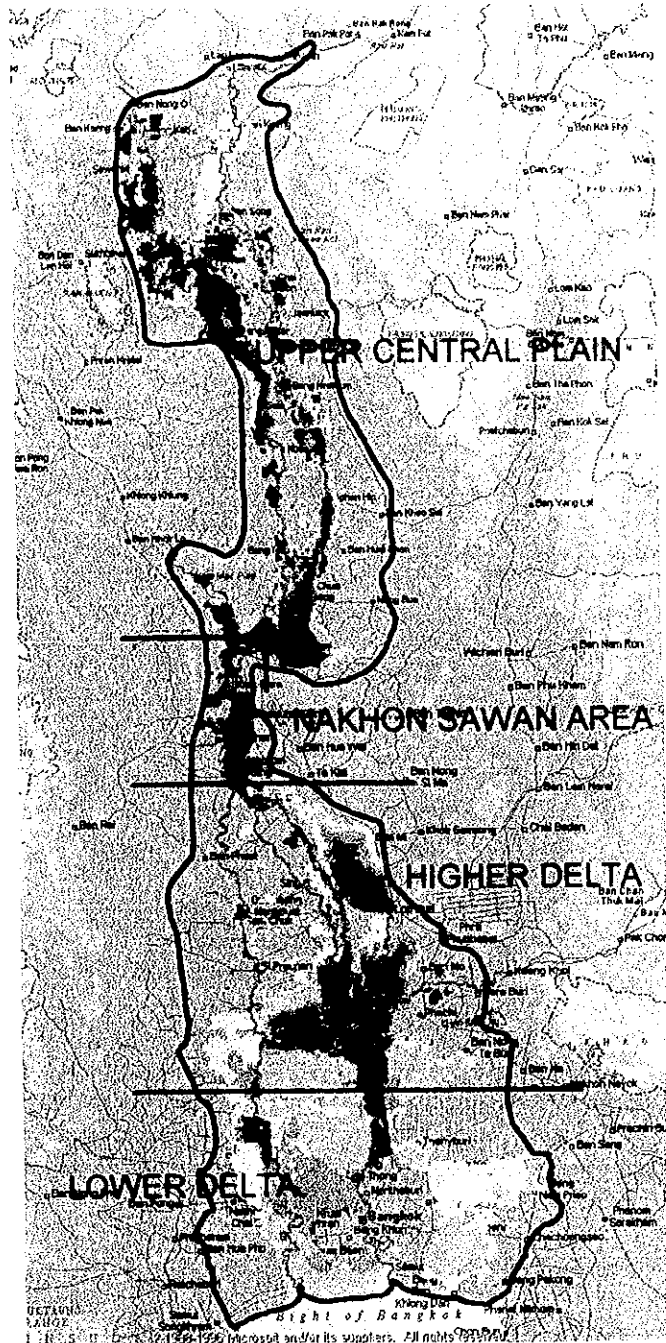
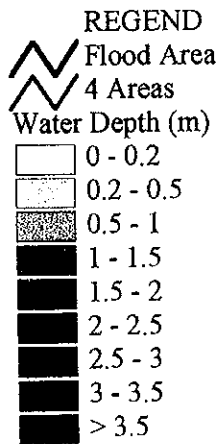
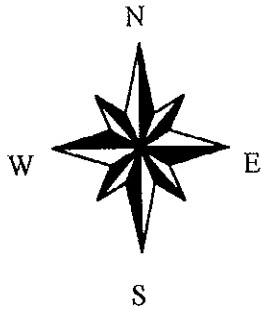


Figures



SIMULATED FLOOD MAP IN 1995



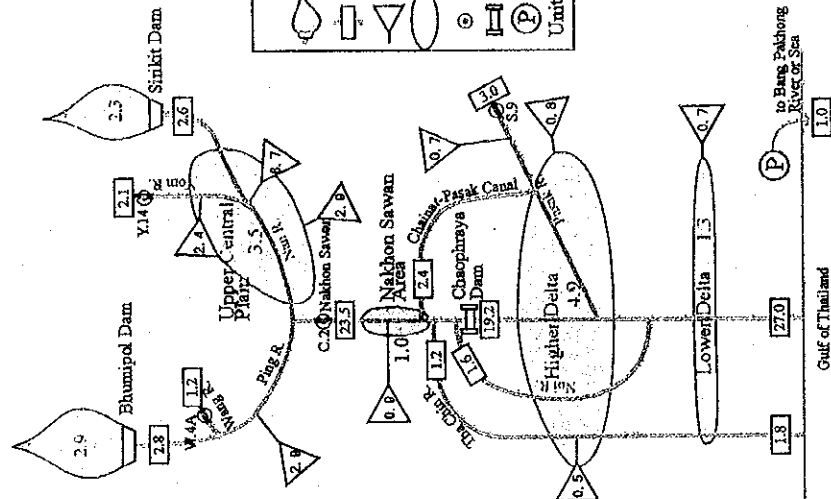
STUDY ON INTEGRATED PLAN FOR FLOOD MITIGATION IN CHAOPHRAYA RIVER BASIN

CTI ENGINEERING CO LTD., & INA CORPORATION

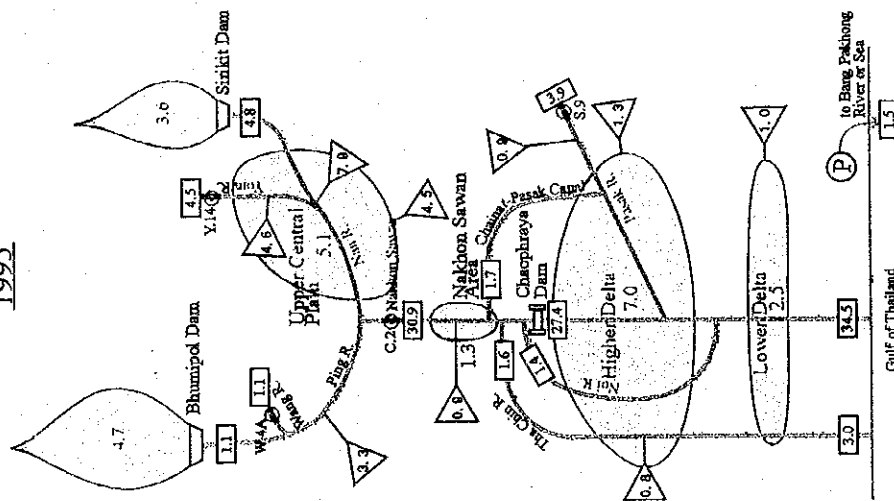
Fig.2.1

ESTIMATED INUNDATION MAP

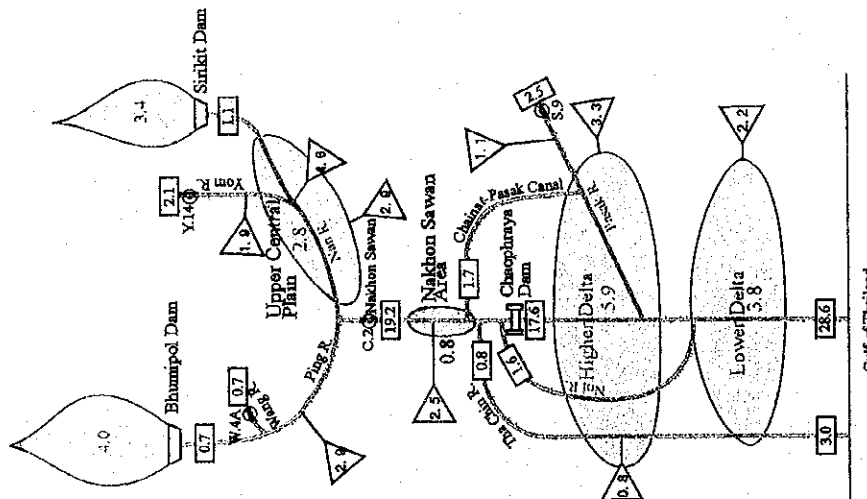
1996



1995



1983

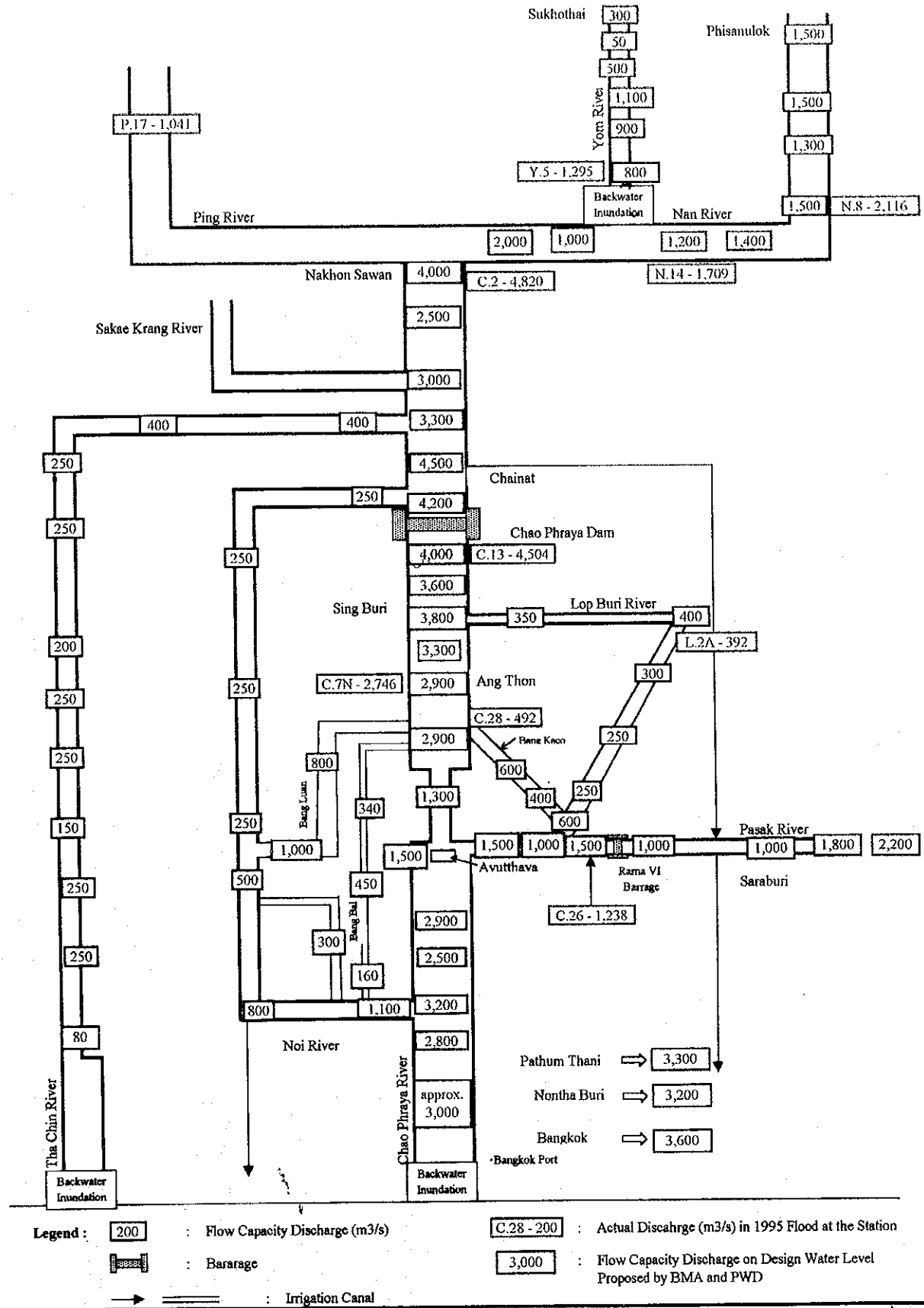


STUDY ON INTEGRATED PLAN FOR FLOOD MITIGATION IN CHAO PHRAYA RIVER BASIN

FIG. 2.2 ESTIMATED WATER BALANCE FROM JULY TO DECEMBER

CTI ENGINEERING CO., LTD AND INA CORPORATION

Flow Capacity of Present River Condition in Chao Phraya River Basin in High Tide



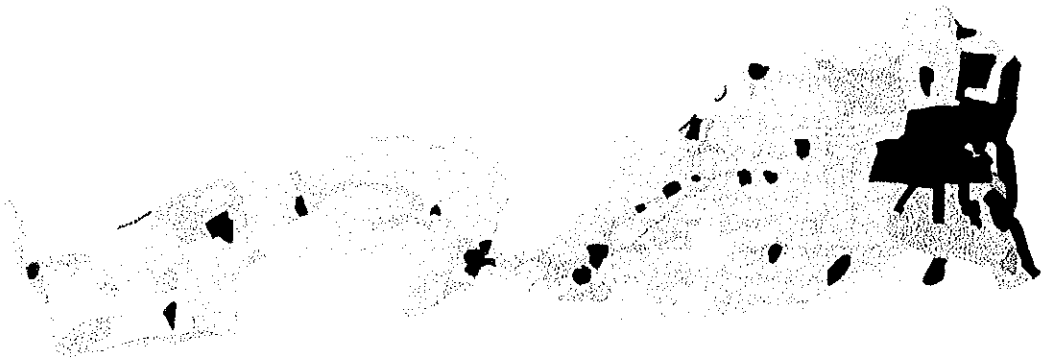
STUDY ON INTEGRATED PLAN FOR FLOOD MITIGATION IN CHAO PHRAYA RIVER BASIN

CTI ENGINEERING CO., LTD AND INA CORPORATION

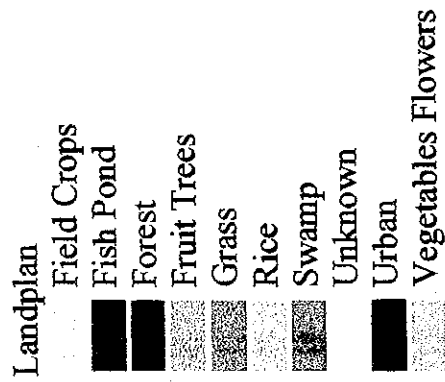
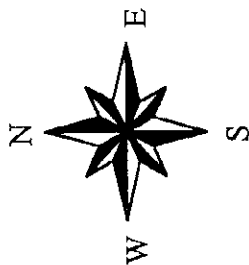
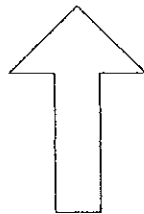
Fig. 2.3

