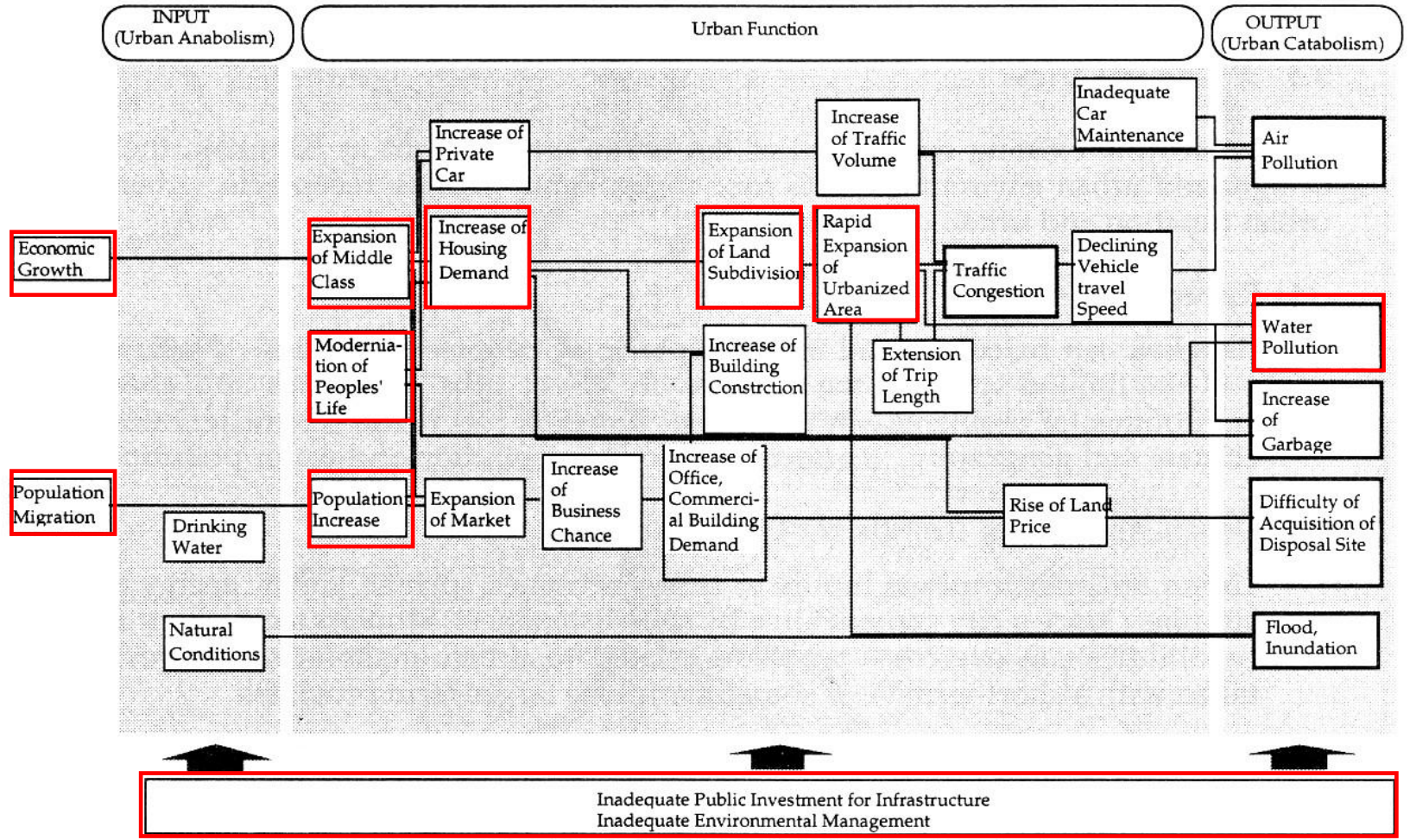


Fig. 3.1 Co-relation of Urban Environmental Problems (A Rough Concept)

Ⅲ. バンコク首都圏の環境変化

3-2 バンコク首都圏の都市環境(1995)

