

10 PLAN 5: WATER-FRIENDLY ECO-CITY

10.1 Appreciation of the Thai Water Culture

The planning concept of "Water-friendly Eco-city" is derived from appreciation of the historical water system which the Thai socio-culture has been deeply rooted in. Thai people are traditionally well-knowledgeable of how to get along with water, and their living culture was based on such a respect on "water". Let us remind it again and restore the water-culture.

10.2 Water Quality Improvement and Restrain of Function of the Urban Khlongs

Currently, water quality of Khlongs are getting worse and the problem areas are expanding along with urbanization, as shown in Fig. 10.1. In order to improve the water quality, sewage treatment systems need to be facilitated together with technical measures such as introduction of the Chao Phraya water and direct aeration.

Functions of khlongs should be restored again in a view of creating "urban ecology" in which people's living systems are integrated with the natural environment.

- **Drainage System:** The most important function of khlongs is for drainage canals for flood protection. This function should be maintained properly and strengthened.
- **Waterways for Public Transportation:** Some of major khlongs are being used as an alternative public transportation meeting commuting and daily traffic demands².
- **Open Space, Greens and Community Amenities:** Water is functioning as community links assorted with greens and open space. Thai people have already developed an outstanding urban design to form a comfortable combination with streets, khlongs and greens.

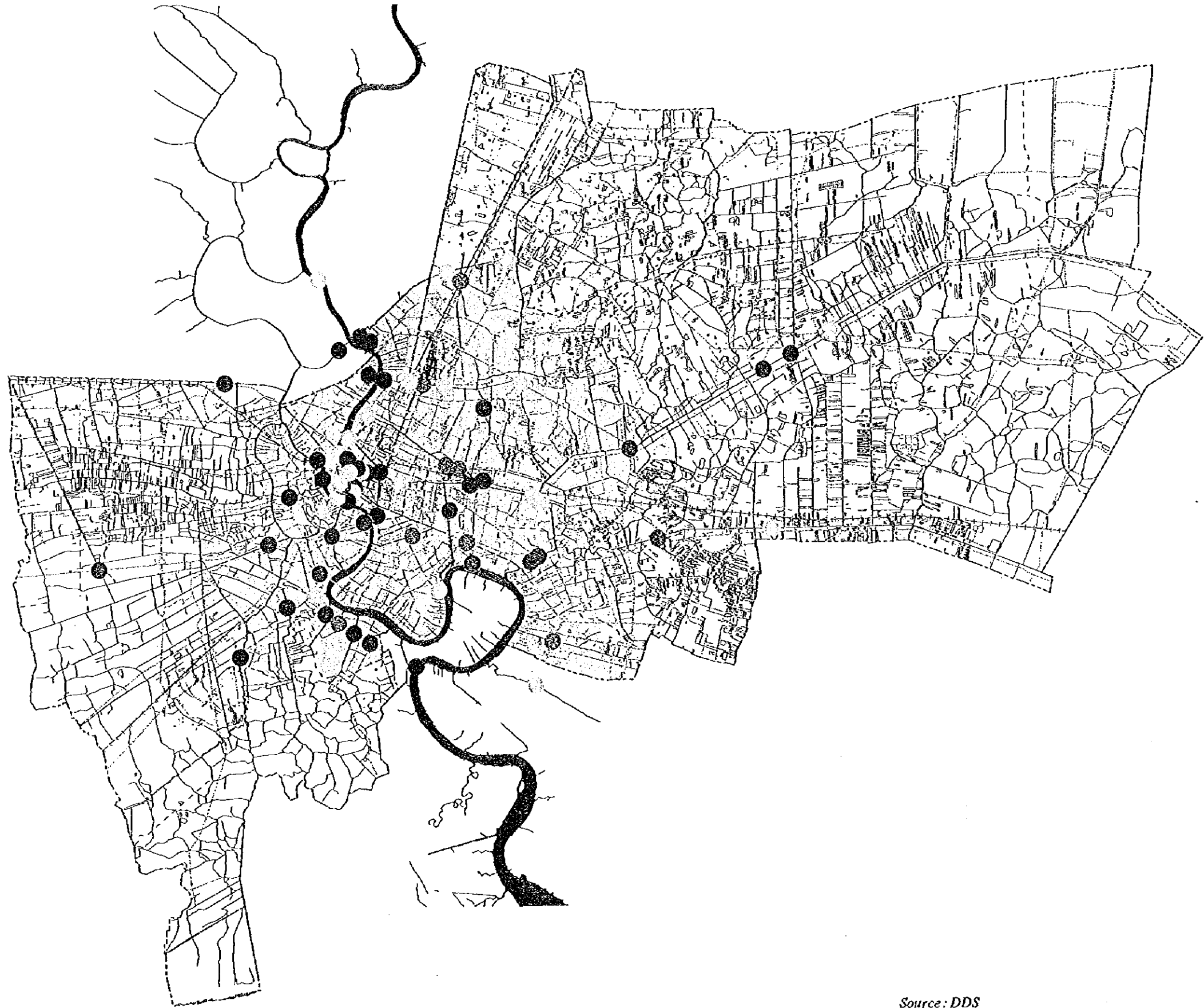
10.3 Beautification of Khlongs and River Front Areas

Water is an effective element of urban amenity and brings out a "Taste of Bangkok", thereby attracting international tourists. Thai landscape design concept should be applied for the beautification program along selected khlongs and Chao Phraya River.













The beautification program needs to be concomitant with sewerage system and housing development.

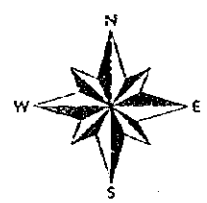
² For crossing the east-west corridor, it takes 55 minutes by boat from the pier near Wat Saket to the Bangkok Pier in Khlong Saen Saep (17 Km). The average speed is 20 km/h, even in peak hours. By car, it takes more than 2 hours in peak hours.

Fig. 10.1 **Water Quality
(Contaminated Area)**

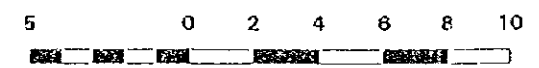


Legend

-  Klong Water Contaminated Area
-  Chao praya River
-  River/Khlong
-  Rail
-  Road
-  BMA Boundary
-  District Boundary
-  Subdistrict Boundary
-  More than 40 mg/l
-  30 to 39 mg/l
-  20 to 29 mg/l
-  Less than 20 mg/l