FLOW CAPACITY OF PRESENT RIVER CONDITION IN CHAO PHRAYA RIVER BASIN IN HIGH TIDE

Projected Landuse in 2018



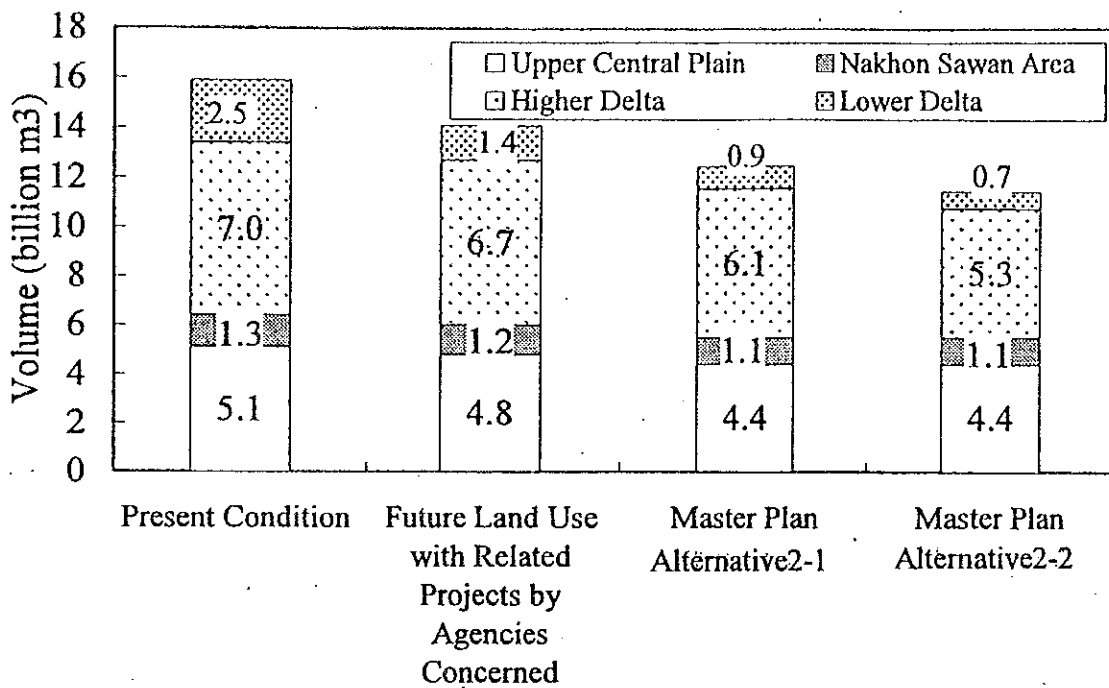
Landuse in 1994



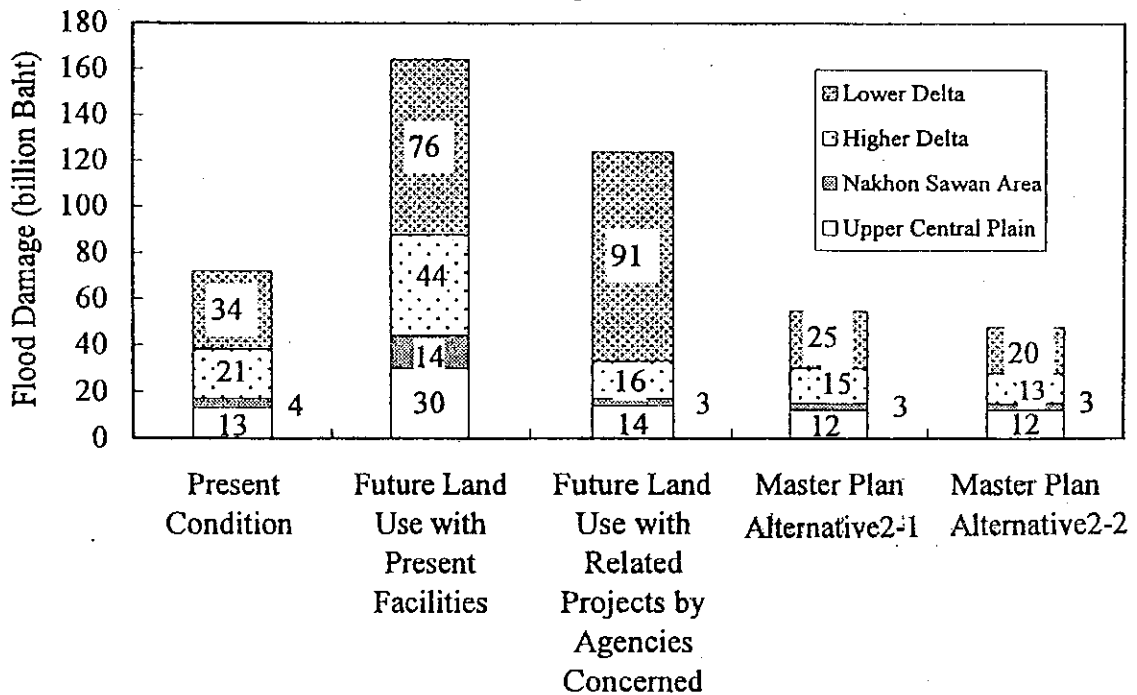
Data Source : MOAC

Note : This future land use is projected in the Study, based on the recent trend of land use change and the urban development plans by DTPC and PWD

Inundation Volume in 1995 Flood



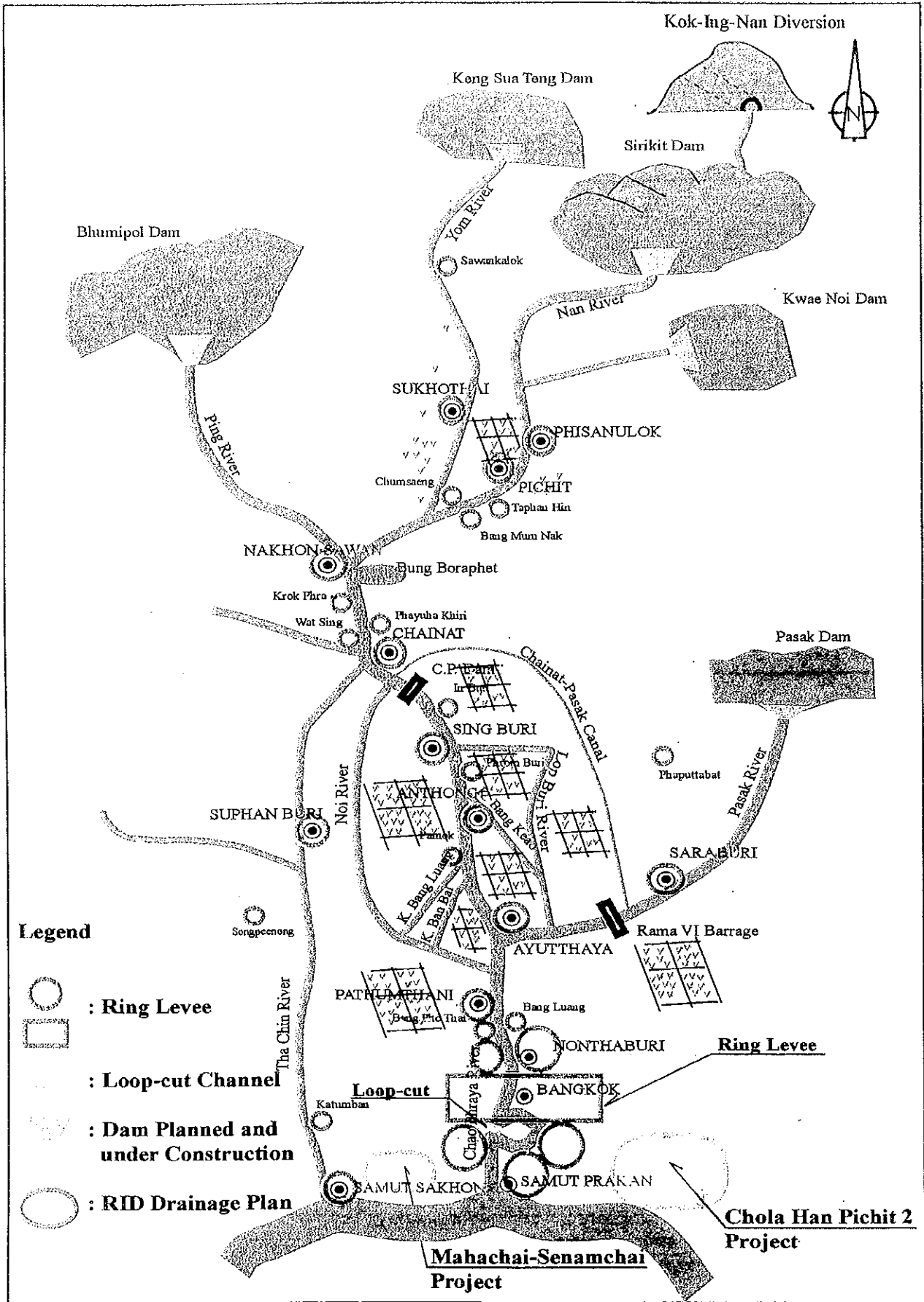
Flood Damage in 1995 Flood



STUDY ON INTEGRATED PLAN FOR FLOOD MITIGATION IN CHAO PHRAYA RIVER BASIN

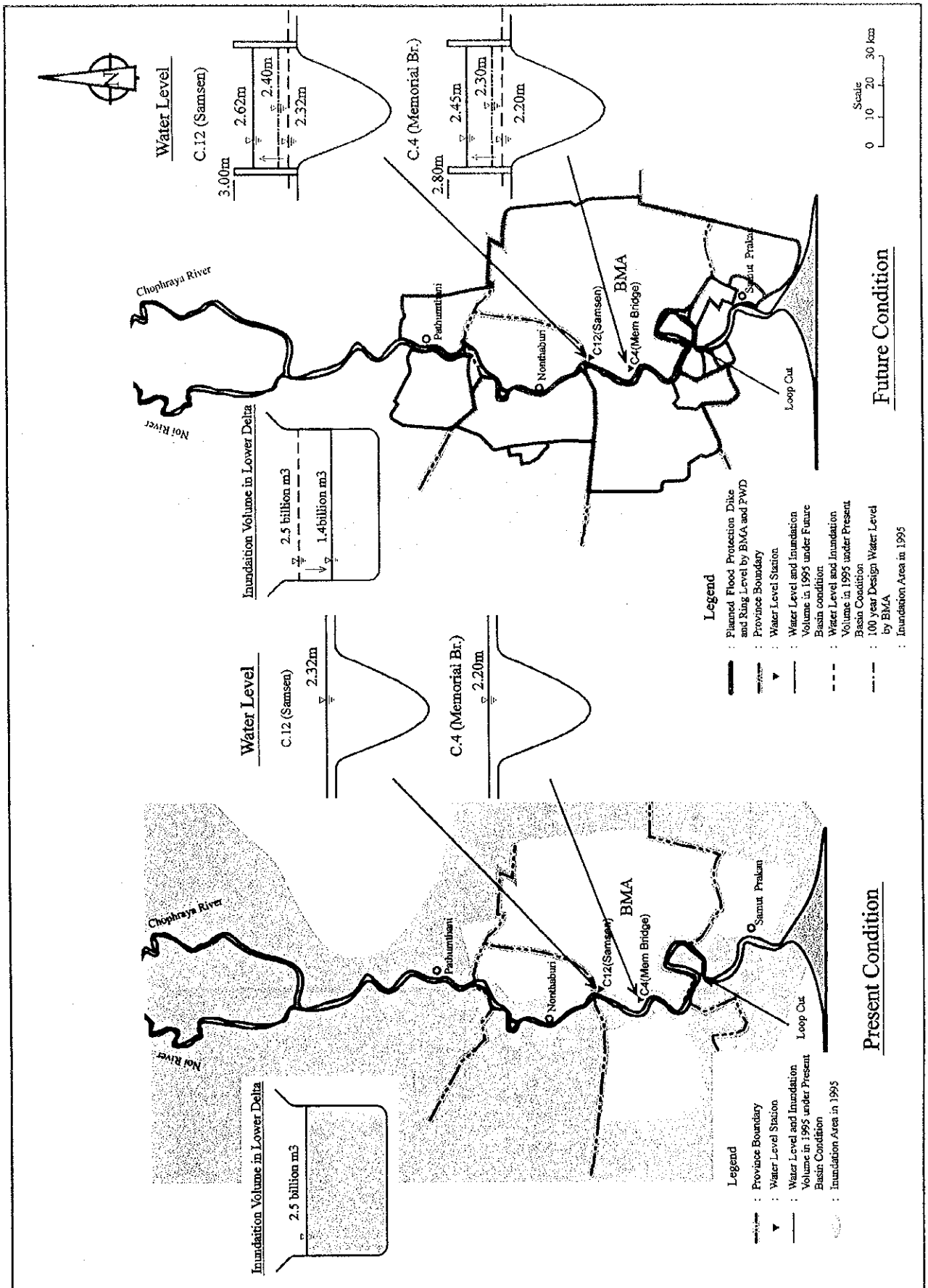
CTI ENGINEERING CO., LTD AND INA CORPORATION