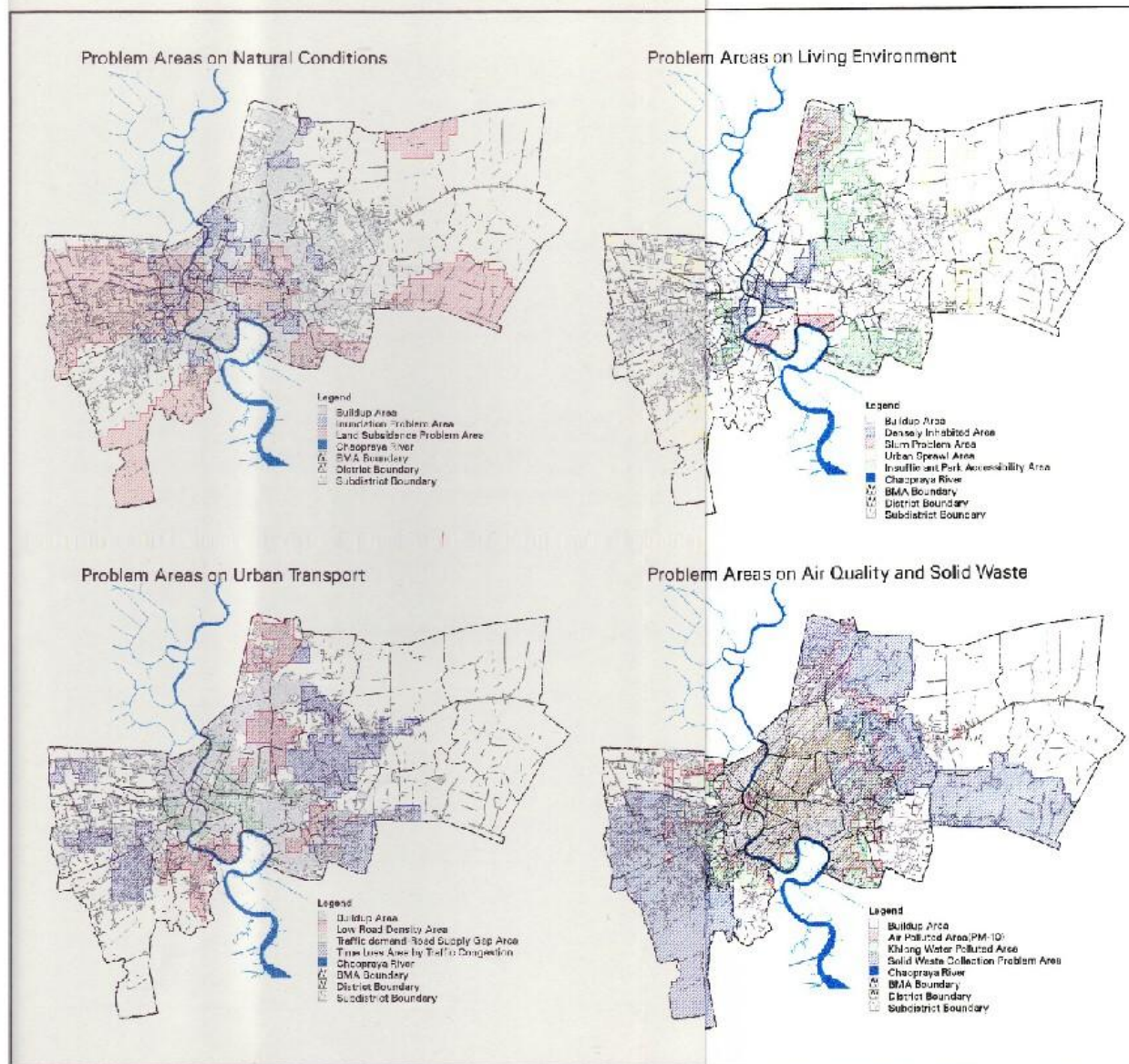
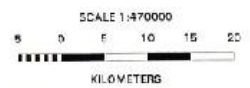


Fig. 3.24

Urban Environmental Problems Map



THE STUDY ON
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BANGKOK METROPOLITAN ADMINISTRATION
THE GOVERNMENT OF THE KINGDOM OF THAILAND