SCALE 1:235000



KILOMETERS

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

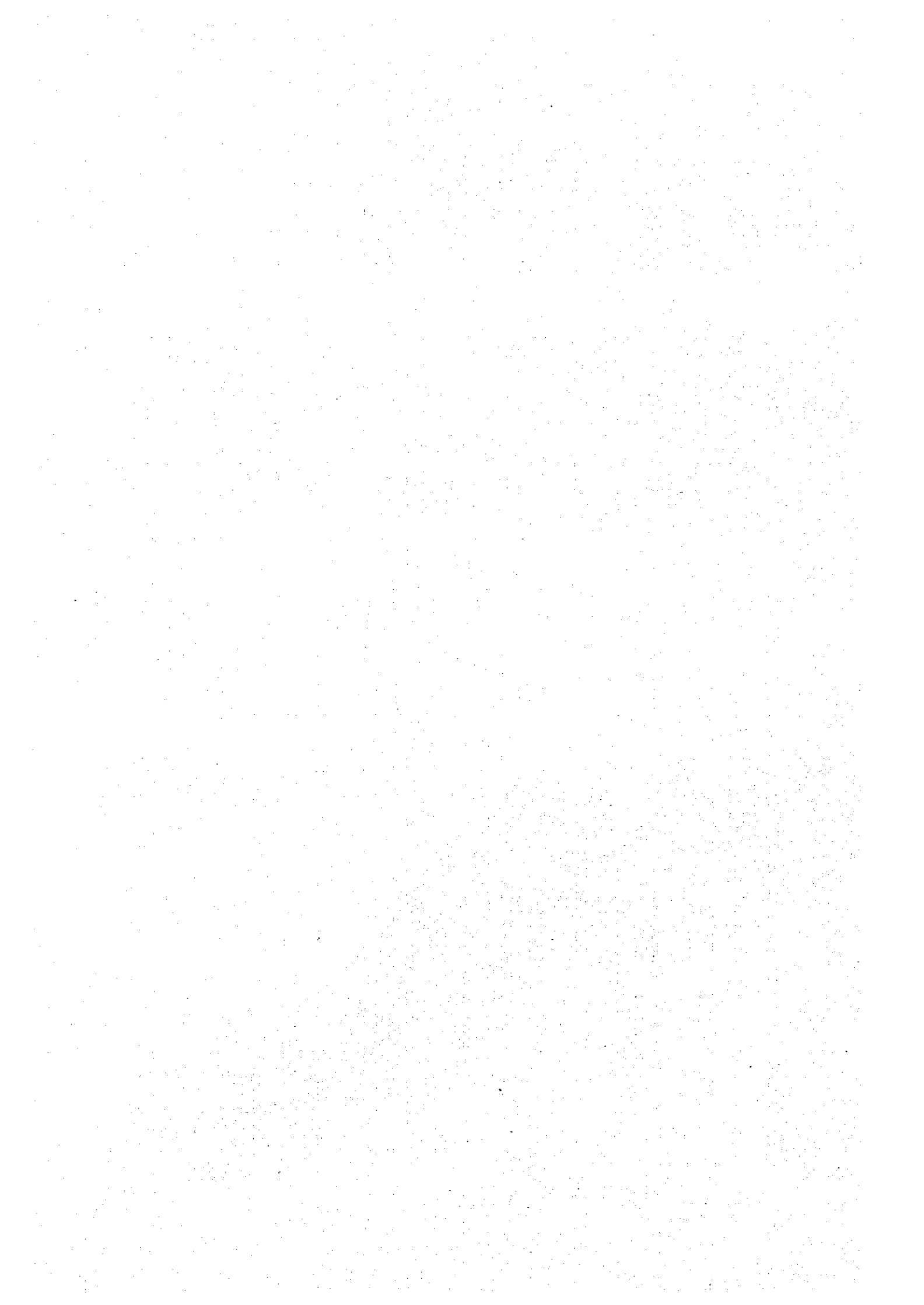


BANGKOK METROPOLITAN ADMINISTRATION (BMA)
THE GOVERNMENT OF THE KINGDOM OF THAILAND



JICA JAPAN INTERNATIONAL COOPERATION AGENCY (JICA)

Source: DDS



11 PLAN 6: UP-GRADING OF QUALITY OF LIVING ENVIRONMENT

11.1 Hygienic Living Environment

Solid waste management is one of the most vital issue for BMA, including the following measures:

- Promotion of social awareness for correct recognition of current problems on solid waste;
- Facilitate people's participation in the improvement with an community approach;
- Establish a sustainable system for solid waste management with the coherent system, including collection, transportation, intermediate treatment, and final disposal; and
- Explore a recycling system, encouraging participation of communities and the business sector, and support recycling industries.

11.2 One-more-step Solution of Slum Problems:

Housing issues are broad and various, and call for a wide variety of social development approach. The "slum problems", reviewing the previous and on-going NHA's attempts and projects/programs, should be further tackled. The financial institutions to support their "self-help solution" should be explored.

11.3 Pedestrian-advantageous Society

In the urban transportation network system, "walking" is the most important transport mode, which shares 29% of the total person-trips. In order to encourage people to utilize public transportation such as buses and mass transit systems, "walking" should be also encouraged. More pedestrian-advantageous urban environment should be created in Bangkok.

11.4 Environment for the Weak

More attention should be paid to the weak such children, handicappers, women and elders in urban design and uses of public service facilities. This is regard as an indicator for the social maturity. Bangkok should never stand behind the maturity, rather go ahead in the world in environment for the weak.

12 PROGRAMMING OF PROJECTS/PROGRAMS

12.1 A Conceptual Ground for Programming

Formulation of projects/programs to materialize the plans was considered in a conceptual frame with two axes: the axis of implementing bodies and the axis of policy approach, as illustrated on Fig. 12.1. In this coordinates, projects/programs are situated as one of four categories characterized as follows:

- I. Public investment for local and sector solution;
- II. Involvement of voluntary private activities;
- III. Institutional system with guidelines, standards and regulations for urban environmental and growth management; and
- IV. Strategic public investment for urban restructure.

All the four (4) types of projects/programs are substantially needed to implement in an integrated manner. However, in the short-term, intensive efforts should be made to enhance the categories of I and III; and in the medium- to long-term, emphasis should be placed on the categories of II and IV.

12.2 Proposed Projects/Programs for Bangkok Environmental Improvement

In the line with the 6 plans, a number of projects/programs were recommended as summarized in the list compiled in the end of this report. The implementing body who has chief responsibility, the relevant authorities with whom well-coordination is required, the degree of private sector's participation for successful completion; and the estimated cost and its allocation. The costs described here are preliminary estimates (at 1995 prices), and subject to changes after reviewing the detailed scheme. Beneficiaries of all the projects are Bangkok people or Thai people.

12.3 Prioritization Criteria

In addition to the above-mentioned basic concepts in Section 12.1, the highest priority is given to projects and programs with the following attributes:

- Effective/supportive to facilitate on-going and planned environmental projects/programs which were assessed to be crucial;
- Necessary or indispensable to achieve **Environmental Minimum**, referring to the attainable level of socioeconomic development in Bangkok;
- Preparatory for massive investment for social capital formation to be implemented in the medium- and long-term;
- Solvable and implementable with additional less investment or institutional improvement;
- Effective to strengthen the governmental capabilities in environmental administration as well as planning and financing.

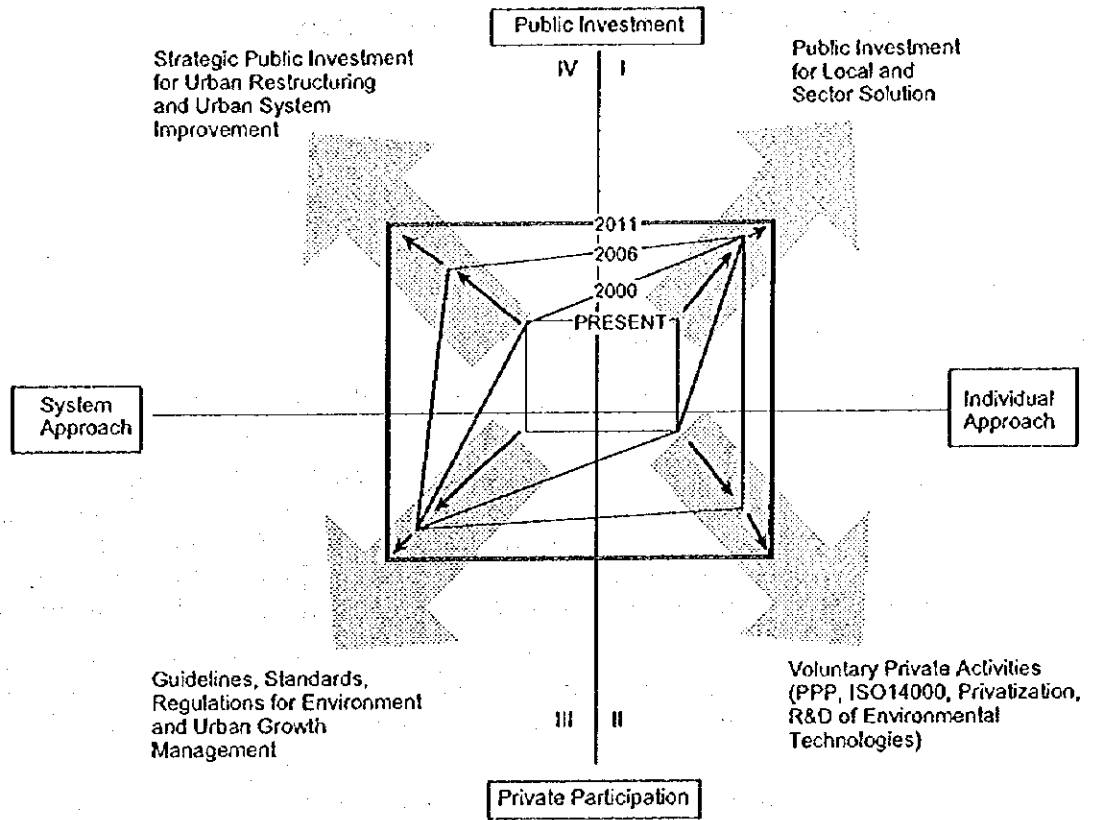


Fig. 12.1 A Conceptual Framework for Projects/Program Identification and Priority

13 BASIC RULES FOR THE IMPLEMENTATION

13.1 Social Rules for the Implementation

Social rules are required to manage and support the deliberate implementation of the plans, taking into account:

- A decrease of environmental resource resulted shall be compensated with an increase of environmental input at the corresponding economic value, first through the market mechanism and secondly by expenditures from tax. Thus, social costs for the environmental improvement should be compensated by the economy itself. **Polluter-Pay-Principle (PPP) or User Charge System** should be justified on this ground.
- Any type of development should minimize anticipated negative impacts on the environment, based on another principle that one's gain never results in worsening the other's welfare.
- A preventive approach is less costly than a curative approach in the long-run. Before worsening the environment, effective measures against it should be undertaken. The sooner action, the more benefits.