FIG. 2.5
CHANGE OF INUNDATION VOLUME AND FLOOD DAMAGE



STUDY ON INTEGRATED PLAN FOR FLOOD MITIGATION IN CHAO PHRAYA RIVER BASIN
 CTI ENGINEERING CO., LTD AND INA CORPORATION

FIG. 2.6
 PROPOSED FLOOD MITIGATION AND PROTECTION WORKS BY AGENCIES CONCERNED



STUDY ON INTEGRATED PLAN FOR FLOOD MITIGATION IN CHAO PHRAYA RIVER BASIN

CTI ENGINEERING CO., LTD AND INA CORPORATION

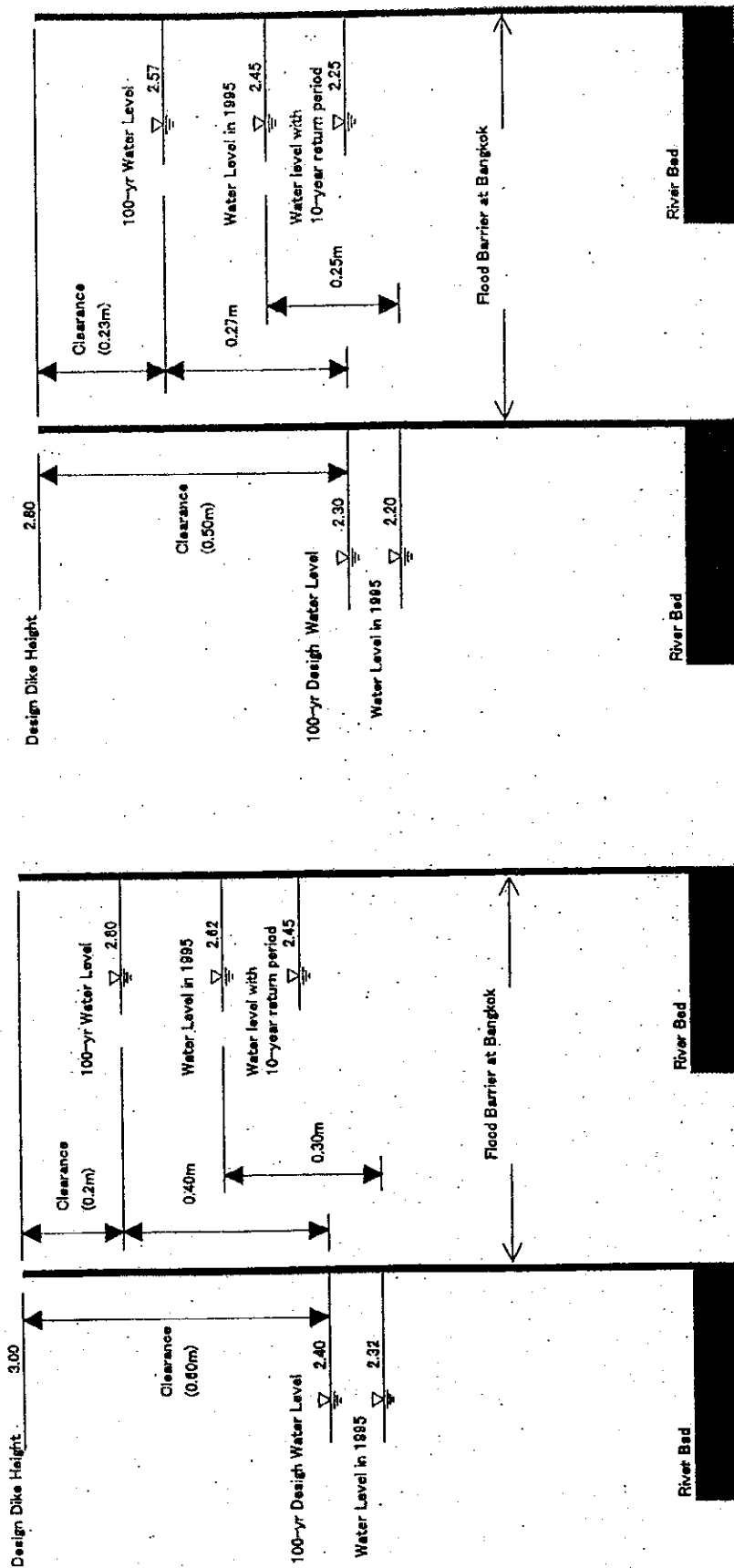
Fig. 2.7
CHANGE OF INUNDATION VOLUME AND
WATER LEVEL BY FUTURE DEVELOPMENT

Future Basin Condition

Present Condition

Future Basin Condition

Present Condition



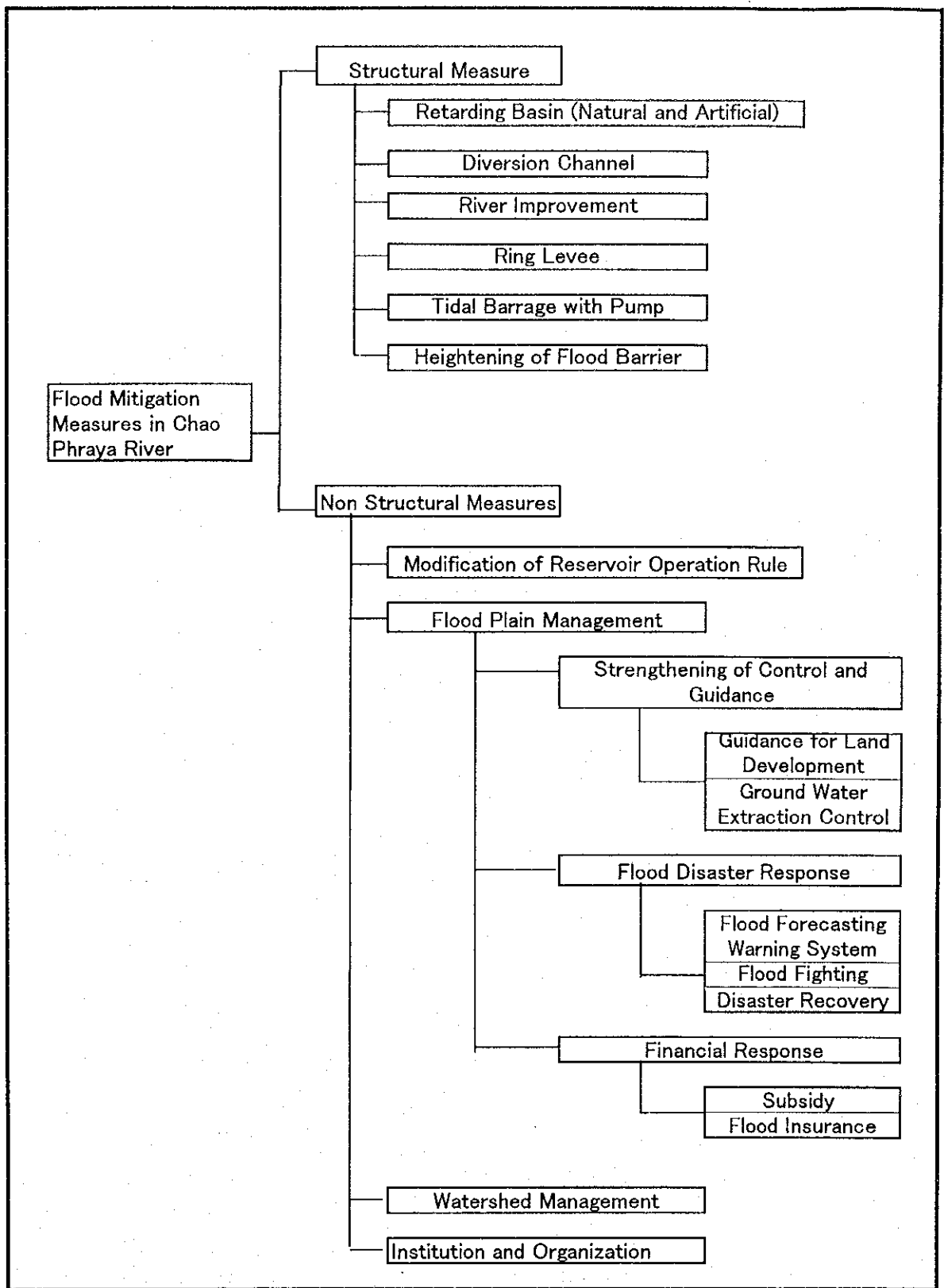
Memorial Bridge (C.4)

Samsen (C.12)

unit : (m MSC)

STUDY ON INTEGRATED PLAN FOR FLOOD MITIGATION IN CHAO PHRAYA RIVER BASIN
 CTI ENGINEERING CO., LTD. AND INA CORPORATION

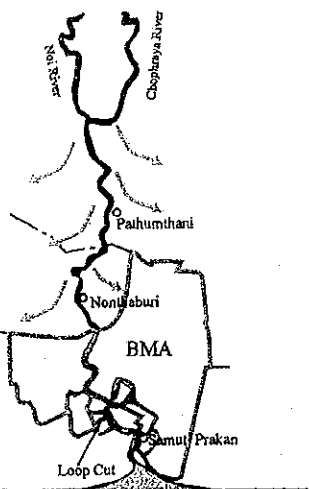
FIG. 2.8 INFLUENCE TO WATER LEVEL IN BANGKOK BY FUTURE DEVELOPMENT



STUDY ON INTEGRATED PLAN FOR FLOOD MITIGATION IN CHAO PHRAYA RIVER BASIN
 CTI ENGINEERING CO., LTD AND INA CORPORATION

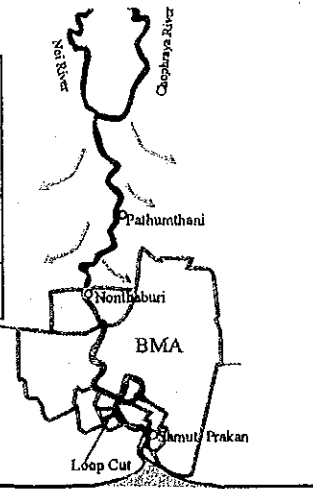
Fig.3.1
 CONCEIVABLE MEASURES FOR COMPREHENSIVE FLOOD MITIGATION IN THE CHAO PHRAYA

Protection Level		
Area	Return Period (year)	Remarks
Pathum Thani (P.T.)	2 to 3	Present Condition
Northa Buri (N.B.)	2 to 3	Present Condition
BMA	125	BMA Plan



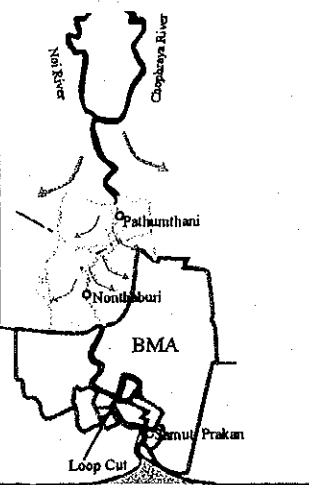
Option 1: Suspension of P.T. & N.B. Protection Works

Protection Level		
Area	Return Period (year)	Remarks
Pathum Thani (P.T.)	2 to 3	Present Condition
Northa Buri (N.B.)	2 to 3 and 100	Partical Protection
BMA	100	BMA Plan



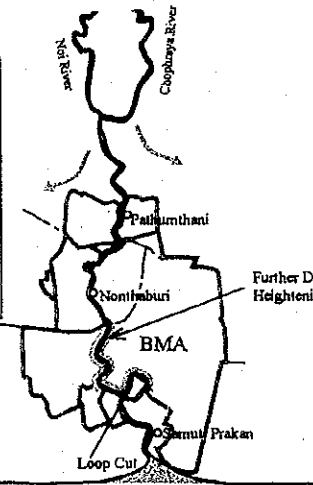
Option 4: Partial Protection of N.B

Protection Level		
Area	Return Period (year)	Remarks
Pathum Thani (P.T.)	5	Minimum Protection
Northa Buri (N.B.)	5	Minimum Protection
BMA	100	BMA Plan



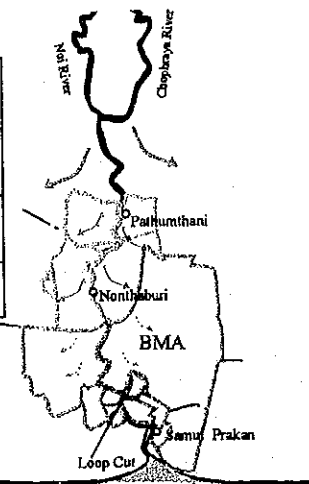
Option 2: Minimum Protection of P.T. & N.B.

Protection Level		
Area	Return Period (year)	Remarks
Pathum Thani (P.T.)	100	PWD Plan
Northa Buri (N.B.)	100	PWD Plan
BMA	100	BMA Plan + Dike Heightening



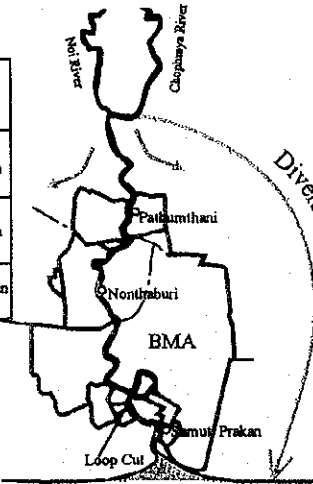
Option 5: 100-year Protection of P.T. & N.B. with Further Dike Heightening in BMA

Protection Level		
Area	Return Period (year)	Remarks
Pathum Thani (P.T.)	7	
Northa Buri (N.B.)	7	
BMA	50	BMA Plan



Option 3: Lowering of Protection Level in BMA with Higher Protection in P.T. & N.B

Protection Level		
Area	Return Period (year)	Remarks
Pathum Thani (P.T.)	100	PWD Plan
Northa Buri (N.B.)	100	PWD Plan
BMA	100	BMA Plan