JICA JAPAN INTERNATIONAL COOPERATION AGENCY

IV. バンコク首都圏の水環境変化

4-1 バンコク首都圏給水状況(1995)

Water Production in Main and Separate System in 1995							MCM
	Main System			Separate System			Grand Total
	Plant	Deep Well	Total	Plant	Deep Well	Total	
Total	1313.9	68.42	1382.32	4.325	18.58	22.905	1405.225
% within system	95.1	4.9	100	18.9	81.1	100	
% inter system			98.4			1.6	

IV. バンコク首都圏の水環境変化

4-2 バンコク首都圏給水状況(1991~1995)

Summary of Water Consumption in 1991-1995

Fiscal Year	Water Production	Water Sold	Domestic Water Consumption			Business Water Consumption		
			Water Consumption	Increase over previous year	Rate to total water Consumption	Water Consumption	Increase over previous year	Rate to total water consumption
	MCM	MCM	MCM	%	%	MCM	%	%
1991	1109.2	781.5	391.70	6.00	50.13	389.60	11.50	49.87
1992	1175.5	823.4	405.40	3.50	49.23	418.00	7.29	50.77
1993	1224.9	836.1	413.90	2.10	49.50	422.20	1.00	50.50
1994	1234.3	816.1	415.80	0.46	50.95	400.30	-5.19	49.05
1995	1405.2	870.3	444.50	6.90	51.08	425.78	6.37	48.92

IV. バンコク首都圏の水環境変化

4-3 環境負荷予測

Table 8.5 Tentative Projection of Demands for Solid Waste, Water and Sewage

	1990	1991	1993	1995	2001	2006	2011
Soild Waste Generation							
Per Capita Generation: Planned (g/d)	-	-	-	1,083	1,191	1,257	1,308
Total Generation (ton/day)	6,847	7,211	7,978	8,800	10,774	12,306	13,730
Per Capita Generation: Regressed (g/d)	940	969	1026	1,083	1,254	1,396	1,539
Reduction Target				0.0%	5.0%	10.0%	15.0%
WATER DEMAND							
Per Capia Demand (LPD)	-	-	-	480	465	452	440
Total Demand (MCD)	-	-	-	3.90	4.20	4.43	4.62
WASTE WATER							
Potential Sewege Amount (MCD)	-	-	-	3.74	4.03	4.25	4.43

Source: the JICA-BEIP Study

IV. バンコク首都圏の水環境変化

4-4 地盤沈下

●中央地域の地盤沈下軽減傾向

←取水許可関連法規制の強化

●郊外への宅地化・工業化の拡大

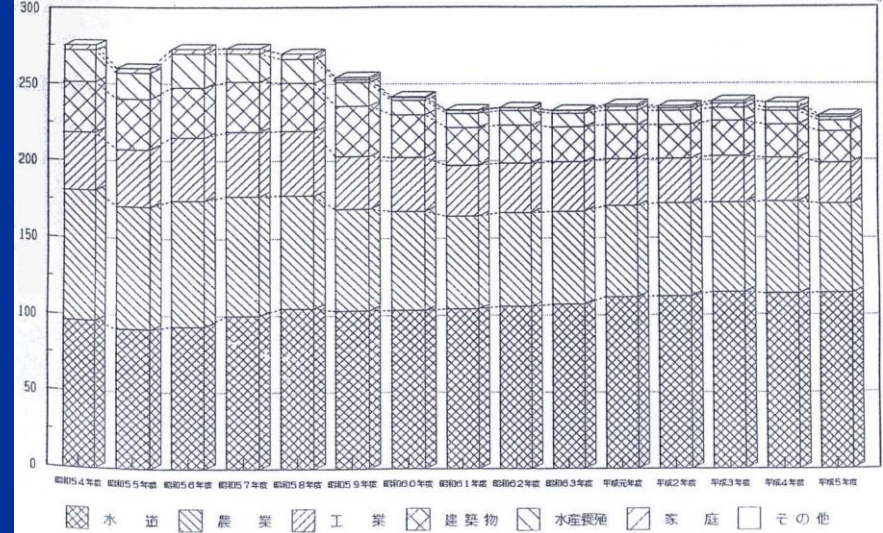
→バンコク市内: 20mm/year

ミンブリ・ラカバン: 40-55mm /year

→郊外地域での洪水被害の拡大

22675m³ (1.0%)