13.2 Institutional Arrangement for Urban Growth Management

A number of institutional arrangement for urban growth management are necessary to support the administrative power to implement the plans, including:

- **Special Policy Zoning System**, supplementing the current Land Use Zoning System, to indicate policy directions and concrete measures of the environmental improvement in accordance with the zonal attributes (refer to Table 13.1 and Fig. 13.1);
- Institutionalization of **Parks and Open-space Development Act** which stipulate guidelines of development and preservation of public parks and green areas along khlongs and other open valuable space;
- Rationalization of the current **Floor Area Ratio** (a flat system of 1,000%) to rationalize the intensity of land use reflected by locational and environmental attributes with institutional links with the Urban Planning Act;
- Enhancement of **Environment-related Acts/Regulations** with enforcement power of the responsible authority;
- Introduction of the regulation of **Traffic Assessment Study** which is obliged to submit the local government together with the application of building permission for a large-scale projects;
- Preparation of **Local Government's Guidelines** for land and subdivision development with deliberate measures for environmental improvement and preservation in a form of **Local Government Ordinance**.

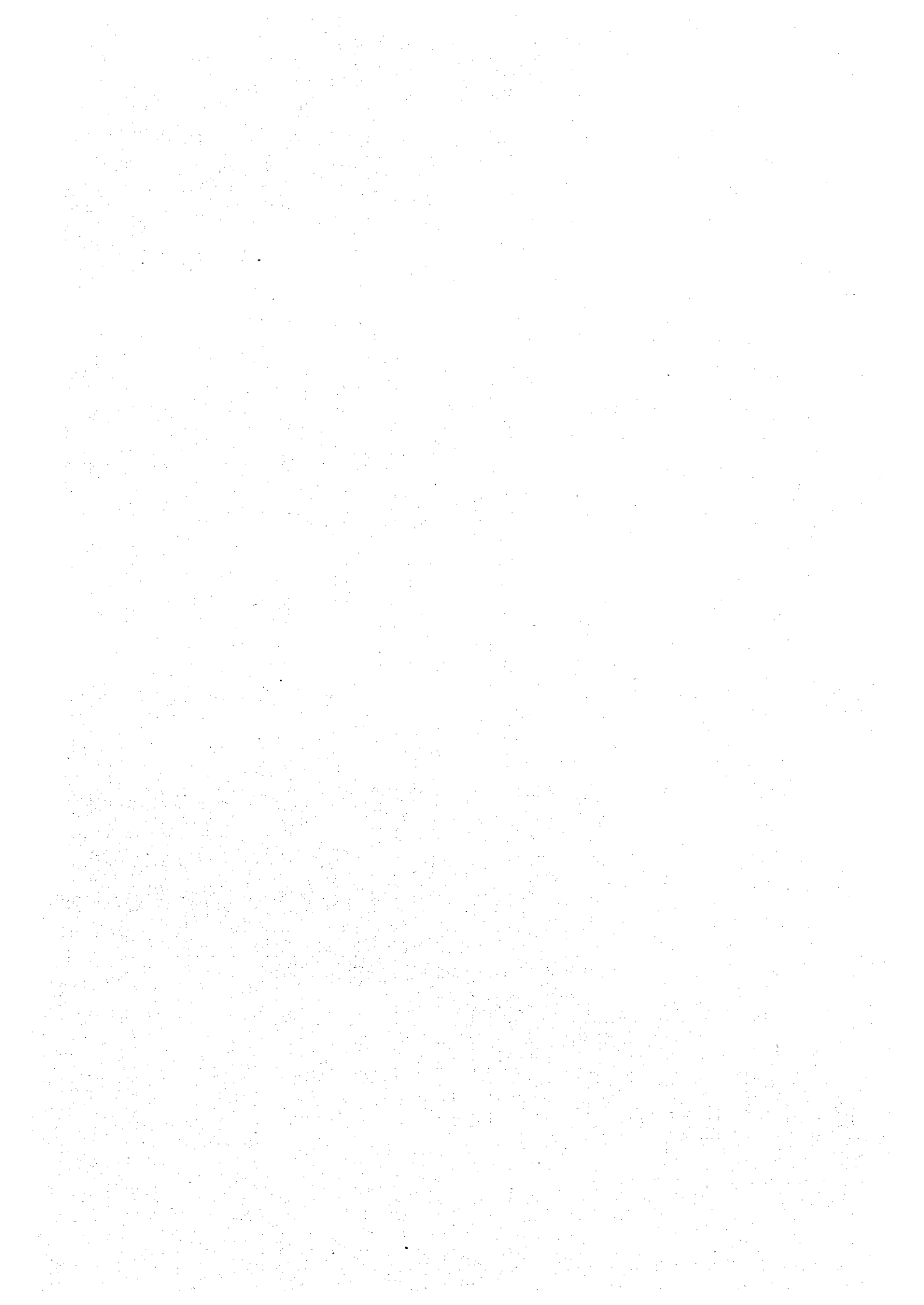




























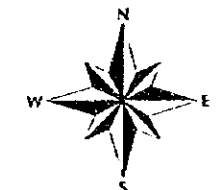


Fig. 13.1

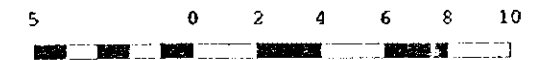
Policy Zoning

Legend

-  Historical Conservation Zone
-  Urban Regeneration Zone
-  Land Use Intensification Zone
-  Environmental Infrastructure Improvement Zone
-  Infrastructure Led Urbanization Zone
-  Controlled Urbanization Zone
-  Preservation Zone
-  New Sub-center Development Zone
-  Khlong Water Improvement Promotion Zone
-  Land Scaping/Scenic Zone
-  Land Development / Transaction Supervision Zone
-  Park / Open Space Promotion Zone
-  Public Transport Priority Zone
-  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



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Table 13.1 Proposed Policy Zone System and Criteria for the Designation

Zone	Criteria for Designation
1. Historical Conservation Zone	<ul style="list-style-type: none"> • Rathanakosin District; • Extended District recommended by the Bangkok Plan
2. Urban Regeneration Zone	<ul style="list-style-type: none"> • Chao Phraya river side area with mixed land use of warehouses, factories, etc. which are no longer functioning well; • Part of the Klong Toey Port Area where integrated development is required; • Part of CBD where infrastructures have been developed but the land uses are highly congested with mixed functions; • Part of CBD where urban redevelopment is assessed to be necessary from the disaster prevention point of view.
3. Land Use Intensification Zone	<ul style="list-style-type: none"> • Intensified land use is required to maximize the location advantages and land economy; • Mass-transit terminal areas; • Business areas with comparatively high road density and
4. Environmental Infrastructure Improvement Zone	<ul style="list-style-type: none"> • Part of built-up areas with poor infrastructures and poor environmental conditions: low road density, too high population density, less services of green and park, low service of water supply and sewerage, fears of land subsidence and occasional floods, etc. • Part of built-up area with so-called super block problems
5. Infrastructure-led Urbanization Promotion Zone	<ul style="list-style-type: none"> • Area where urban land use should be promoted to accommodate increasing population and land use demands; • Areas with a high urbanization potential and a comparatively low built-up ratio at present where the urbanization pressure is thought to be high; • Areas with poor infrastructures and public facilities • Area where disorderly subdivision development is anticipated without provision of advanced infrastructure.
6. Controlled Urbanization Zone	<ul style="list-style-type: none"> • Areas with low urbanization potential and serious natural constraints ; • Areas where active urbanization needs to be controlled from the environmental point of view even though high urbanization potentials are observed; • Areas along rivers and Klongs necessary for flood prevention and environmental purposes.
7. Preservation Zone	<ul style="list-style-type: none"> • Areas with considerably low urbanization potential and to be conserved from the environmental viewpoint; • Areas to be reserved on a long-term perspective.
8. Social Development Zones	
8.1 Public Transit Advantage Zone	<ul style="list-style-type: none"> • Part of CBD with intensive services by mass-transit systems are to provided (covered with 800 m walking distance from stations of MRTs); and • Part of CBD with extremely high traffic generation and/or attraction, and functionally accessible by alternative public transportation.
8.2 New Sub-center Development Zone	<ul style="list-style-type: none"> • Locations proposed by the Bangkok Plan, or • Another areas where are assessed to be suitable for publicly initiated sub-center development from the environmental view point.
8.3 Khlong Water Quality Improvement Promotion Zone	<ul style="list-style-type: none"> • Central urbanized areas both side of Chao Phraya River, encompassed with Khlong Lad Phrao in the eastern side and Khlong Bangkok Yai in the western side.
8.4 Park and Open Space Zone	<ul style="list-style-type: none"> • Existing large-scale parks and open space alongside Khlongs; • Community parks to be planned; • Green areas to be conserved.
8.5 Special Scenic Zone	<ul style="list-style-type: none"> • Area with historical, cultural and tourism assets • Special area where landscaping should be improved • Part of Chao Phraya River side areas to be scentially preserved

14 MICRO STUDY

14.1 Major Issues and Selected Areas

Since environmental problems always appear at local level, the solutions need to address local reality with concrete images including institutional, administrative as well as implementation of infrastructure projects. In this context, based on the implications derived from the macro study, the Micro Study aims at seeking some of the feasible ways to solve the local problems by the urban planning approach.