Option 6: 100-year Protection of P.T. & N.B. with Diversion Channel

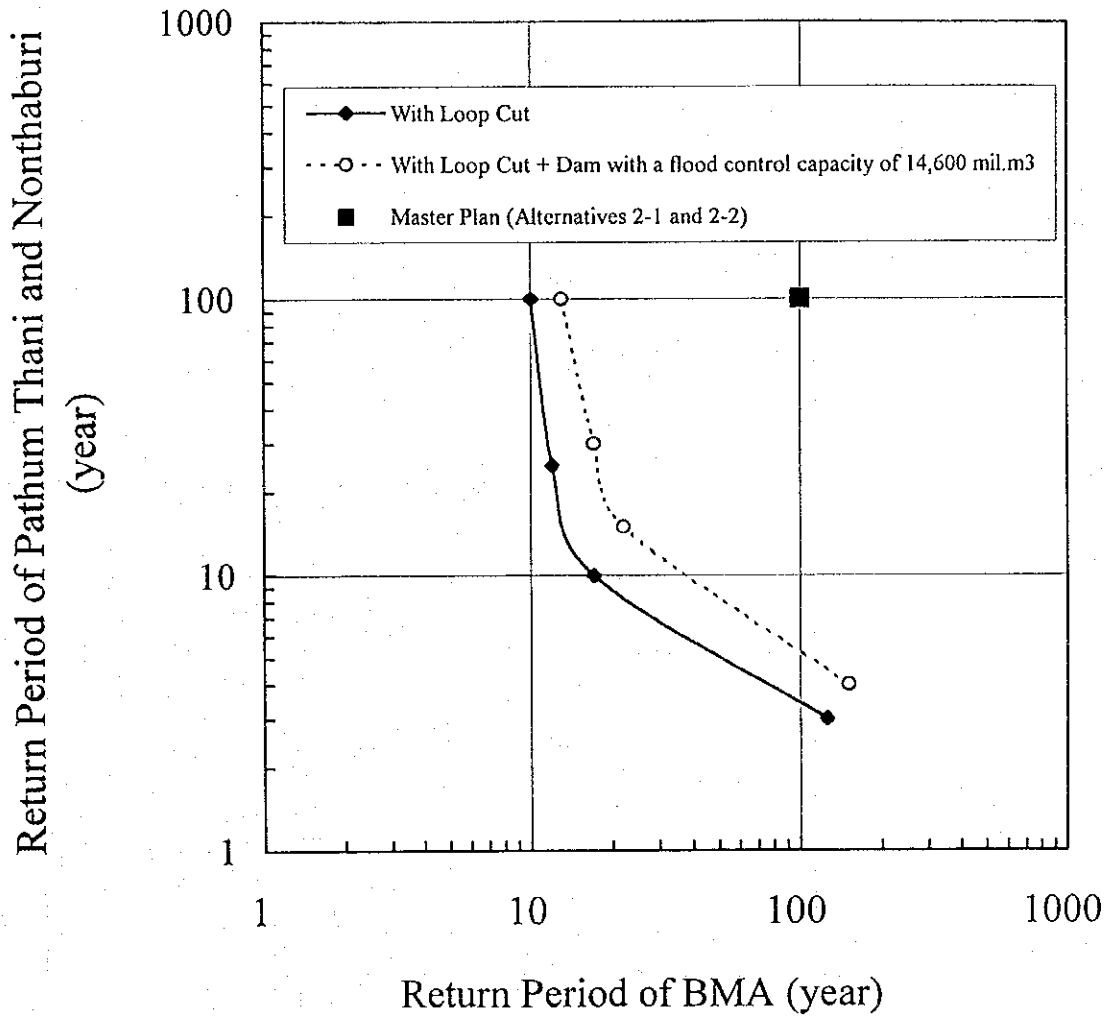
STUDY ON INTEGRATED PLAN FOR FLOOD MITIGATION IN CHAO PHRAYA RIVER BASIN

CTI ENGINEERING CO., LTD AND INA CORPORATION

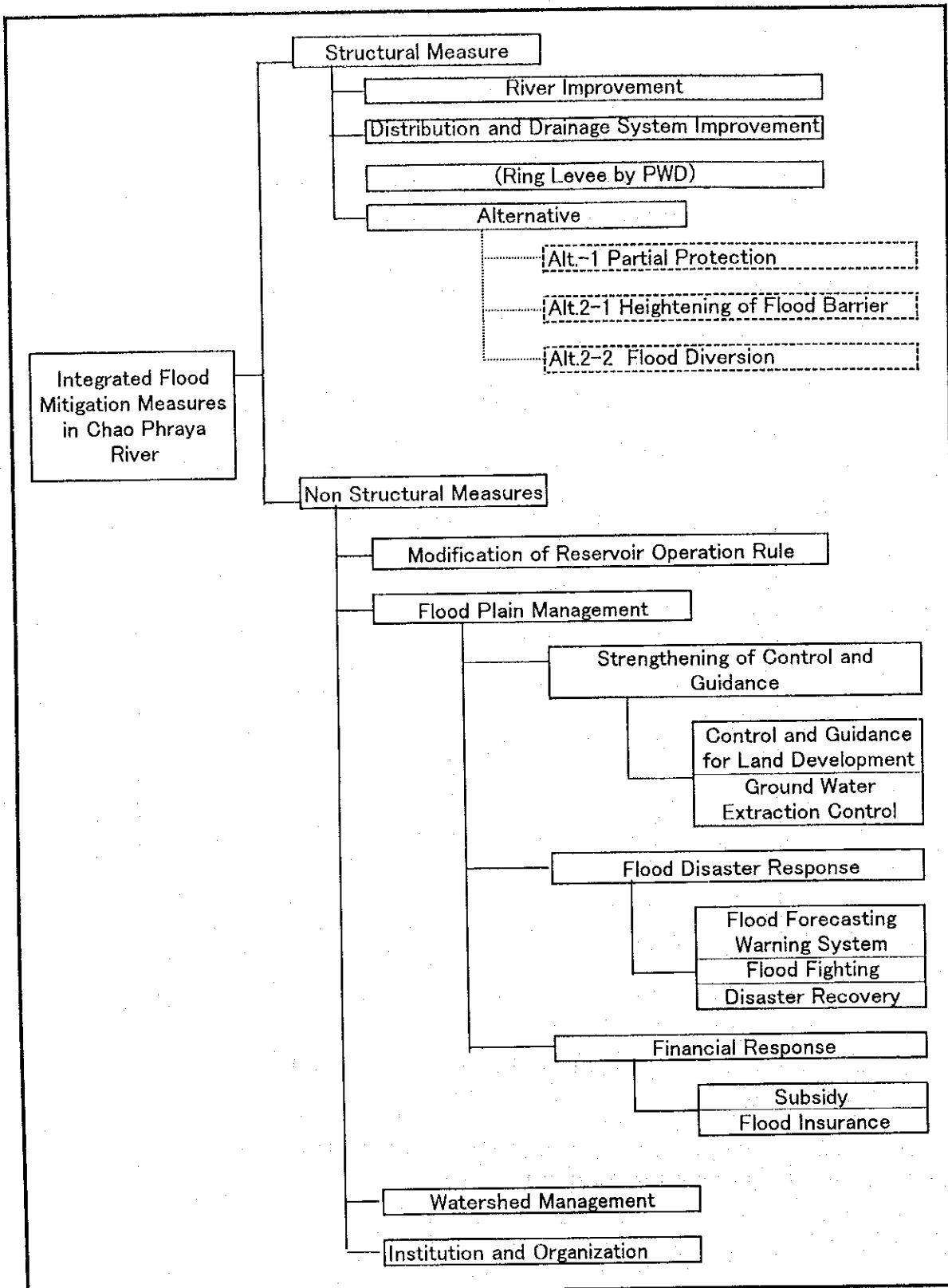
FIG. 3.2

COMBINATION OPTION OF PROTECTION OF BMA, NONTHABURI AND PATHUM THANI

Relationship of Protection Level between BMA and Pathum Thani & Nonthaburi



Note : BMA Area is assumed to have been protected by the flood barrier dike which is currently under construction.