地下水採取量 [単位: 百万m³/年度]



Ⅲ. バンコク首都圏の環境変化

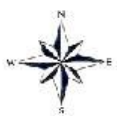
4-5 地盤沈下と洪水被害リスク

Fig 3.4

Problem Areas on Natural Constraints

Legend

- Less than -50 cm
- 50 to -75 cm
- 75 to -100 cm
- 100 to -125 cm
- 125 to -150 cm
- More than -150 cm
- Flooded Area in 1983
- Chaopraya River
- Railways
- BMA Boundary
- District Boundary
- Subdistrict Boundary



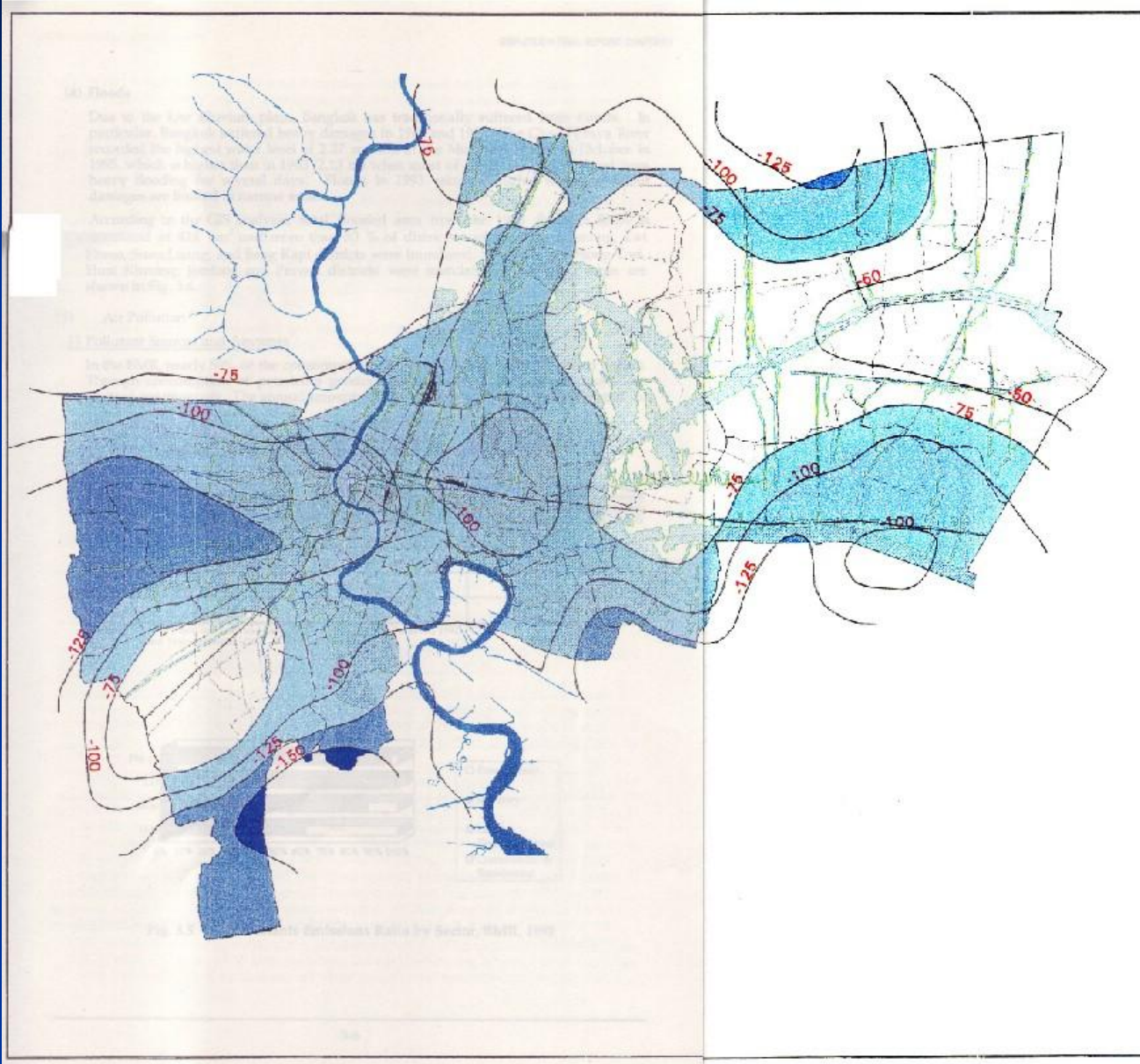
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Ⅲ. バンコク首都圏の環境変化