Six areas are selected as the model areas where there are typical environmental problems for which urban planning tools should be employed. The six areas have respective attributes as follows, and the locations are shown in Fig. 14.1. A conceptual physical plan is prepared for each selected area.

Table 14.1 Selected Areas and Their Nature

Selected Areas	Nature of Area
Lat Krabang Subcenter Zone	As a model of guided urbanization of subcenter zone development in the eastern Bangkok area where vast potentials are still available to accommodate increasing population and job places.
Taling Chan Subcenter Zone	As a model of MRT-driven urbanization in the western Bangkok with great potential for rapid urbanization, where disorderly sprawl would take place without infrastructure-led development.
Part of Khlong Toey	As a model of improvement of road network in the highly built-up area, in relation to the forthcoming MRT systems and restructuring of the inner city areas.
Din Daeng Renewal	As a model of the public housing renewal project (NHA) in the inner city in association with public projects of New Bangkok City Hall, MRT stations and other new urban projects in the vicinities. Public transportation-based urban re-structuring is the main theme.
Chao Phraya River-front Renewal	As a mode of Chao Phraya River-front redevelopment by relocation of existing less-functioning warehouses and factories, and new land use for a purpose of environmental facilities development.
Rathanakosin Historical Conservation	As a model of institutional building for historical conservation based on a review of the on-going Master Plan Study by the national committee for Rathanakosin Conservation. The conservation of historical assets must be one of important environmental policies.

As the quality of urban environment depends largely on quality of urban design, three design principles are recommended, which should be commonly applicable to the selected six areas.

Three Design Principles

- Design Principle 1: Appreciation of Thai Traditional Urban Design;
- Design Principle 2: Functional Inter-modal Transfer Facilities and Pedestrian Environment;
- Design Principle 3: Building Set-back and Street Design.

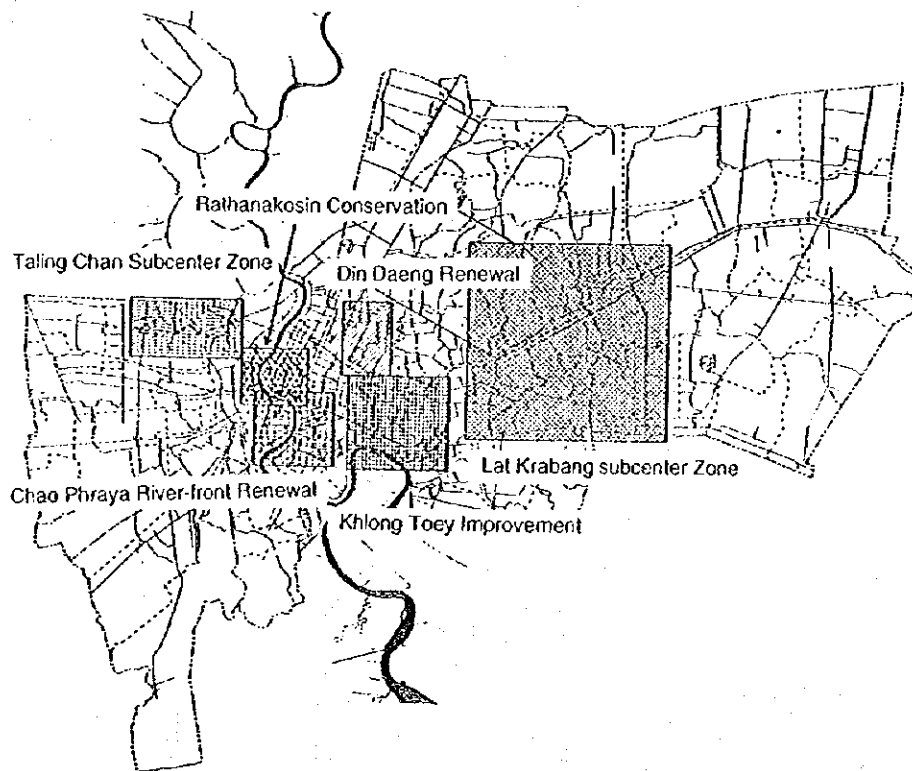
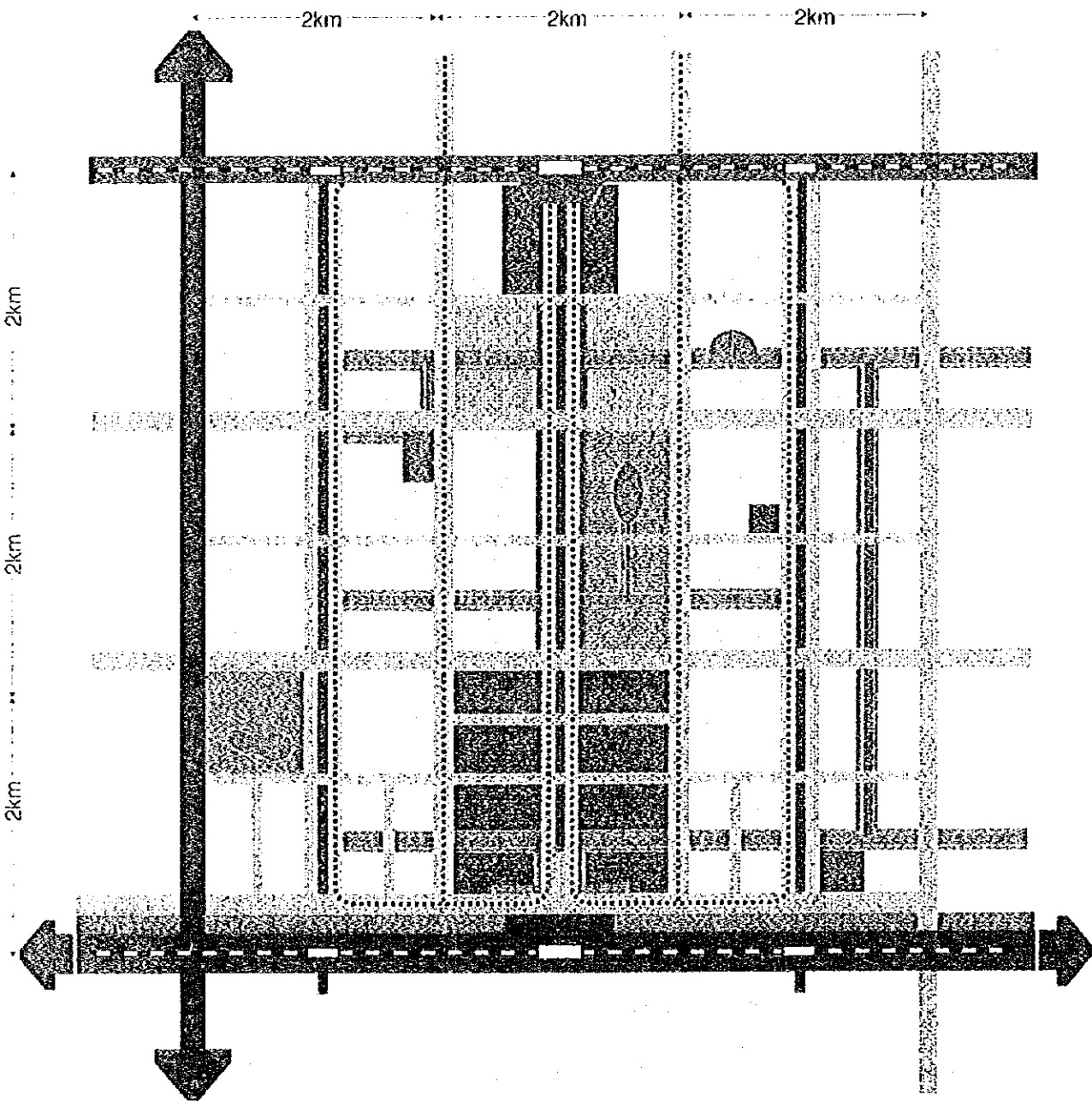