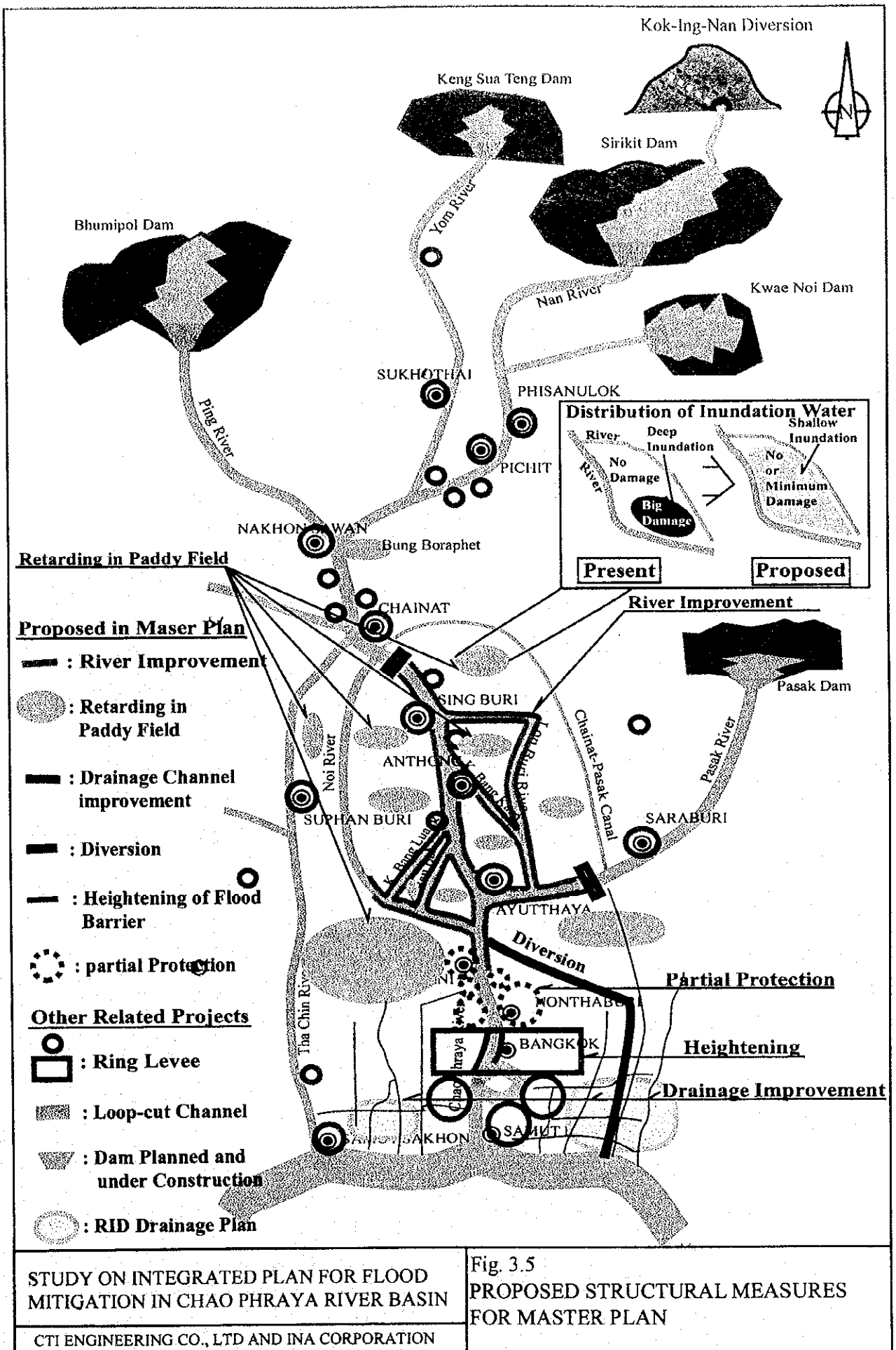


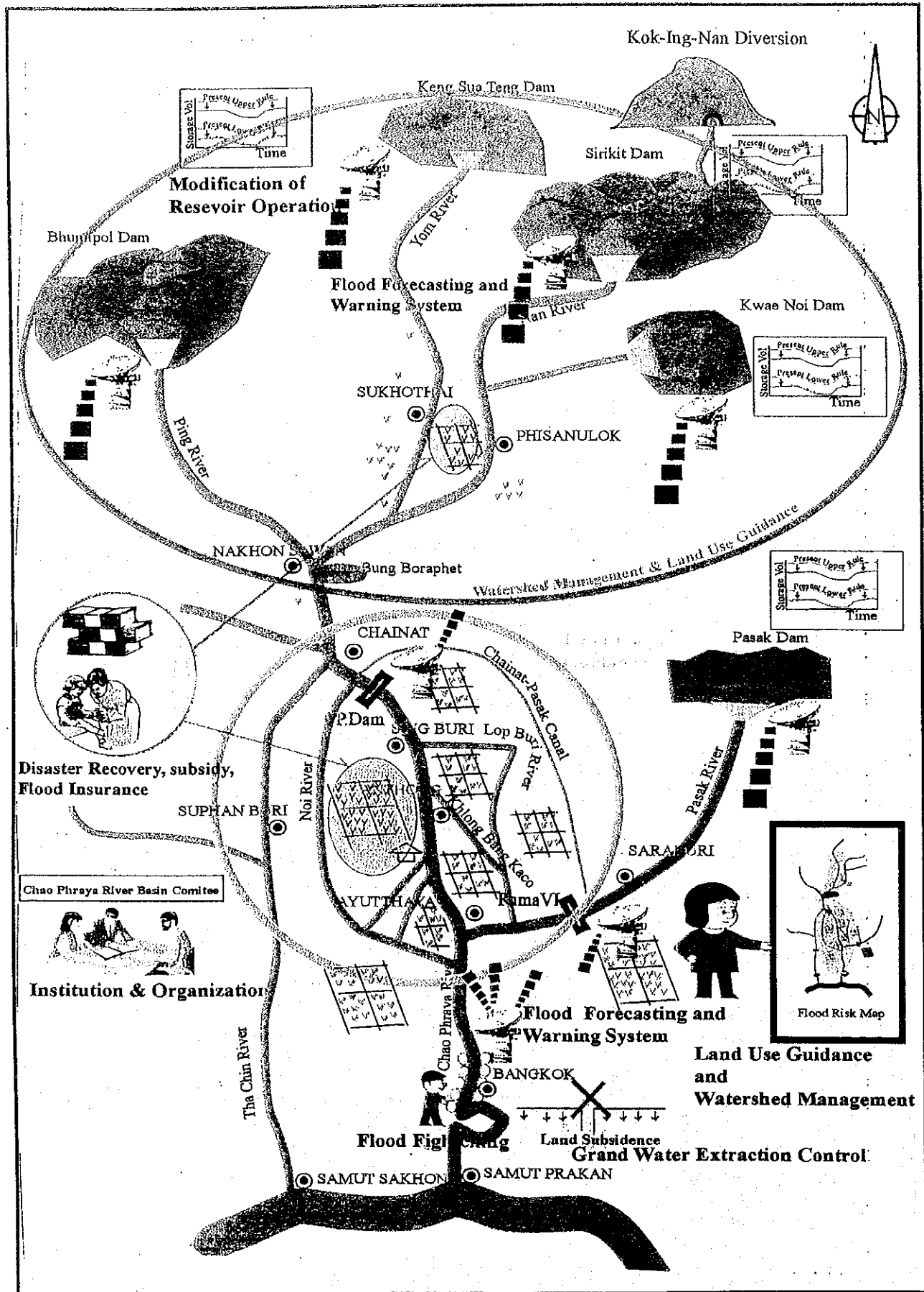
STUDY ON INTEGRATED PLAN FOR FLOOD MITIGATION IN CHAO PHRAYA RIVER BASIN

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Fig.3.4

COMPOSITION OF MASTER PLAN





STUDY ON INTEGRATED PLAN FOR FLOOD MITIGATION IN CHAO PHRAYA RIVER BASIN

FIG. 3.6 PROPOSED NON-STRUCTURAL MEASURES FOR MASTER PLAN

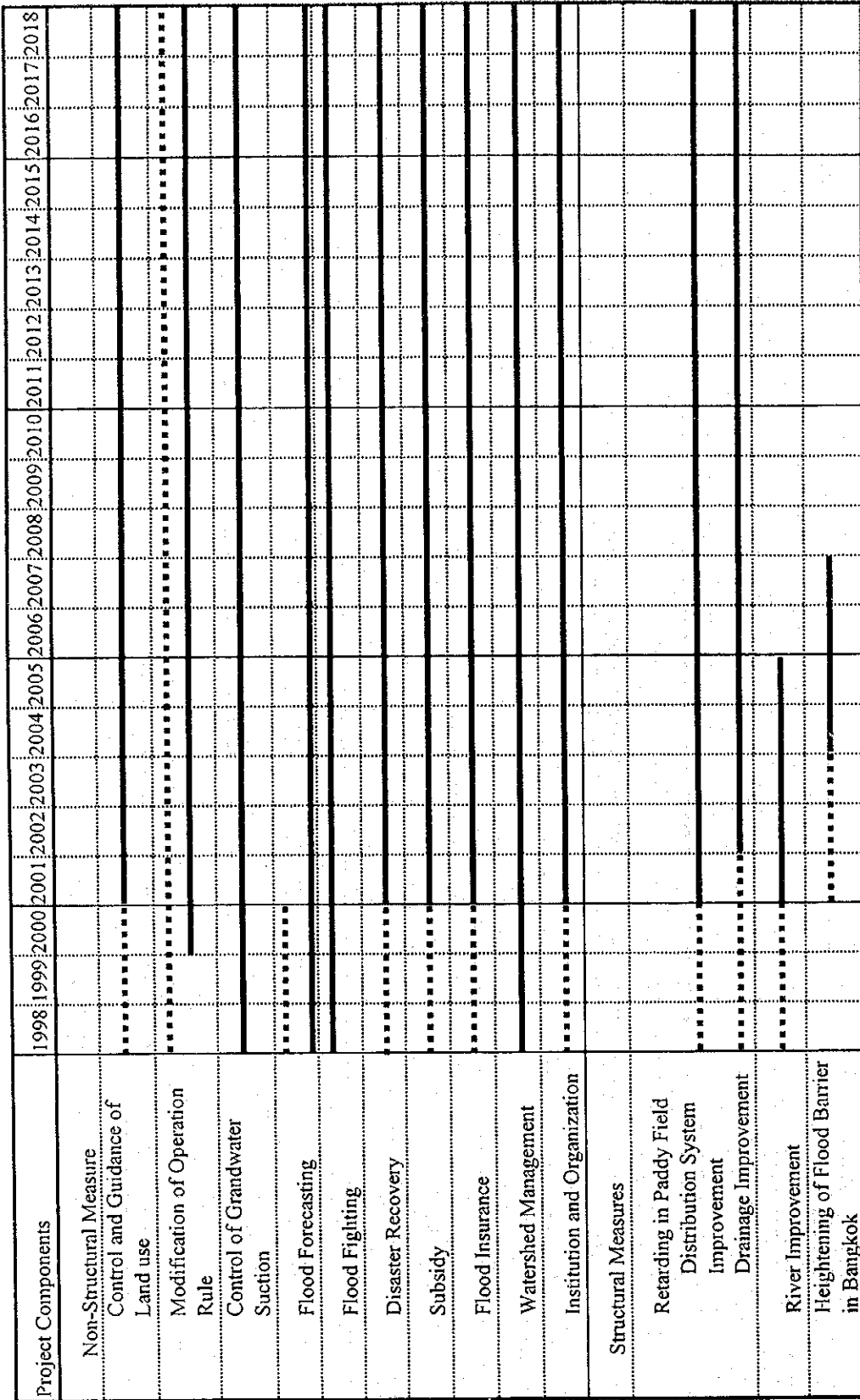
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Project Components	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	
Non-Structural Measure																						
Control and Guidance of Land use																				
Modification of Operation Rule																				
Control of Grandwater Suction																						
Flood Forecasting																				
Flood Fighting																				
Disaster Recovery																				
Subsidy																				
Flood Insurance																				
Watershed Management																				
Institution and Organization																				
Structural Measures																						
Retarding in Paddy Field																						
Distribution System Improvement																				
Drainage Improvement																				
River Improvement																				

..... : Study Period
 — : Implementation Period

STUDY ON INTEGRATED PLAN FOR FLOOD MITIGATION IN CHAO PHRAYA RIVER BASIN
 CTI ENGINEERING CO., LTD AND INA CORPORATION

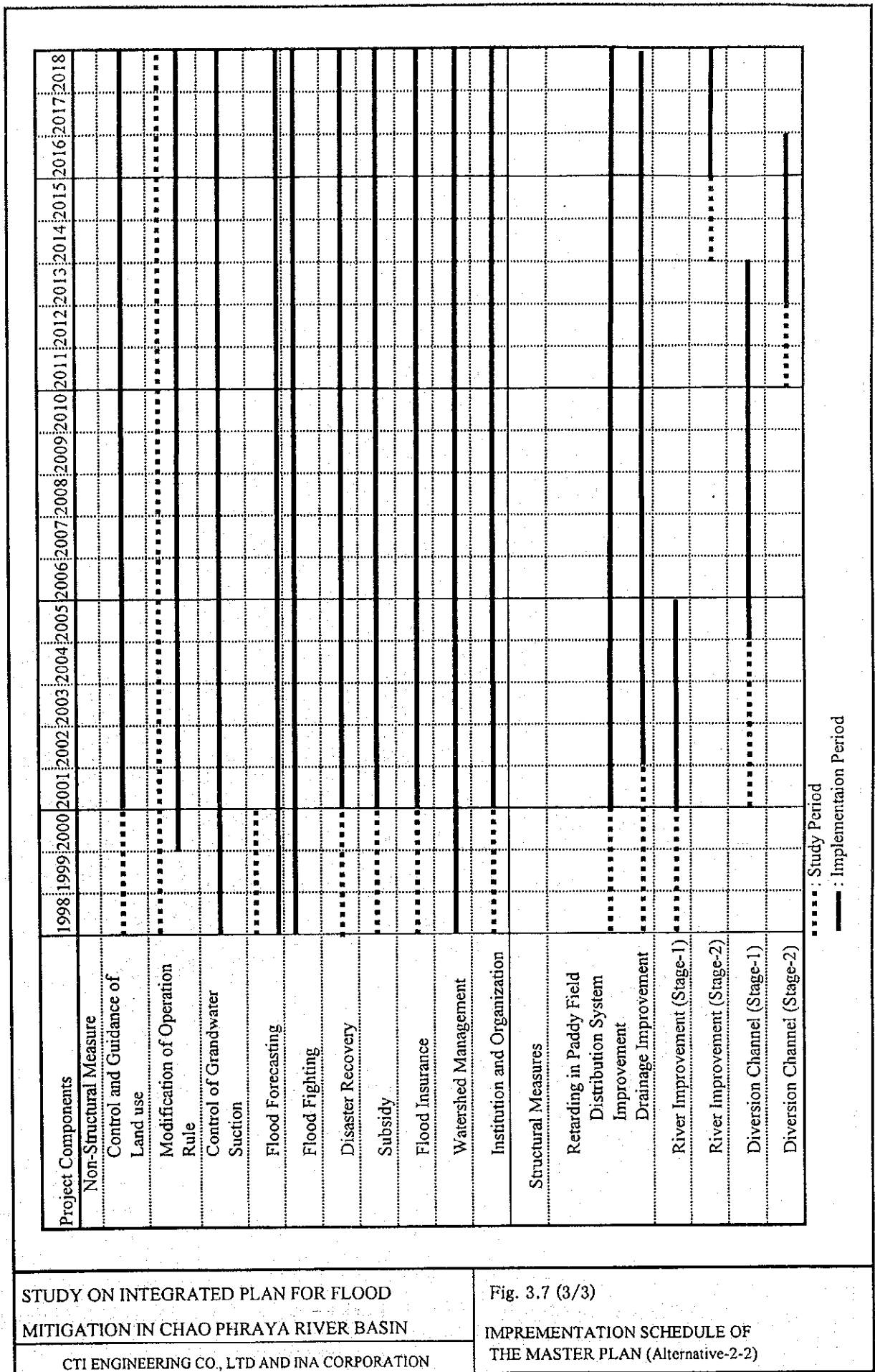
Fig. 3.7 (1/3)
 IMPREMENTATION SCHEDULE OF THE MASTER PLAN (Alternative-1)



.....: Study Period
 ———: Implementation Period

STUDY ON INTEGRATED PLAN FOR FLOOD MITIGATION IN CHAO PHRAYA RIVER BASIN
 CTI ENGINEERING CO., LTD AND INA CORPORATION

Fig. 3.7 (2/3)
 IMPLEMENTATION SCHEDULE OF THE MASTER PLAN (Alternative-2-1)

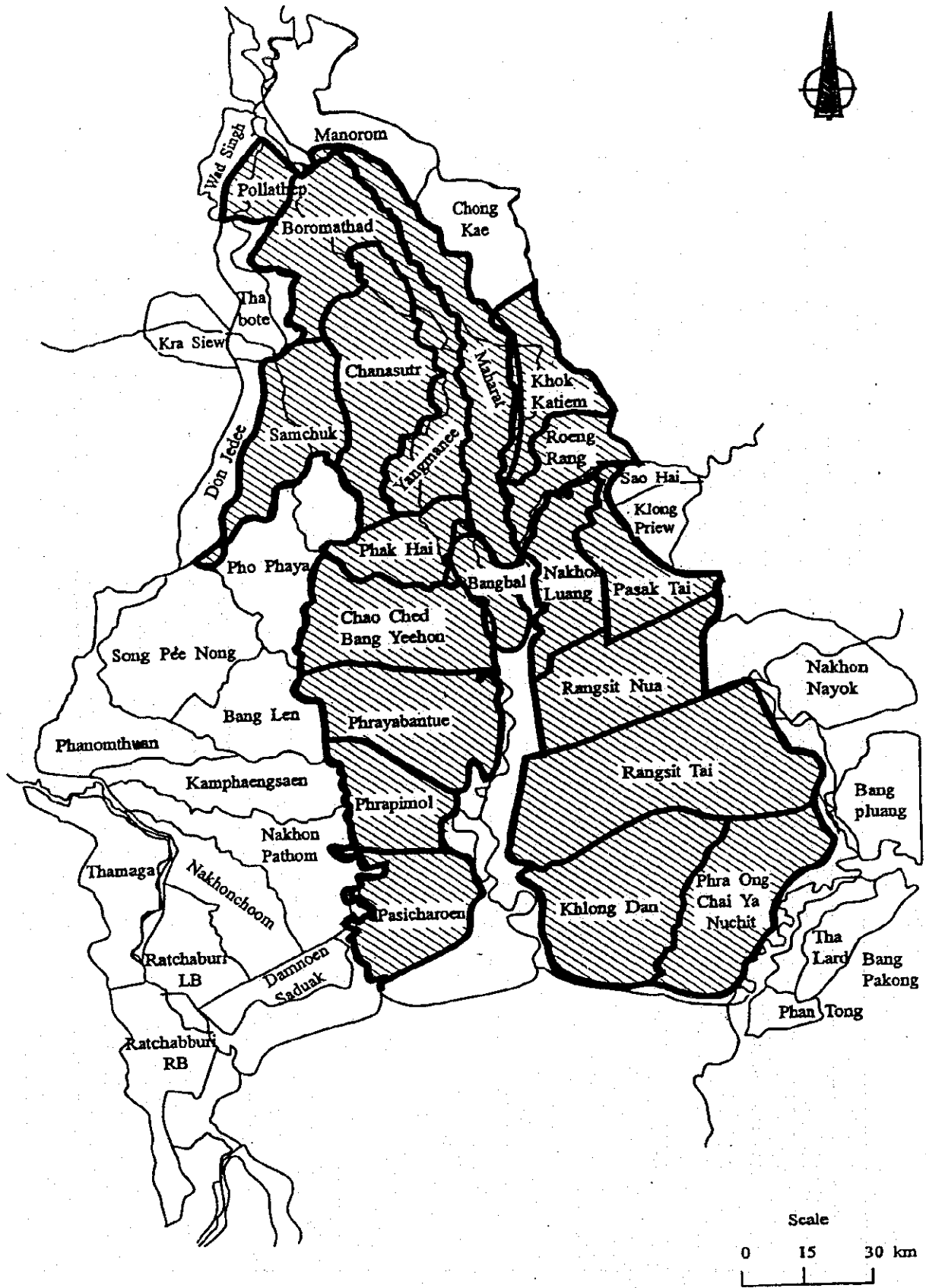


STUDY ON INTEGRATED PLAN FOR FLOOD MITIGATION IN CHAO PHRAYA RIVER BASIN

CTI ENGINEERING CO., LTD AND INA CORPORATION

Fig. 3.7 (3/3)