4-6 河川及びクローン水質悪化(BOD)状況

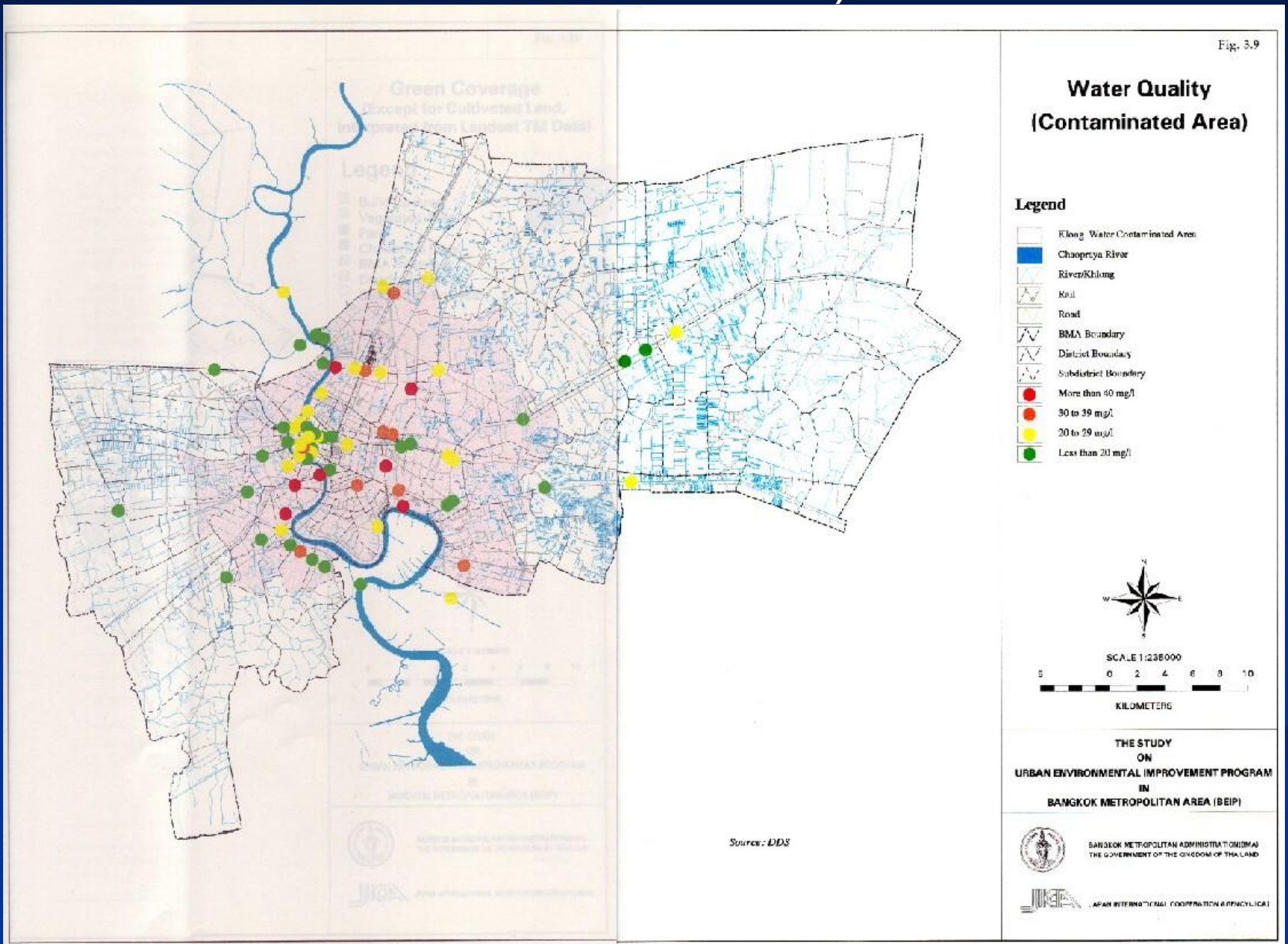


Fig. 3.9

VI. 都市環境改善のための方策

6-1 都市環境計画策定のための規範 1/2

■ 都市環境調和の実現 :

Healthiness, Safeness, Comfortableness, Convenience

■ 環境調和型持続的経済成長実現に向けた規律 :

*Polluter-pay-principle, Manner (Social rules),
Systematized urban development management*