Fig. 14.1 Locations of Micro Study Model Areas

14.2 A Conceptual Physical Model of Sub-center Zone Development

Given about half million population with about 7000 ha area, a conceptual model for physical urban development as a sub-center development, for example, in Minburi/Lat Krabang area, was prepared. This urban model intends to create a physical feature of "Environment-friendly Urban Development" through considering the following four planning concepts:

- 1) Rational Land Use Pattern:
 - Moderate population density (140 persons/ha in average in a total land area of 3,500 ha);
 - Concise activity center area (200 jobs/ha in the area of 750 ha); and
 - Sufficient open spaces for the environment and public uses.
- 2) Mass Transit-based Urban Development
- 3) Water Channel-cum-road System
- 4) Feeder Public Transport System



LEGEND

Land Use

- Business, Commercial
- Higher Education and Government Services
- R & D and Information, Light Industrial
- Park, Open Space and Public Utilities
- Residential
- Drainage Channels and Retaining Ponds

Transportation

- Regional Arterial Road (Express Highway)
- Arterial Road
- Secondary Road
- Tertiary (Local) Road
- Mass Transit System and Station
- Bus Service Routes

Fig. 14.2 A Conceptual Urban Model of Sub-center Zone Development

15 FINANCING FOR THE IMPLEMENTATION

15.1 Financial Demarcation System

Since environmental problems always appear at local level, the local government like BMA has to have a chief responsibility for resolving the problems. However, the current local administrative system does not allow the local government to share a large portion of the financial responsibility, which would thereby be a hindrance against up-lifting of planning ability and project implementability of the local government.

For the implementation of projects, the budgetary autonomy of local government like BMA is limited, and its power is greatly concentrated in the central government. Most of environmental projects are carried out under the current subsidy system that about 60-65% of the total costs come from the central government. Further devolution in the budgetary power for projects/programs should be pursued in such a way that BMA can directly tackle with local environmental problems, improving the existing subsidization system.

15.2 Enhancement of BMA Financial Capability

Financial and implementing capabilities of BMA itself should be further strengthened in order to put the plans into action, though:

- (1) Improvement of the executing system of the current Local Taxation, including 1) preparation of "Land and Assets Ownership Map, or Cadastral Maps; 2) Re-evaluation of Asset Value; and 3) improvement of Tax Collection System;
- (2) Introduction of PPP or User Charge System for environmental services;
- (3) Utilization of External Financial Resources (soft loans) for initiation of infrastructure projects and social capital formation; and
- (4) Development of Training Programs of Local Government Personnel particularly for planners, engineers and financial staff.

15.3 Evaluation of BMA's Financial Capability for the Implementation of Environmental Projects/Programs

The financial capability of BMA for the implantation of the proposed projects/programs was assessed. Table 14.1 summarizes the estimated financial requirements and budget revenues of BMA in a phased time-frame up to 2011.

(1) Evaluation of BMA's Financial Capability in the Short-term

The BMA 5th Development Plan (1996-2001) has lunched a number of projects/programs for the environmental improvement, including roads and transport projects. The total amount of investment costs for all those projects/programs are estimated at approximately 120,000 million Baht., as shown in Table 14.1.

On the other hand, besides the above, the cost of all the BEIP proposed projects/programs as "Urgent Actions" which are to be implemented in the same

period between 1996 and 2001, amounts to approximately 47,300 million Baht, of which those to be implemented by BMA is estimated at 31,700 million Baht. Therefore, adding this 31,700 million Baht to the cost of the 5th Plan projects/programs, a total of about 152,000 million Baht should be allocated for the Bangkok environmental projects for coming 5 years up to 2001.

In the meantime, this amount of 152,000 million Baht is equivalent to 2.7% of the anticipated GPP of Bangkok during the same period. This amount, in fact, is huge, but not assessed to be an over-investment, taking into account the World Bank report that a total amount of 2.0 to 3.0% of GDP needs to be invested for environmental projects/programs in developing countries up to 2000.

Given the current subsidy system from the central government, BMA itself has to share approximately 53,300 million Baht out of the total of 152,000 million Baht. Now, a question is whether or not BMA will be able to afford its budget for this amount of investment. The answers, based on the outcomes of the financial analysis of BMA, are as follows (refer to Table 14.1):

- If BMA succeeded in execution of the enhancement program for financial capability as proposed in the preceding section 14.2, BMA could enlarge its revenue sources through local taxes, thereby, could bear an accumulated budget up to 2001 of about 22,300 million Baht available for the environmental investment.
- Therefore, if BMA implements all the projects/programs proposed by both the 5th Plan and the BEIP Study in schedule, a fund shortage, or a budgetary deficit, will occur at an amount of 31,000 million Baht in 2001. This deficit is equivalent to 27% of the total BMA budget income.
- Two ways are conceivable to fulfill this deficit, i.e., 1) to claim a special subsidy allocation to the central government; or 2) to seek some external fund sources in a form of soft loans.

(2) Evaluation of BMA's Financial Capability in the Medium and Long-term

As shown in Table 14.1, out of the projects/programs proposed by the BEIP Study, those to be chiefly implemented by BMA will cost approximately 123,000 million Baht for the medium-term (2001-2006), and 141,000 million Baht for the long-term (2006-2011). Under the current subsidy system from the central government, BMA itself has to share 43,000 million Baht for the medium-term (2001-2006), and 49,400 million Baht for the long-term (2006-2011).

On the fund supply side, BMA will bear available budgets of 49,800 million Baht for the medium-term, and 49,400 million Baht for the long-term for the environmental investment. This estimate is based on an assumption that BMA will continuously make efforts to strengthen its financial base through the program proposed in Section 14.2.

As the result, obviously, BMA will be able to be affordable and manageable to implement all the projects/programs proposed by the BEIP Study, that is, the available budgets will be greater than all the costs. In the long-term, the deficit born in the short-time (1996-2001) will be fulfilled with the surplus, and the balance will be all clear in 2011.

15.4 Overall Evaluation of Project Implementability of BMA

As proved above, under two premises that the current subsidy system is workable and that BMA implements the proposed program to enhance its budgetary base, BMA is assessed to be financially capable of executing all the projects/programs stipulated by the 5th Plan and the BEIP Study, despite that BMA will suffer from a budget shortage in the short-run.

Therefore, it is critical whether or not BMA will challenge to put forth the Enhancement Program which is included in the list of the proposed projects/programs compiled in this report.

Fig. 15.1 BMA's Financial Capability of Implementation of the Proposed Projects and Programs for Environmental Improvement

		million baht			
		Urgent Actions (1997-2001)	Medium-term Projects (2002-2006)	Long-term Projects (2007-2011)	Total
1) Required Environment Investment Costs, 1997 - 2011					
Investment Budget of Environment Projects in BMA Fifth Five-Year Plan	(a)	120,500			120,500
Investment Budget of MWA Five-Year Plan	(b)	114,900			114,900
Total Costs of Projects/Programs of BEIP Study	(c)	47,330	415,450	472,600	935,380
- BMA	(d)	31,740	122,730	141,140	295,610
- Central government		2,320	4,690	1,860	8,870
- State Enterprise		8,680	180,690	216,500	405,870
- Private Sector		4,590	107,340	113,100	225,030
Total Investment Cost	(e)=(a)+(b)+(c)	282,730	415,450	472,600	1,170,780
2) Estimated GPP of BMA in Socio-economic Framework of BEIP Study					
Aggregated GPP (1993 price)	(f)	10,362,000	14,786,000	20,138,000	45,286,000
Increased GDP	(g)	2,187,000	6,611,000	11,963,000	20,761,000
3) Share of Environmental Investment Cost of GPP					
Total Environment Costs as Percentage of GPP	(e)/(f)	2.7%	2.8%	2.3%	2.6%
Total Environment Costs as Percentage of Increased GDP	(e)/(g)	12.9%	6.3%	4.0%	5.6%
4) BMA Budget Revenue in Challenging Case					
Estimated BMA Budget Revenue	(h)	115,100	182,300	255,800	553,200
Percentage of GPP	(h)/(f)	1.1%	1.2%	1.3%	1.2%
5) Source of Investment Budget of BMA					
Investment Budget (BMA)	(i)	28,100	58,070	86,600	172,770
- Percentage of Total Expenditure Budget of BMA	(i)/(h)	24.4%	31.9%	33.9%	31.2%
Investment Budget of Environment Sector	(j)	22,300	49,790	75,320	147,410
- Share of Environment of Total Investment Budget	(j)/(i)	79%	86%	87%	85%
6) Require Amount for Environmental Investment of BMA					
Required Amount for Environmental Investment	(k)=(a)+(d)	152,240	122,730	141,140	416,110
- Required Investment of BMA	(l)=(k)×35%	53,280	42,960	49,400	145,640
- Required Subsidies from Central Government	(m)=(k)×65%	98,960	79,770	91,740	270,470
7) Potential Investment Budget of BMA for Environment					
Potential Investment Budget of BMA for Environment	(j)	22,300	49,790	75,320	147,410
Balance of BMA Budget	(n)=(j)-(l)	-30,980	6,830	25,920	1,770
Percentage of BMA Total Budget	(n)/(h)	-27%	4%	10%	0%