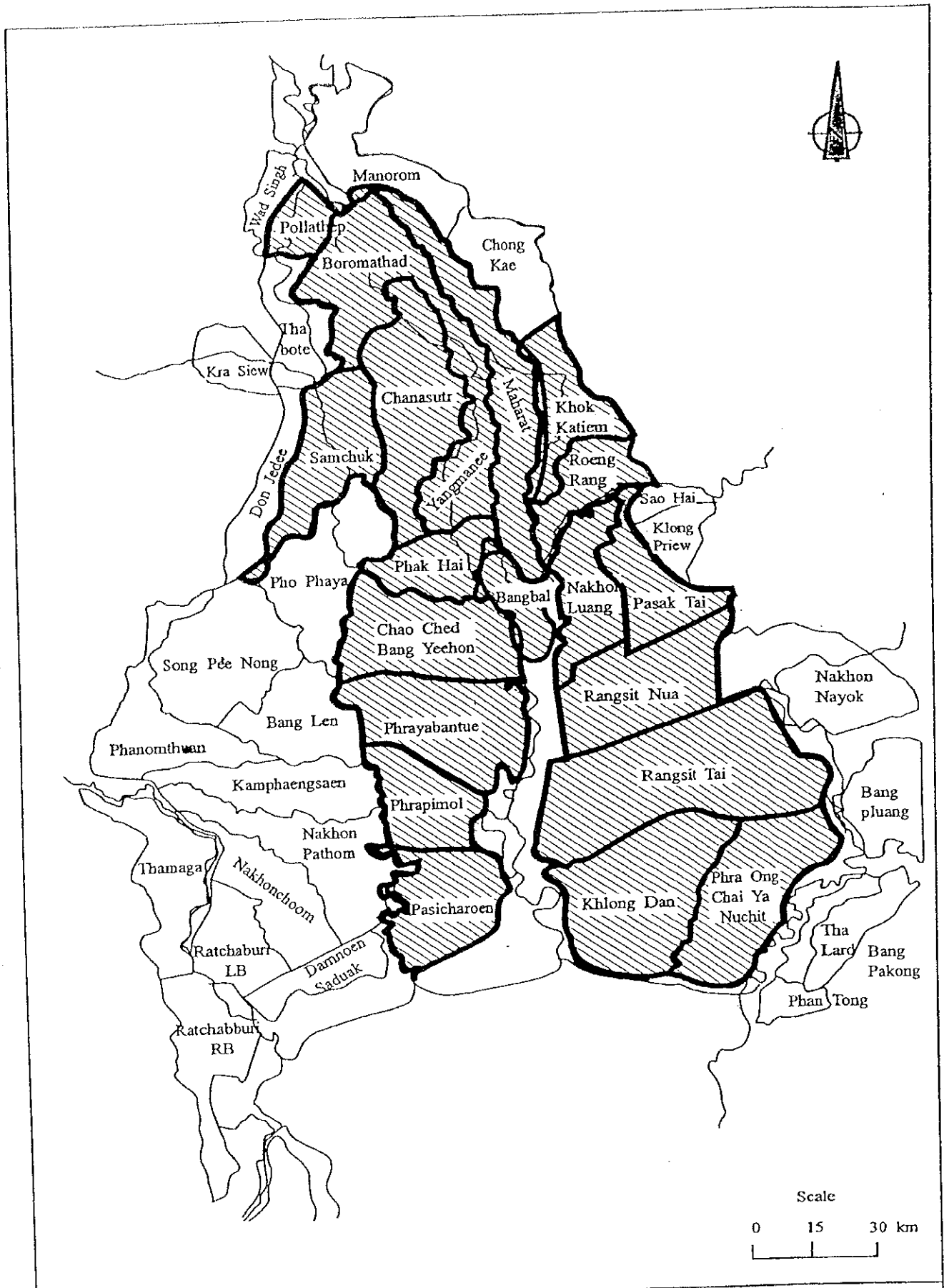
IMPLEMENTATION SCHEDULE OF THE MASTER PLAN (Alternative-2-2)



STUDY ON INTEGRATED PLAN FOR FLOOD MITIGATION IN CHAO PHRAYA RIVER BASIN

CTI ENGINEERING CO., LTD AND INA CORPORATION

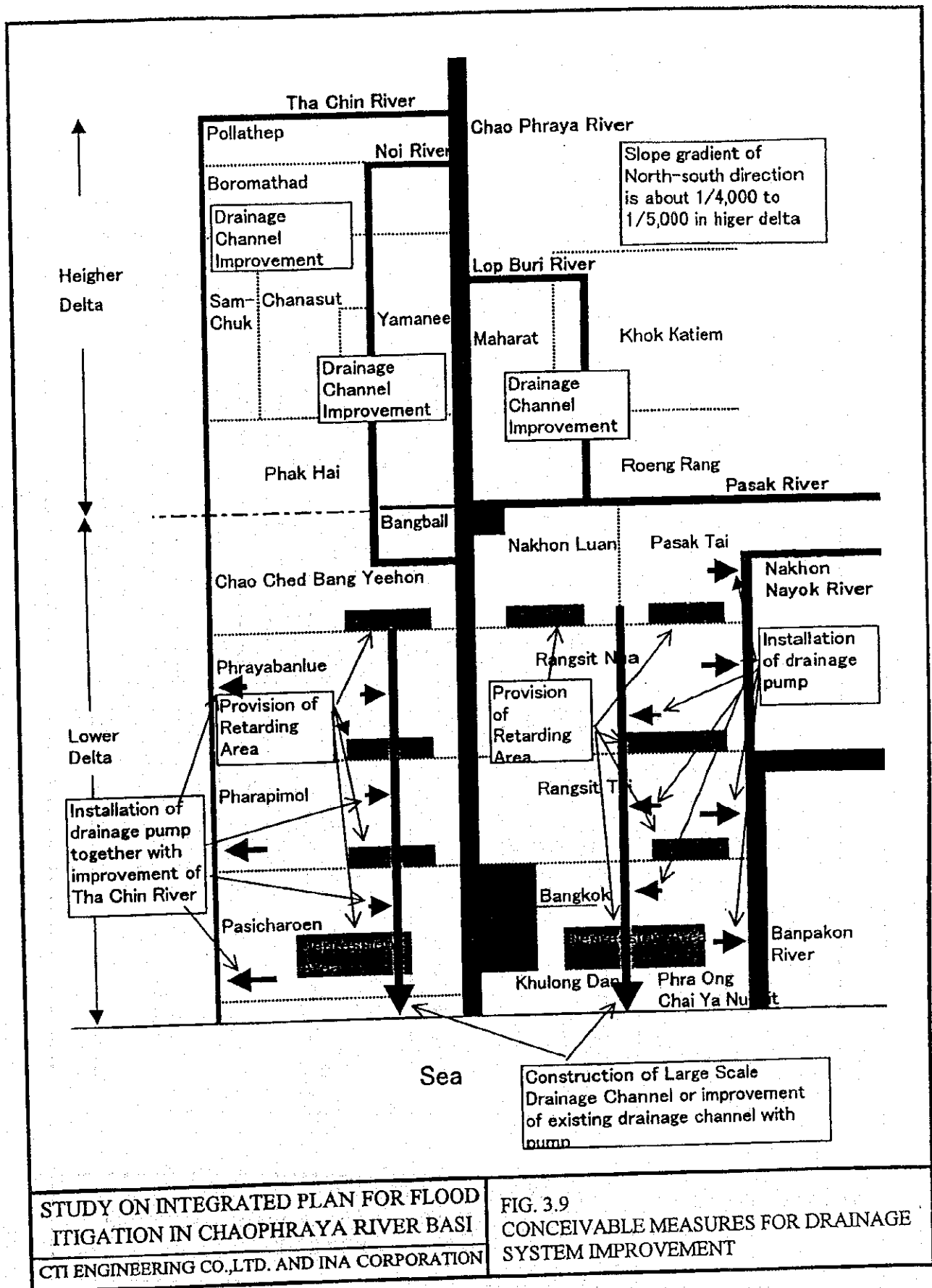
FIG. 3.8
OBJECTIVE AREA FOR DRAINAGE SYSTEM IMPROVEMENT



STUDY ON INTEGRATED PLAN FOR FLOOD MITIGATION IN CHAO PHRAYA RIVER BASIN

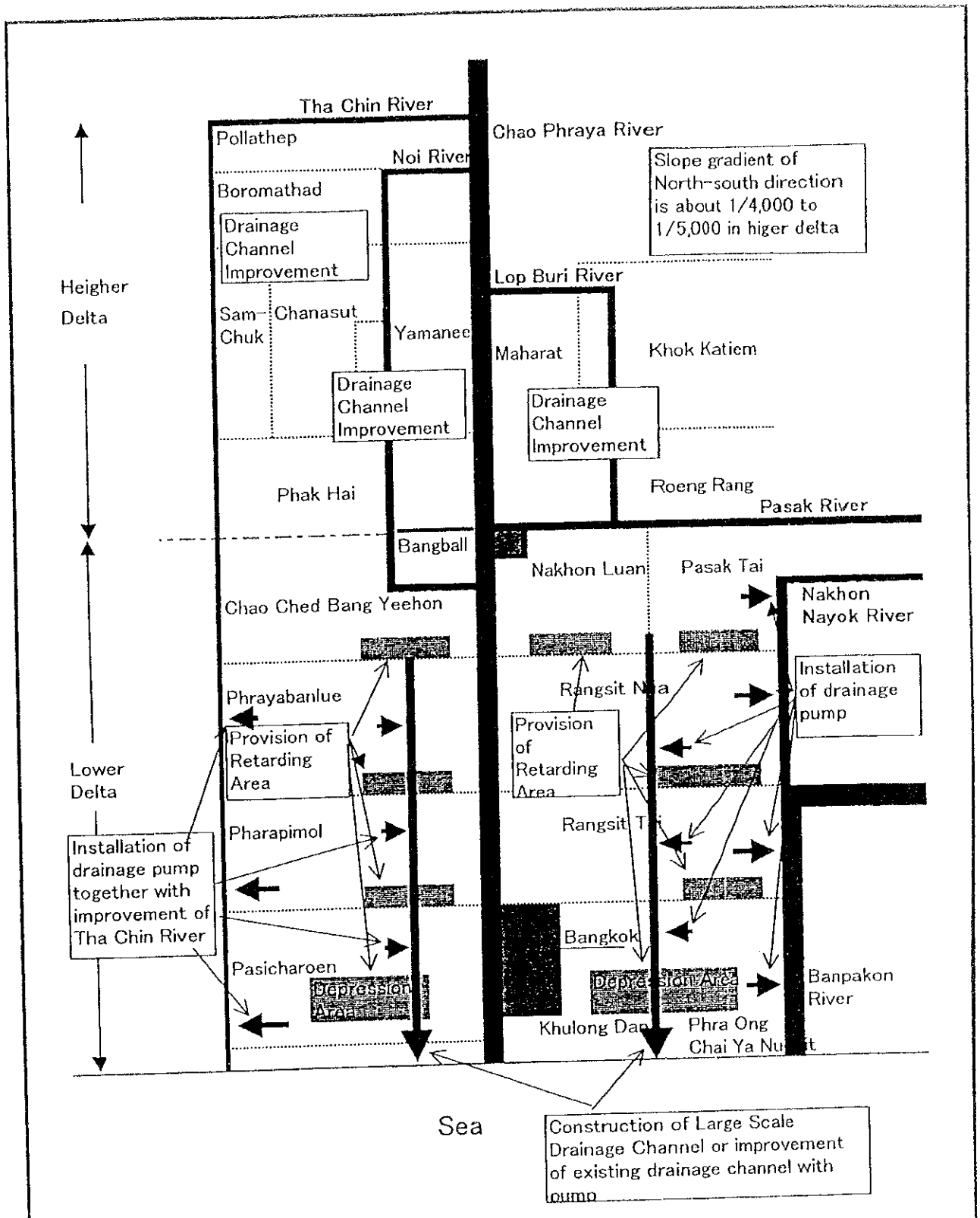
FIG. 3.8 OBJECTIVE AREA FOR DRAINAGE SYSTEM IMPROVEMENT

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STUDY ON INTEGRATED PLAN FOR FLOOD MITIGATION IN CHAOPHRAYA RIVER BASIN
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FIG. 3.9
 CONCEIVABLE MEASURES FOR DRAINAGE SYSTEM IMPROVEMENT



STUDY ON INTEGRATED PLAN FOR FLOOD MITIGATION IN CHAOPHRAYA RIVER BASIN
 CTI ENGINEERING CO.,LTD. AND INA CORPORATION

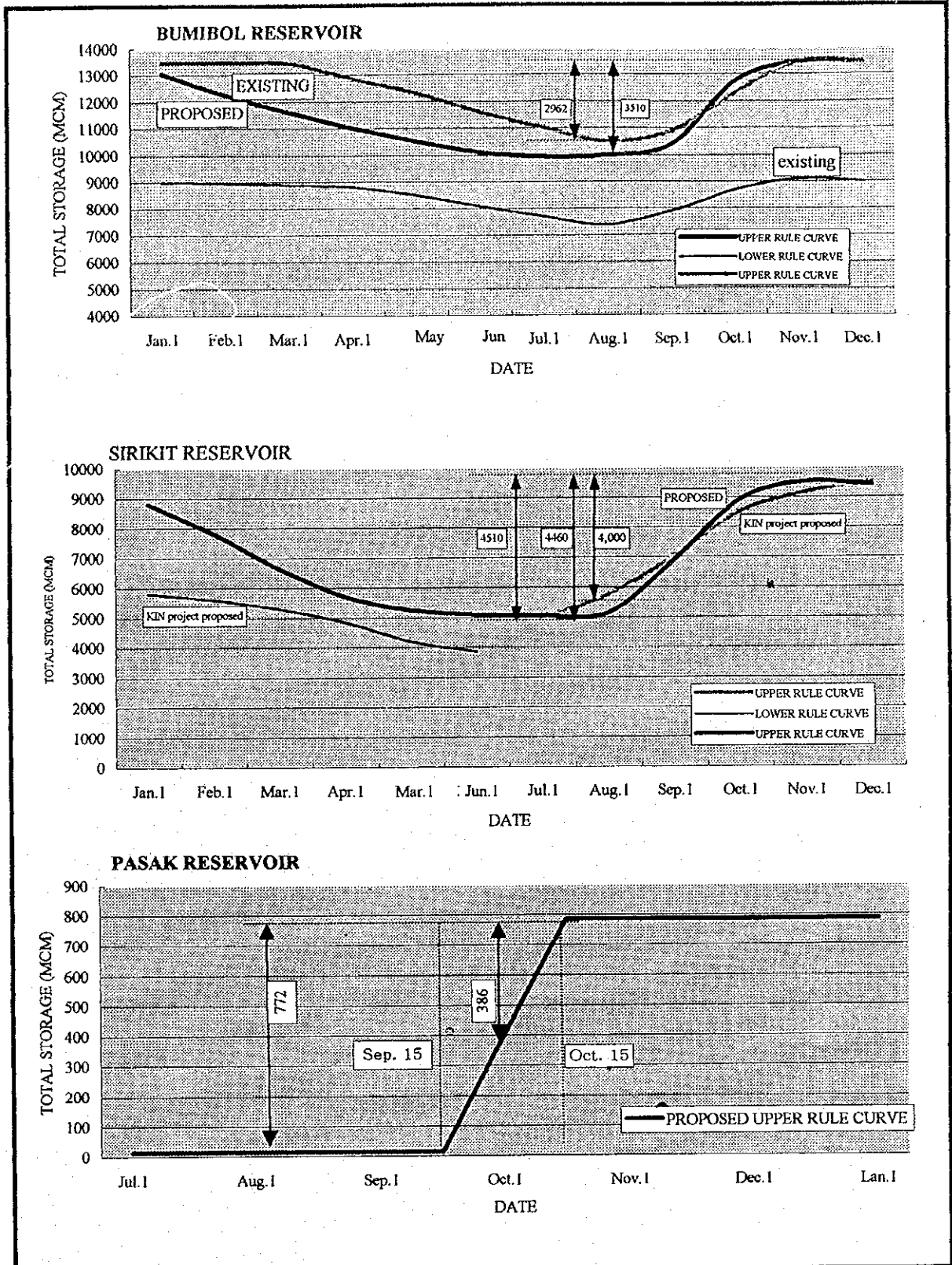
FIG. 3.9
 CONCEIVABLE MEASURES FOR DRAINAGE SYSTEM IMPROVEMENT