■ Urban Metabolism

Systemの機能 :

Anabolism systemと

Catabolism systemの

相互機能

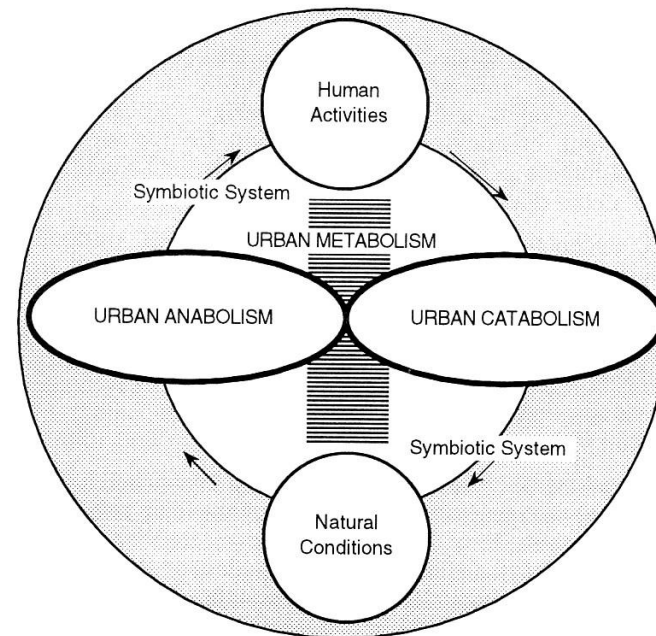


Fig. 8.3

A Concept of Urban Metabolism and Environmental Symbiosis

VI. 都市環境改善のための方策

6-2 都市環境計画策定のための規範 2/2

■ 都市成長マネージメント・システムの強化:

Institutional system development

■ 環境管理プログラム実現のための関係性強化:

Tripartite Approach among Government,
Economic and Social Sectors

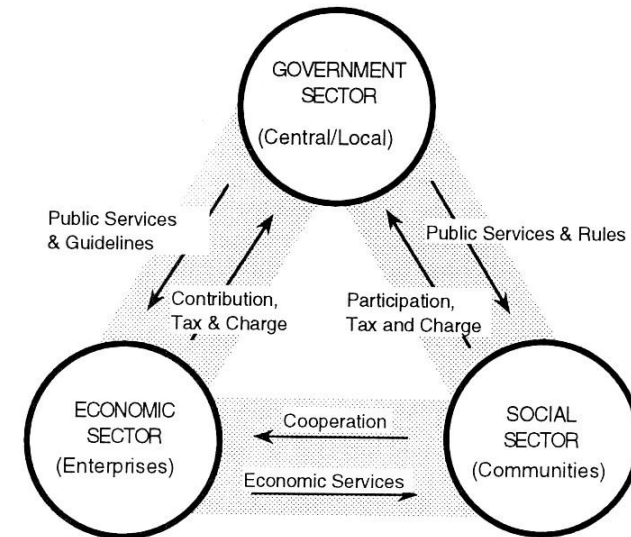


Fig. 8.4

Tripartite Approach Required for Environmental Improvement

VI. 都市環境改善のための方策

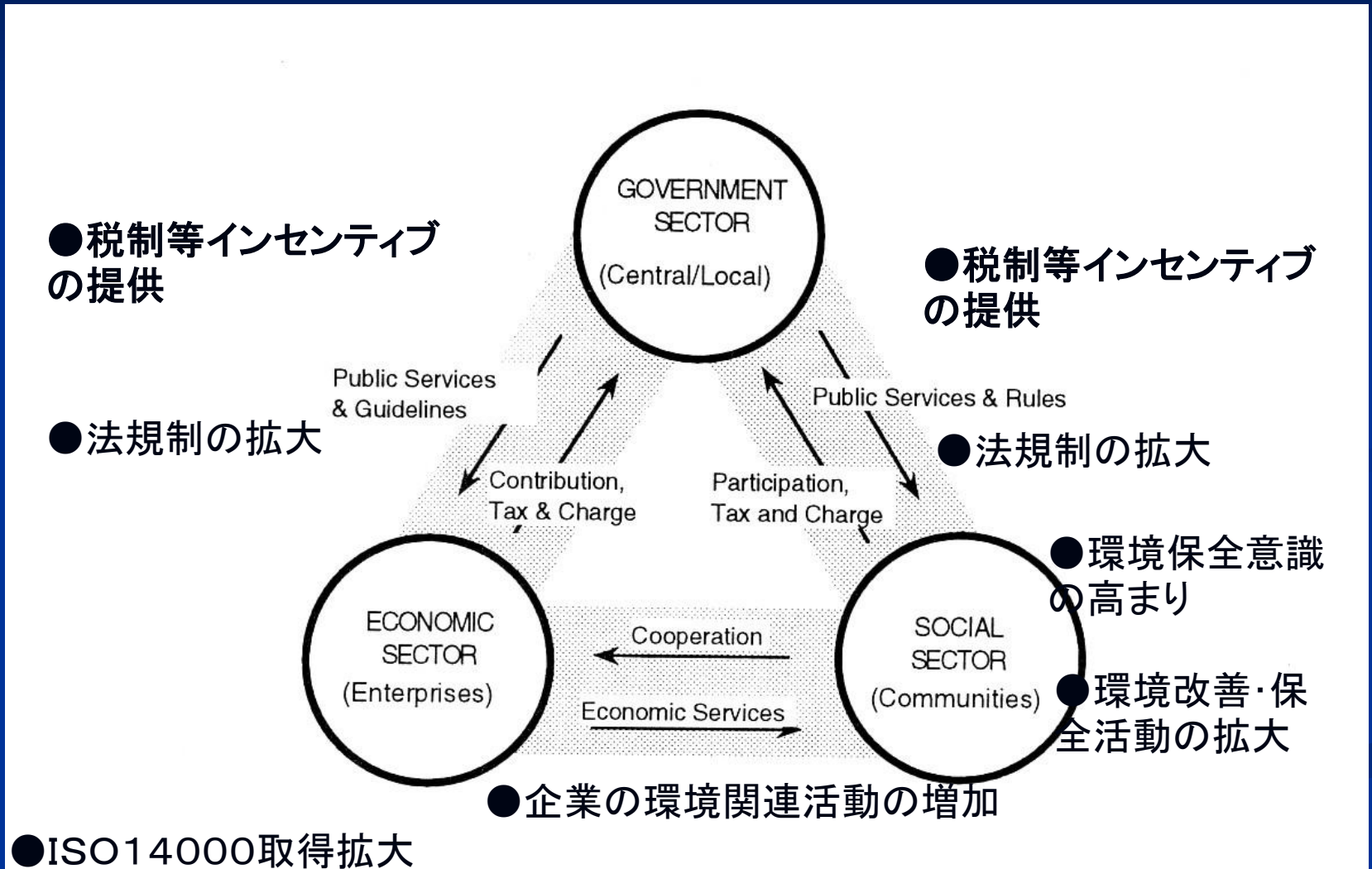


Fig. 8.4

Tripartite Approach Required for Environmental Improvement