Source: BEIP Study

**A List
of
Proposed Projects and Programs
for
Bangkok Environmental Improvement**

PROPOSED PROJECTS AND PROGRAMS FOR URBAN ENVIRONMENTAL IMPROVEMENT IN BANGKOK

Title of Projects/Programs	Type of Project A: Development Study B: Institutional Building C: Infrastructure Dev. D: Others	Prioritization Criteria M: Minimum B: Basic S: Strategic	Implementing Body	Related Agencies	Private Participation I: Major II: Supporting	Cost and Allocation (million baht)			
						Total Cost	BMA	Central Government	State Enterprise Private
Plan 1: Sustainable Resource Utilization									
Urgent Actions									
RU11: Formulation of Institutional Program for Land Subsidence Protection Projects (based on the JICA Study, 1992-95)	B	M	BMA	MOSTE					
RU12: Establishment of Guidelines for Land Development and Environmental Preservation (related to UR12)	B	M	BMA	MOSTE /MOI					
RU13: Public Campaign for Promotion of People's Awareness of Energy-saving	D	M	MOSTE	MOI	II	90	90		
Medium-term Projects/programs									
RU21: Development of "Solid Waste Recycling Center" plus Encouragement of Recycling Industries" (related to SW21)	B, C	B	BMA	MOSTE	I				
RU22: Development of "Green and Water Network" along Major Khlongs (related to WE24)	B, C	B	BMA		II	4,390	4,390		
RU23: R & D Support Program for Environmental and Energy-saving Technologies (related to AR24)	D	S	MOSTE		I				
RU31: Implementation of Projects/Programs for "Energy-saving" and "Environmental Preservation" (based on RU23)	B, D	B	MOSTE	MOI	I				
Plan 2: Flood-free Urbanization									
Urgent Actions									
FL11: Long-term Master Plan Study for Flood Control in Lower Chao Phraya River Basin (scheduled to be supported by JICA)	A	M	BMA	RID					
FL12: Improvement, Rehabilitation and Enhancement of Existing Flood Protection Facilities (Dike, Water Gates, Pumping Stations and Drainage Systems)	C	M	BMA	MOI/RID		310	310		
FL13: Flood Plain Management Project for the Eastern Bank Area (Thonburi Side)	C	M	BMA	MOI		880	880		
FL14: Implementation of Projects for BMA 5th Five-year Plan	C	B	BMA			23,630	23,630		
FL21: Implementation of Phase I Projects for Flood Protection System/Facilities Development (based on FL11)	C	B	BMA	RID/MOI		310	310		

PROPOSED PROJECTS AND PROGRAMS FOR URBAN ENVIRONMENTAL IMPROVEMENT IN BANGKOK

Title of Projects/Programs	Type of Project A: Development Study B: Institutional Building C: Infrastructure Dev. D: Others	Prioritization Criteria M: Minimum B: Basic S: Strategic	Implementing Body	Related Agencies	Private Participation I: Major II: Supporting	Cost and Allocation (million baht)			
						Total Cost	BMA	Central Government	State Enterprise Private
FL22: Implementation of the Extended Flood Plain Management Project for the Eastern Bank Area (following-up FL13)	C	B	BMA	MOI		380	380		
Long-term Projects/Programs									
FL31: Implementation of Phase II Projects for Flood Protection System/Facilities Development (based on FL11)	C	B	BMA	RID/MOI		880	880		
Plan 3: Environment-initiative Urban Transport (Eco-transport) System									
Urgent Actions									
ET11 Pedestrian Environment Improvement Plan	A	M	BMA			60	60		
ET12 Eco-Street Development Plan	A	B	BMA	MOTC		40	40		
ET13 Water Transport Revitalization Program	A	B	MOTC /BMA			40	40		
ET14 Public Transport Integration Plan	A	M	OCMRT /BMA	BMTA		60	60		
ET15 Master Plan and Feasibility Study on Public Transport Terminals and Inter-Modal Facilities	A	B	OCMRT /BMA	MOTC /BMTA		60	60		
ET16 Feasibility study and Engineering Study on Major Secondary Road	A	B	BMA			140	140		
ET17 Area Road Pricing plan	A	B	OCMRT	BMA /MOTC /MOTC /ETA		60	60		
ET18 Review of Primary Road System	A	B	OCMRT			20	20		
ET19 Implementation of Projects for BMA 5th Five-year Plan	C	B	BMA			54,400	54,400		
Medium-term Projects/programs									
ET24 Pedestrian Environment Improvement Phase 1 (based on ET11)	C	M	BMA		II	3,910	3,910		
ET25 Eco-Street Development Phase 1 (based on ET12)	C	B	BMA	MOTC	II	680	680		
ET26 Water Transport Revitalization Phase 1 (based on ET13)	C	M	MOTC /BMA		II	840	840		
ET27 Public Transport Integration Phase 1 (based on ET14)	C	M	BMTA	MOTC		100	100		100
ET28 Public Transport Terminals and Inter-Modal Facilities Development (based on ET15)	C	B	MOTC /BMTA /BMA	MOTC OCMRT	II	7,480	2,490	2,490	2,500
ET29 Implementation of Major Secondary Road Projects (based on ET16)	C	B	BMA			2,450	2,450		

PROPOSED PROJECTS AND PROGRAMS FOR URBAN ENVIRONMENTAL IMPROVEMENT IN BANGKOK

Title of Projects/Programs	Type of Project A: Development Study B: Institutional Building C: Infrastructure Dev. D: Other	Prioritization Criteria M: Minimum B: Basic S: Strategic	Implementing Body	Related Agencies	Private Participation I: Major II: Supporting	Cost and Allocation (million baht)			
						Total Cost	BMA	Central Government	State Enterprise Private
ET30 Implementation of Area Road Pricing Project (based on ET17)	C	B	BMA	MOTC /OCMRT		300	300		
ET31 Formulation of Transport Master Plan for 9th National Development Plan	A	M	OCMRT	NESDB		60	60		
ET32 Proceed Implementation of Extended Mass Transit System Projects (71.4km)	C	S	MRTA	MOTC /BMA	I	42,080		29,290	12,790
Long-term Projects/Programs									
ET33 Pedestrian Environment Improvement Phase 2 (based on ET11)	C	M	BMA		II	1,360	1,360		
ET34 Eco-Street Development Phase 2 (based on ET12)	C	B	BMA	MOTC	II	1,560	1,560		
ET35 Water Transport Revitalization Phase 2 (based on ET13)	C	M	MOTC	BMA	II	1,550	1,550		
ET36 Public Transport Integration Phase 2 (based on ET14)	C	M	OCMRT	BMTA		100	1,550		100
ET37 Public Transport Terminals and Inter-Modal Facilities Development (based on ET15)	C	B	MOTC /BMTA /BMA	OCMRT		640	210	210	220
ET38 Implementation of Major Secondary Road Projects (based on ET16)	C	B	BMA			32,390	32,390		
ET39 Formulation of Transport Master Plan for 10th National Development Plan	A	M	OCMRT	NESDB		100	100		
ET40 Proceed Implementation of Mass Transit System Projects (53.6km)	C	S	MRTA	MOTC /BMA	I	37,400		26,520	10,880
Plan 4: Pursuance of "Fresh and Clean Air Policy"									
Urgent Actions									
AR11: Environmental Administration Enhancement Program, including: • Extension of Monitoring Stations and Equipment for Meteorology and Ambient Air Quality. • Establishment of Epidemiological Surveillance System; and • Training and Technology Transfer of Analytical Technique.	B, D	M	MOSTE	BMA		130		130	
AR12: Establishment of Air Pollutants Protection Guidelines for Private Activities, including: • Construction Site Management and Truck Cleaning; and • Combustion Management and Emission Control for Factories.	B	M	MOSTE	BMA	I				