Study Area	Division of Area	Name of Project Area	Priority	Implementation Schedule				
				1998-2000	2001-2005	2006-2010	2011-2015	2016-2018
Higer Delta	Northern Part surrounded by Thachin and Noi Rivers	Boremethad	2-4-4					
		Samdhuk	2-4-3					
		Chanasut	2-4-2					
		Phak Hai	2-4-1					
	Area surrounded by Noi and Chao Phraya Rivers	Boremethad	2-3-4					
		Yamane	2-3-3					
		Phak Hai	2-3-2					
		Bang Bai	2-3-1					
		Maharat	2-1-2					
		Khok Katiom	2-1-1					
Lower Delta	Area surrounded by Chao Phraya and Lop Buri	Khok Katiom	2-2-2					
		Roang Rang	2-2-1					
	East Bank Area	Nakhon Luang	1-1-5					
		Pasak Tai	1-1-8					
		Rangsit Nua	1-1-4					
		Rangsit Tai	1-1-3					
		Khlong Dan	1-1-1					
		Phra Ong Chai	1-1-2					
		Ya Nuchit						
		Chao Ched	1-2-4					
West Bank Area	Bang Yeehon	1-2-3						
	Phrayahantue	1-2-2						
	Pashcharoen	1-2-1						

STUDY ON INTEGRATED PLAN FOR FLOOD MITIGATION IN CHAOPHRAYA RIVER BASIN

FIG. 3.10 PRIORITY OF DRAINAGE SYSTEM IMPROVEMENT

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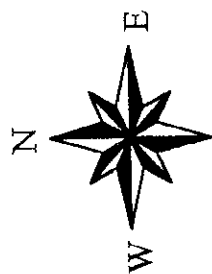
STUDY ON INTEGRATED PLAN FOR FLOOD MITIGATION IN CHAO PHRAYA RIVER BASIN

FIG. 4.1

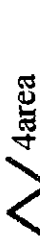
PROPOSED RULE CURVES

CTI ENGINEERING CO, LTD. AND INA CORPORATION

Note:
 i) The return period(T) was estimated for the inundation volume.
 ii) Urban areas to be protected by future ring dikes were excluded from the flood mapping.

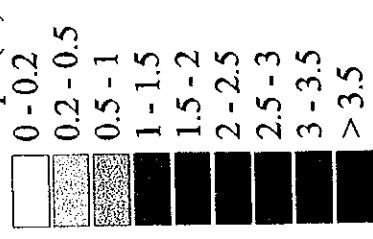


LEGEND

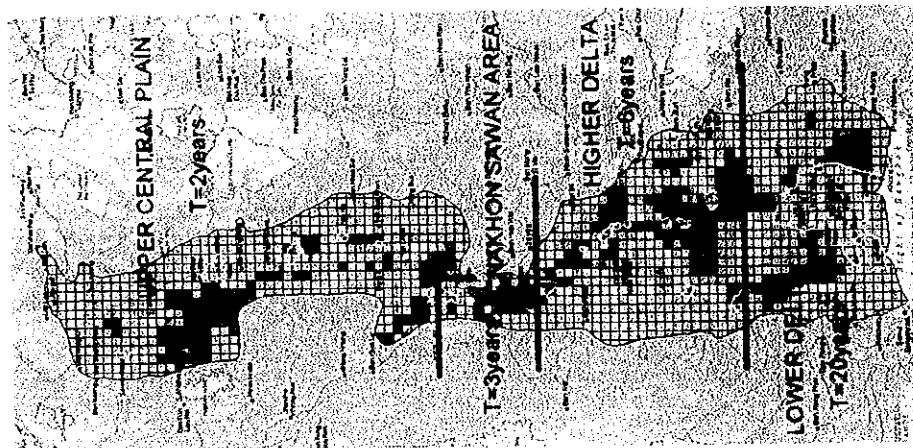


Ring Dike

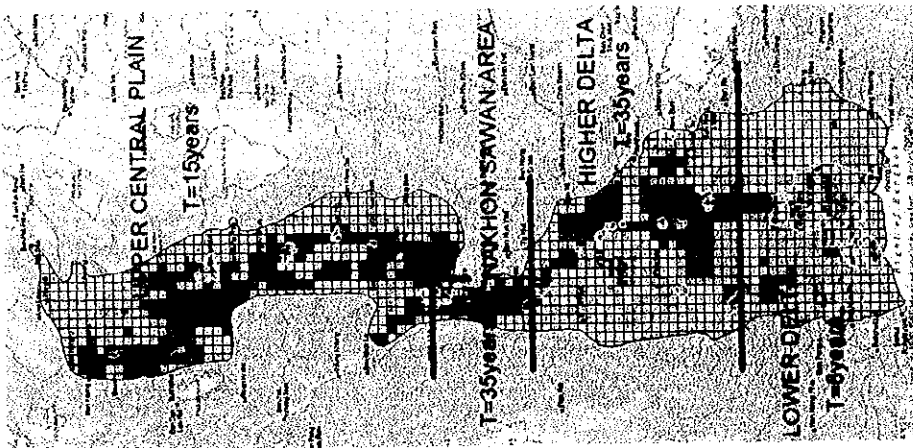
WaterDepth(m)



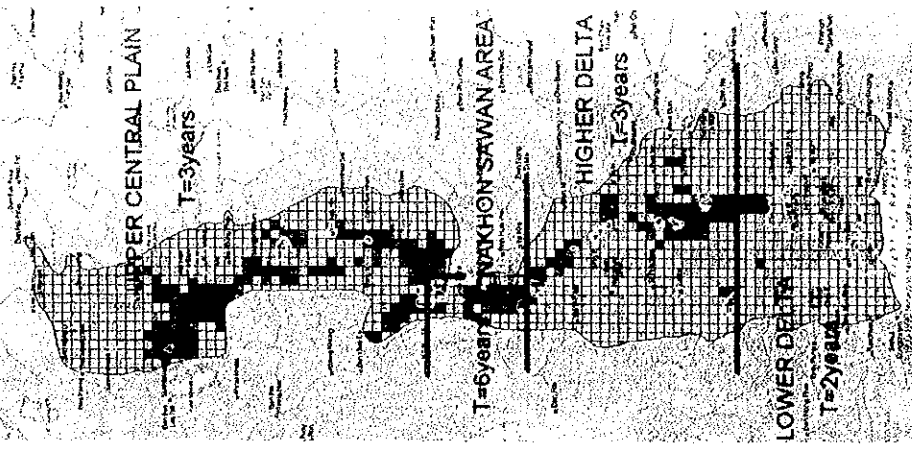
1983



1995

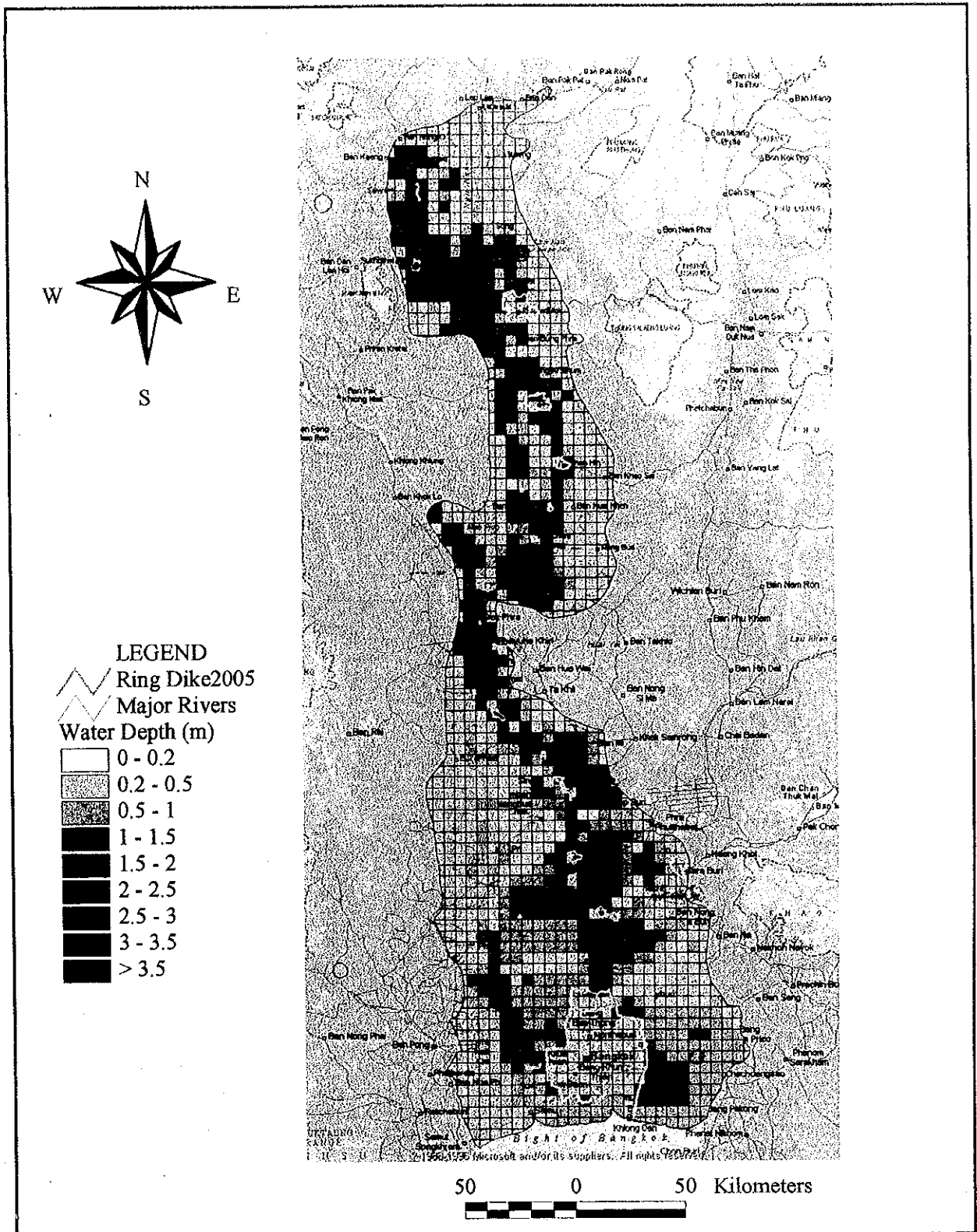


1996



STUDY ON INTEGRATED PLAN FOR FLOOD MITIGATION IN CHAOPHRAYA RIVER BASIN

Fig. 4.2 FLOOD INUNDATION MAP



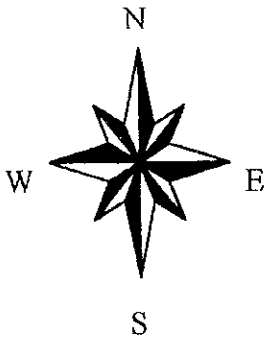
STUDY ON INTEGRATED PLAN FOR FLOOD MITIGATION IN CHAOPHYARA RIVER BASIN

CTI ENGINEERING CO LTD., & INA CORPORATION

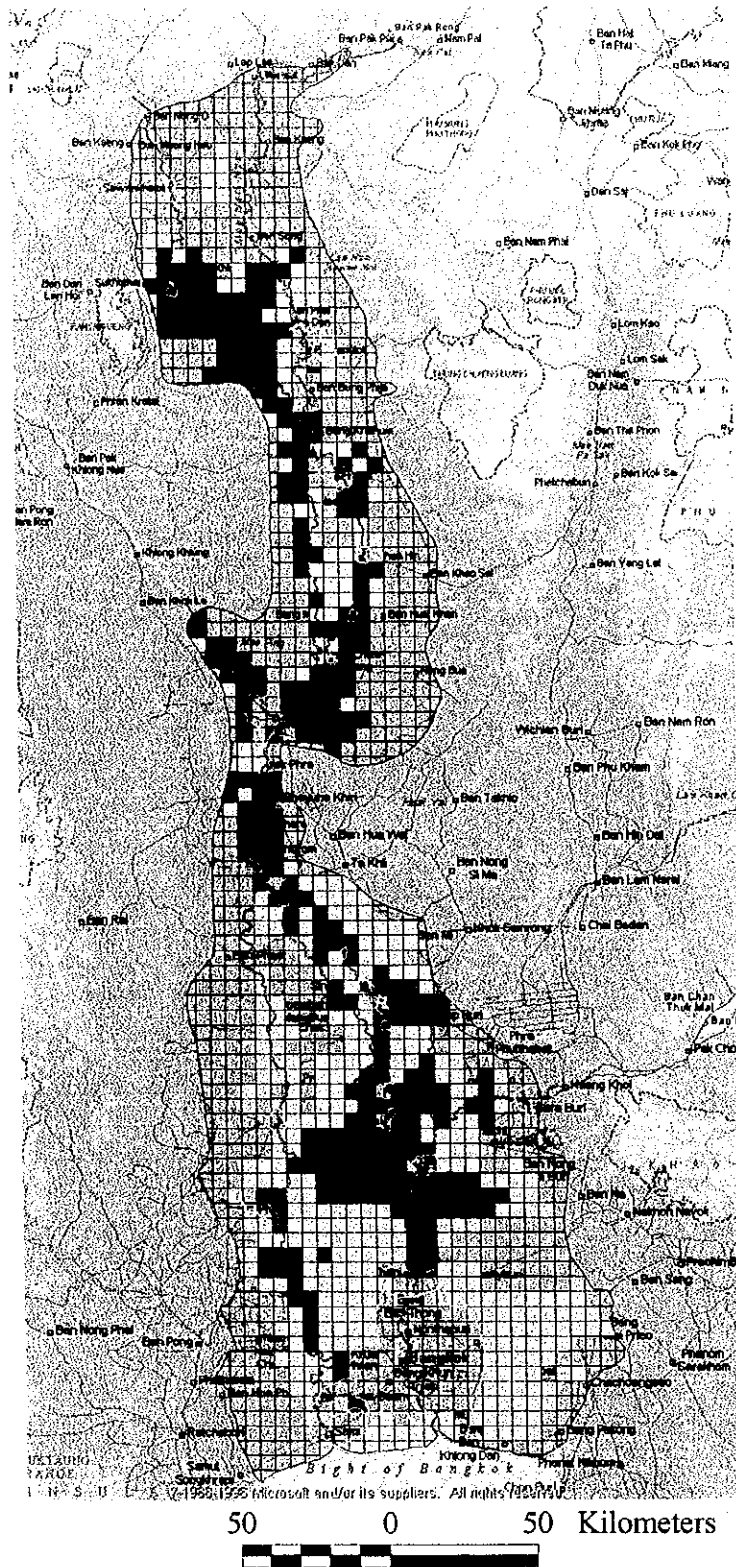
Fig. 4.3

MAXIMUM INUNDATION DEPTH MAP IN 1983, 1995 AND 1996 FLOOD

Flood Potential Map



- LEGEND**
- Urban Dike
 - Major Rivers
 - Flood Potential**
 - Low
 - Middle
 - High