PROPOSED PROJECTS AND PROGRAMS FOR URBAN ENVIRONMENTAL IMPROVEMENT IN BANGKOK

Title of Projects/Programs	Type of Project A: Development Study B: Institutional Building C: Infrastructural Dev. D: Others	Prioritization Criteria M: Medium B: Basic S: Strategic	Implementing Body	Related Agencies	Private Participation I: Major II: Supporting	Cost/Land Allocation (million baht)		
						Total Cost	BMA Government	State Employees Private
AR13: Improvement of Vehicle Inspection and Maintenance System Program, including <ul style="list-style-type: none"> Standardization and Technical Guidelines of Emission Inspection; Training and Qualification System for Inspectors /Mechanics; Public Relation of the System, and Institution Building, and so on. 	B, D	M	MOTC	MOSTE /BMA	I	600	600	
AR14: Implementation of "Fresh and Clean Air Program for Public Bus", including: <ul style="list-style-type: none"> Checking System of Maintenance and Exhaust Gas; and Low-Pollution Bus Replacement (Introduction of CNG Bus, ect.) Program. 	B, D	B	BMTA	MOTC /BMA	II	9,350	940	8,410
AR15: Public Campaign for Promotion of People's Awareness of Vehicle Maintenance and Dust Reduction by Construction	D	M	MOSTE /BMA	MOTC	II	60	60	
AR16: Establishment of Transportation Research Center (in coordination with ERTC), including <ul style="list-style-type: none"> Study for environmentally sound transportation policies; Research for low-emission-vehicles and transportation technology suitable for South East Asia 	B, D	S	MOTC	MOSTE /MOI		90	90	
AR17: Study of Action Plans for "Comprehensive Urban Traffic Pollution Management"	A	M	MOSTE /MOTC	BMA	II	40	40	
AR18: Implementation of Projects for BMA 5th Five-year Plan Medium-term Projects/programs	C	M	BMA	MOSTE	II	240	240	
AR21: Implementation of the Extended Environmental Administration Enhancement Program (following-up AR11)	C, D	M	MOSTE		II	70	70	
AR22: Enhancement of Voluntary Activities by the Private Sector, including: <ul style="list-style-type: none"> Introduction of Voluntary Environment Management System; Promotion of Private Laboratory and Monitoring Activities; Establishment of Public Qualification System for Environmental Engineers/Managers; and Introduction of ISO14000 System. 	B	B	MOSTE	NESDB /MOID	I	60	60	

PROPOSED PROJECTS AND PROGRAMS FOR URBAN ENVIRONMENTAL IMPROVEMENT IN BANGKOK

Title of Projects/Programs	Type of Project (A: Development Study B: Institutional Building C: Infrastructure Dev. D: Others)	Prioritization (Criteria: M: Minimum B: Basic S: Strategic)	Implementing Body	Related Agencies	Private Participation (I: Major II: Supporting)	Cost and Allocation (million baht)			
						Total Cost	BMA	Central Government	State Enterprise Private
AR23: Implementation of the Extended Vehicle Inspection and Maintenance System Improvement Program (following-up AR13)	C	M	MOTC	MOSTE	I	170		90	30
AR24: Implementation of "Energy-saving Policy", including: • Incentive Provision for Shifting to Cleaner Energy/Fuel; and • Institutional Support for Fuel Efficiency Improvement.	B	S	MOSTE	NESDB /MOF /MO/D	I	60		60	
AR25: R & D Support Program for Less Pollutant Vehicle Production (hybrid Electric Vehicle etc.)	A	S	MOSTE		I	5,100		1,020	4,080
Plan 5: Creation of Water-friendly Eco-city									
Sewerage System Development									
Urgent Actions									
SS11: Review of the Existing Sewerage Master Plan in Priority, Facility Sites, Systems, Engineering Design and Implementation Scheme	A	M	BMA	WMA/ MOSTE		20	20		
SS12: Feasibility Study on Priority Sewerage System Projects, Committed in the BMA 5th Five Year Strategic Plan (based on SS11)	A	M	BMA	WMA/ MOSTE		40	40		
SS13: Procurement of Sewerage Treatment Facility Construction Sites for the Priority Project (related to SS12)	C	B	BMA	WMA/ MOSTE	II	22,870	22,870		
SS14: Promotion of Public Campaign for Saving Water and Reducing Water Pollutants	D	M	BMA	WMA/ MOSTE		90	90		
SS15: Implementation Project for BMA 5th Five-year Plan	C	B	BMA	WMA/ MOSTE		18,300	18,300		
Medium-term Projects/programs									
SS21: Implementation of the Priority Projects (based on SS11-13)	C	B	BMA	WMA/ MOSTE	II	50,020	50,020		
SS22: Feasibility Study on Second Priority (Phase II) Sewerage System Projects (based on SS11)	A	B	BMA	WMA/ MOSTE		40	40		
SS23: System Management and Maintenance Capability Enhancement Project (related to UR22)	B	B	BMA	WMA/ MOSTE	II	590	590		
Long-term Projects/Programs									
SS31: Implementation of Second Priority (Phase II) Sewerage System Projects (based on SS22)	C	B	BMA	WMA/ MOSTE	II	46,890	46,890		
SS32: Implementation of Extended Project for Sewerage System Development	C	B	BMA	WMA/ MOSTE	II	1,070	1,070		

PROPOSED PROJECTS AND PROGRAMS FOR URBAN ENVIRONMENTAL IMPROVEMENT IN BANGKOK

Title of Projects/Programs	Type of Project A: Development Study B: Institutional Building C: Infrastructure Dev. D: Others	Prioritization Criteria M: Minimum B: Basic S: Strategic	Implementing Body	Related Agencies	Private Participation I: Major II: Supporting	Cost and Allocation (million baht)			
						Total Cost	BMA	Central Government	State Enterprise
River and Khlong Water Improvement									
Urgent Actions									
WE11: Extension of the on-going Khlong Beautification Program in the Eastern Bank Area	C	M	BMA		II	200	200		
WE12: Feasibility Study for Khlong Waterway and Boat Piers Improvement Project (related to ET13)	A	M	BMA	MOTC		30	30		
WE13: Formulation of "Khlong Water Beautification Program" in Thonburi Area	A	M	BMA	MOSTE/ MOTC		30	30		
WE14: Master Plan Study for Chao Phraya River Water Front Regeneration Project	A	M	BMA	MOSTE /MOTC		30	30		
WE15: Promotion of Public Campaign for "Clean, Green, Khlongs"	D	M	BMA	MOSTE	II	90	90		
Medium-term Projects/Programs									
WE21: Implementation of Khlong Waterway and Boat Piers Improvement Project (based on WE12)	C	M	BMA	MOTC	II	530	530		
WE22: Implementation of "Khlong Water Beautification Program" in Thonburi Area" (based on WE13)	C	M	BMA	MOSTE /MOTC	II	200	200		
WE23: Implementation of Phase I Project for Chao Phraya River Water Front Regeneration (based on WE14)	C	S	BMA	MOSTE /MOTC /MOI	I	980	490		490
WE24: "Green and Water Network" Project along Major Khlongs	C	B	BMA	MOI	II	780	780		
Long-term Projects/Programs	C	S	BMA	MOI	I	980	490		490
WE31: Implementation of the Extended Phase II Projects for Chao Phraya River Water Front Regeneration (following-up WE23)									
Plan 6: Up-grading of Quality of Living Environment									
Solid Waste Management									
Urgent Actions									
SW11: Master Plan, Feasibility and Engineering Study for Final Disposal Sites/Facilities Development in Bangkok	A	M	BMA			60	60		
SW12: Feasibility and Engineering Study on Intermediate Solid Waste Treatment Facilities and Long-term System Development (including Improvement of Collection and Transport Systems)	A	M	BMA			40	40		

PROPOSED PROJECTS AND PROGRAMS FOR URBAN ENVIRONMENTAL IMPROVEMENT IN BANGKOK

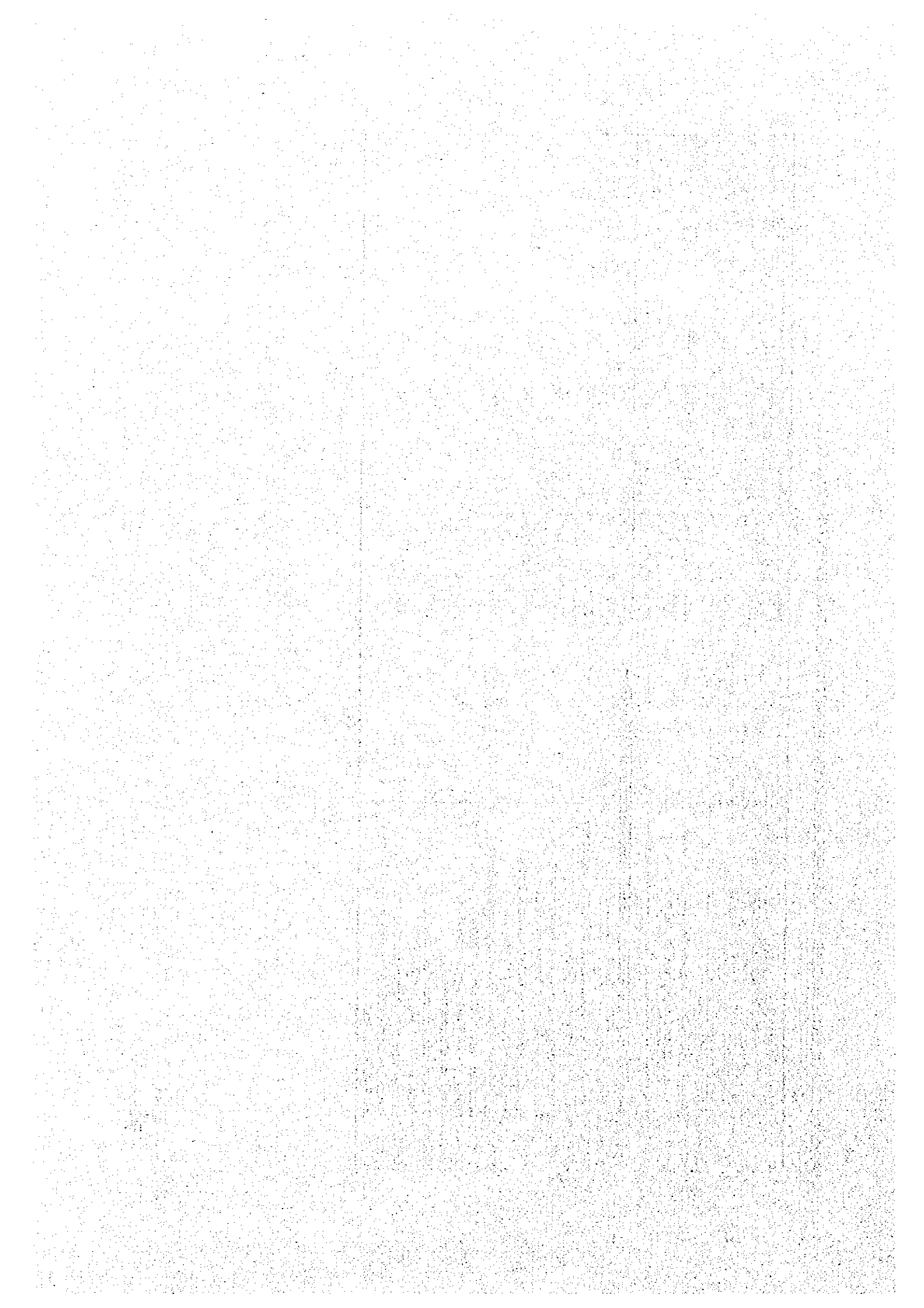
Title of Projects/Programs	Type of Project A: Development Study B: Institutional Building C: Infrastructure Dev. D: Others	Prioritization Criteria M: Medium B: Basic S: Strategic	Implementing Body	Related Agencies	Private Participation I: Major II: Supporting	Cost and Allocation (million baht)		
						Total Cost	BMA	Central Government State Enterprise Private
SW13: Bangkok Incineration Plant Development Project (based on a review of the existing BOT/Turn-key program)	C	B	BMA	MOSTE	II	9,180	4,550	4,550
SW14: Public Campaign for Promotion of People's Awareness for Solid Waste Reduction and Community Collection System	D	M	MOSTE	BMA	II	90	90	
SW15: Implementation of Projects for BMA Fifth Five-year Plan • Facilities Development • Disposal contract Medium-term Projects/programs	C	B	BMA		II	23,930	23,930	
SW21: Development of "Solid Waste Recycling Center" and Encouragement of Recycling Industries	C	B	BMA	MOID	I	4,750	2,380	2,370
SW22: Implementation of Final Disposal Site/Facility Development Project (based on SW11)	C	M	BMA	MOSTE	II	5,430	5,430	
SW23: Implementation of Intermediate Waste Treatment System Development (following up SW12)	C	B	BMA		II	980	980	
SW24: Extended Project of Incineration Plant Development (linked with SW13)	C	B	BMA	MOSTE	I	27,550	13,780	13,770
Long-term Projects/Programs								
SW31: Implementation of Extended Projects of Solid Waste Intermediate and Final Disposal Facilities Development (linked with SW21-23)	C	B	BMA	MOSTE	II	5,430	5,430	
Water Supply System								
Urgent Actions								
WS11: Feasibility Study for Improvement and Rehabilitation of Existing Water Supply Facilities and Subscriber Management System	A	M	MWA	BMA		60	60	60
WS12: Review of the Existing Long-term Master Plan of Water Supply System Development	A	M	MWA	BMA		30	30	30
WS13: Implementation of Projects for MWA 5th Five-year Plan	C	B	MWA	BMA		114,900	114,900	114,900
WS21: Implementation of Improvement/Rehabilitation of Water Supply System (based on WS11 and WS12)	C	M	MWA	BMA		58,620	58,620	58,620
WS22: Development of Computerized Management and Maintenance Systems for Water Supply Facilities and Subscribers	C	S	MWA			780	780	780

PROPOSED PROJECTS AND PROGRAMS FOR URBAN ENVIRONMENTAL IMPROVEMENT IN BANGKOK

Title of Projects/Programs	Type of Project A: Development/Study B: Institutional/Building C: Infrastructure Dev. D: Others	Prioritization Criteria M: Minimum B: Basic S: Strategic	Implementing Body	Related Agency	Private Participation I: Major II: Supporting	Cost and Allocation (million Baht)			
						Total Cost	BMA	Central Government	State Enterprise Private
Long-term Projects/Programs									
WS31: Implementation of Extended Water Resource Development and Supply System Development (based on WS12)	C	M	MWA	BMA		87,930			87,930
Housing and Community Development									
Urgent Actions									
HC11: Feasibility and Engineering Study of the NHA Five-Year Program for Provision of Low and Middle Income Households (related to UR11)	A	B	NHA	BMA		40			40
HC12: Feasibility Study for Slum Resettlement and Up-grading Programs with Enhancement of Financial Support Programs	A	M	NHA	BMA	II	40			40
HC13: Public Campaign for Promotion of Community Participation in Solving Environmental Problems (related to SW14)	D	M	NHA	BMA	II	40			40
HC14: Master Plan and Action Programs Study for Metropolitan Sub-center Development	A	M	BMA	NESDB /MOI /NHA		60			60
Medium-term Project/Programs									
HC21: Implementation of the NHA Five-Year Program for Provision of Low and Middle Income Households (based on HC11)	C	B	NHA	BMA		15,630			15,630
HC22: Implementation of Slum Resettlement and Up-grading Programs with Enhancement of Financial Support Programs (based on HC12)	C	M	NHA	BMA /MOF /NESDB /MOI	I	39,080			19,540
HC23: Support Program for Development of Community Parks, Environmental Green and Pedestrian Facilities (following up HC13)	C	B	BMA		II	3,910	3,910		
HC24: Implementation of Redevelopment Projects of NHA Housing Areas (given to priority to Din Daeng Project)	C	B	NHA	BMA	I	19,540	3,910		7,820
HC25: Implementation of Infrastructure Projects of Sub-center Zone Development (based on HC14)	B, C	S	BMA /NHA	NESDB /MOI /MOTC, etc.	I	116,030	23,210		46,410

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Title of Projects/Programs	Type of Project A. Development Study B. Institutional Building C. Infrastructure Dev. D. Others	Prioritization Criteria M: Minimum B: Basic S: Strategic	Implementing Body	Related Agencies etc.	Private Participation I: Major II: Supporting	Cost and Allocation (million baht)			
						Total Cost	BMA	Central Government	State Enterprise
Long-term Projects/Programs HC31: Implementation of Infrastructure Projects of Extended Sub-center Zone Development (based on HC14)	C	S	BMA /NHA	NESDB /MOI /MOTC, etc.	I	254,320	50,860	101,730	101,730
Special Projects/Programs for Urban Planning and Institutional Enhancement									
Urgent Actions									
UR11: Formulation and Empowerment of Local Environmental Plans and Guidelines by District	A	M	MOSTE			40		40	
UR12: Strategic Study for Urban Management System and Financial Enhancement Programs of BMA	A	M	BMA	MOSTE		70	70		
UR13: Establishment of "Bangkok Information & System Development Center (BISDC)" in BMA	C, D	B	BMA	MOI /MOF		780	780		
UR14: Development of Large Scale Topographical and Cadastral Maps for Urban Planning and Tax Assessment Administration (linked with UR12 and UR13)	C, D	B	BMA			1,370	1,370		
Medium-term Projects/programs									
UR21: Computerization of Local Tax Administration in BMA (based on UR14 and UR15)	B, C	M	BMA		II	290	290		
UR22: Establishment of "Environmental Engineering & Technology Center (EETC)" in BMA, for Staff Training and R&D Promotion	C, D	B	BMA			780	780		



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