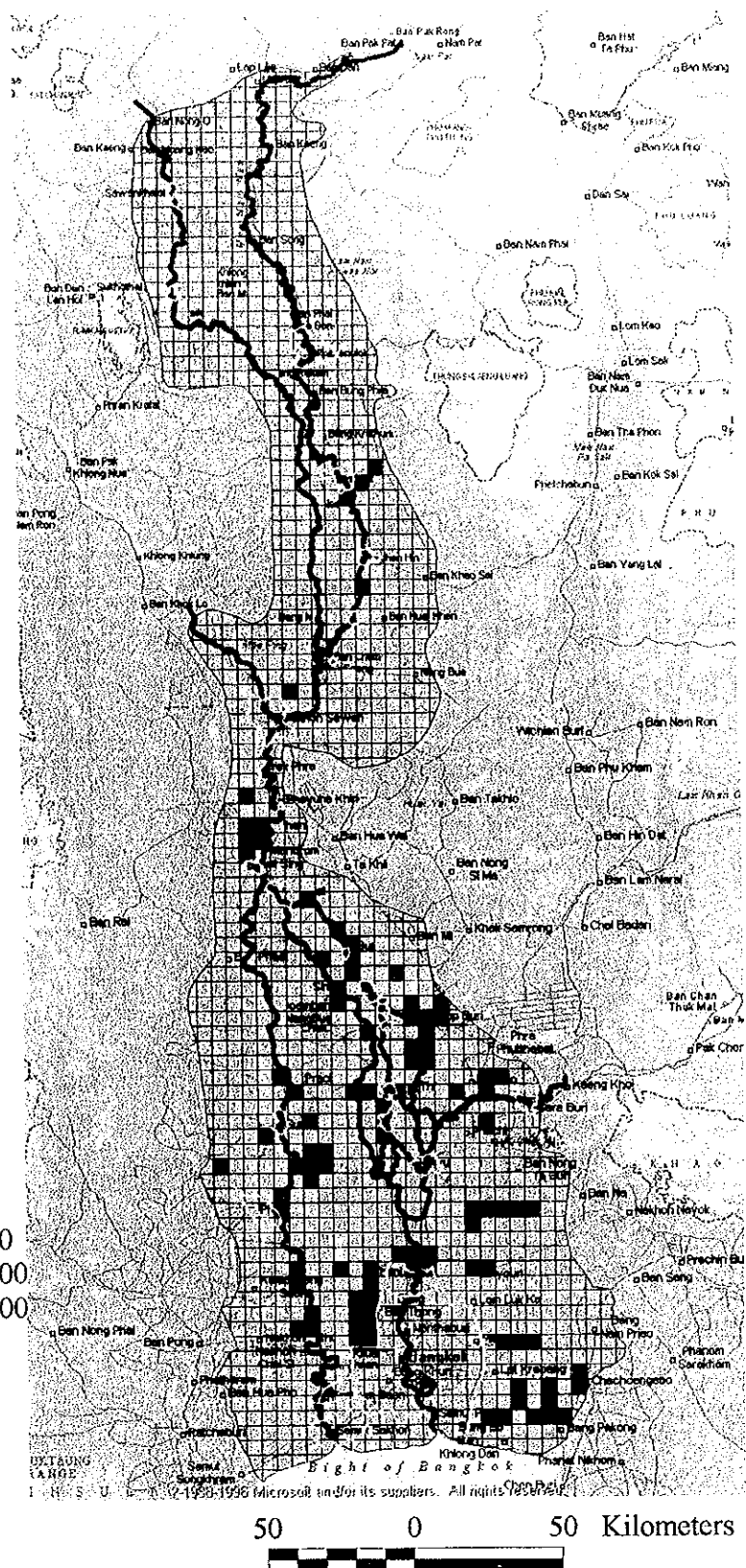
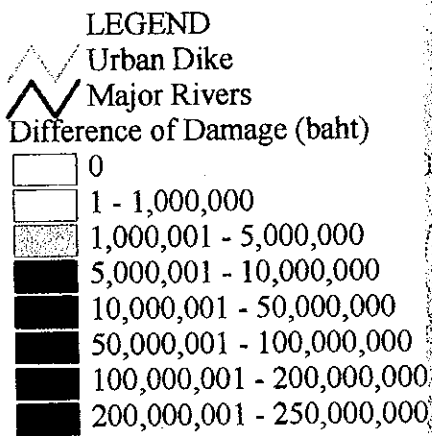
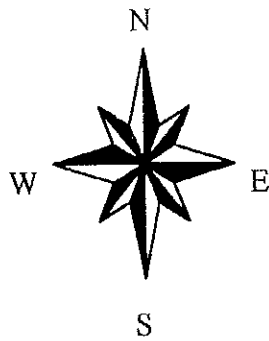


STUDY ON INTEGRATED PLAN FOR FLOOD MITIGATION IN CHAO PHRAYA RIVER BASIN

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Fig. 4.4

FLOOD POTENTIAL MAP

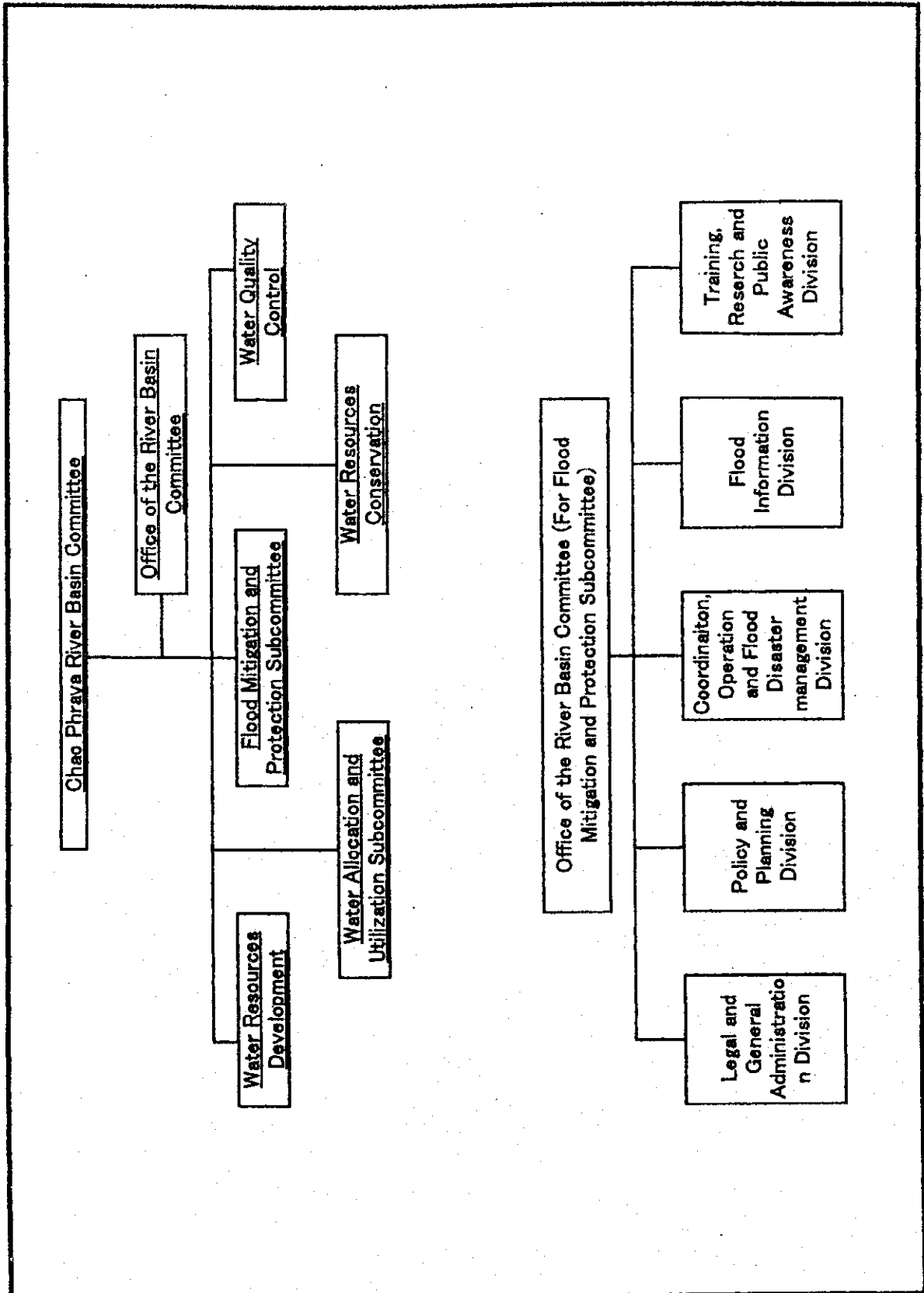


STUDY ON INTEGRATED PLAN FOR FLOOD MITIGATION IN CHAOPHRAYA RIVER BASIN

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Fig. 4.5

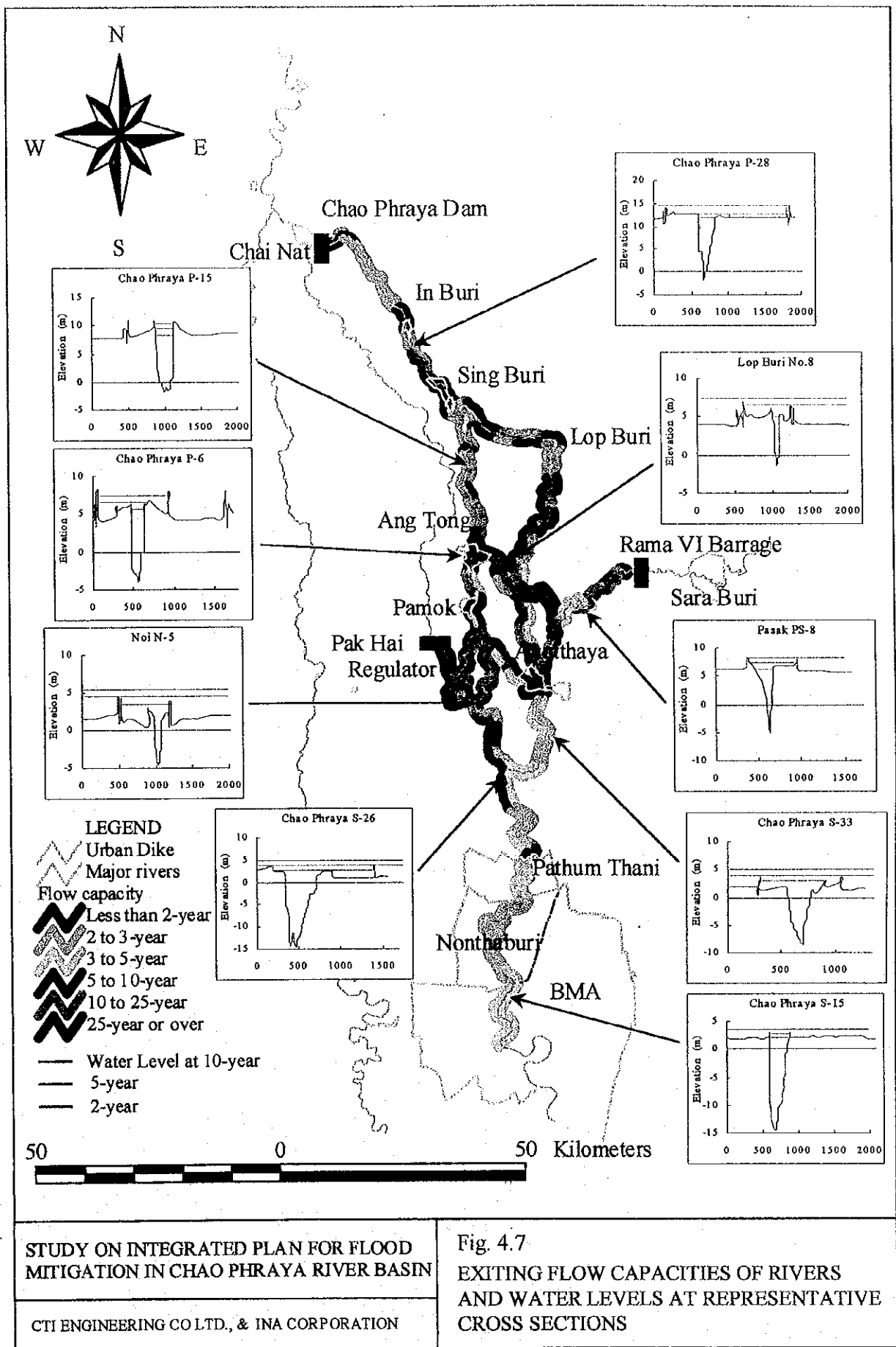
FUTURE FLOOD DAMAGE INCREASE MAP

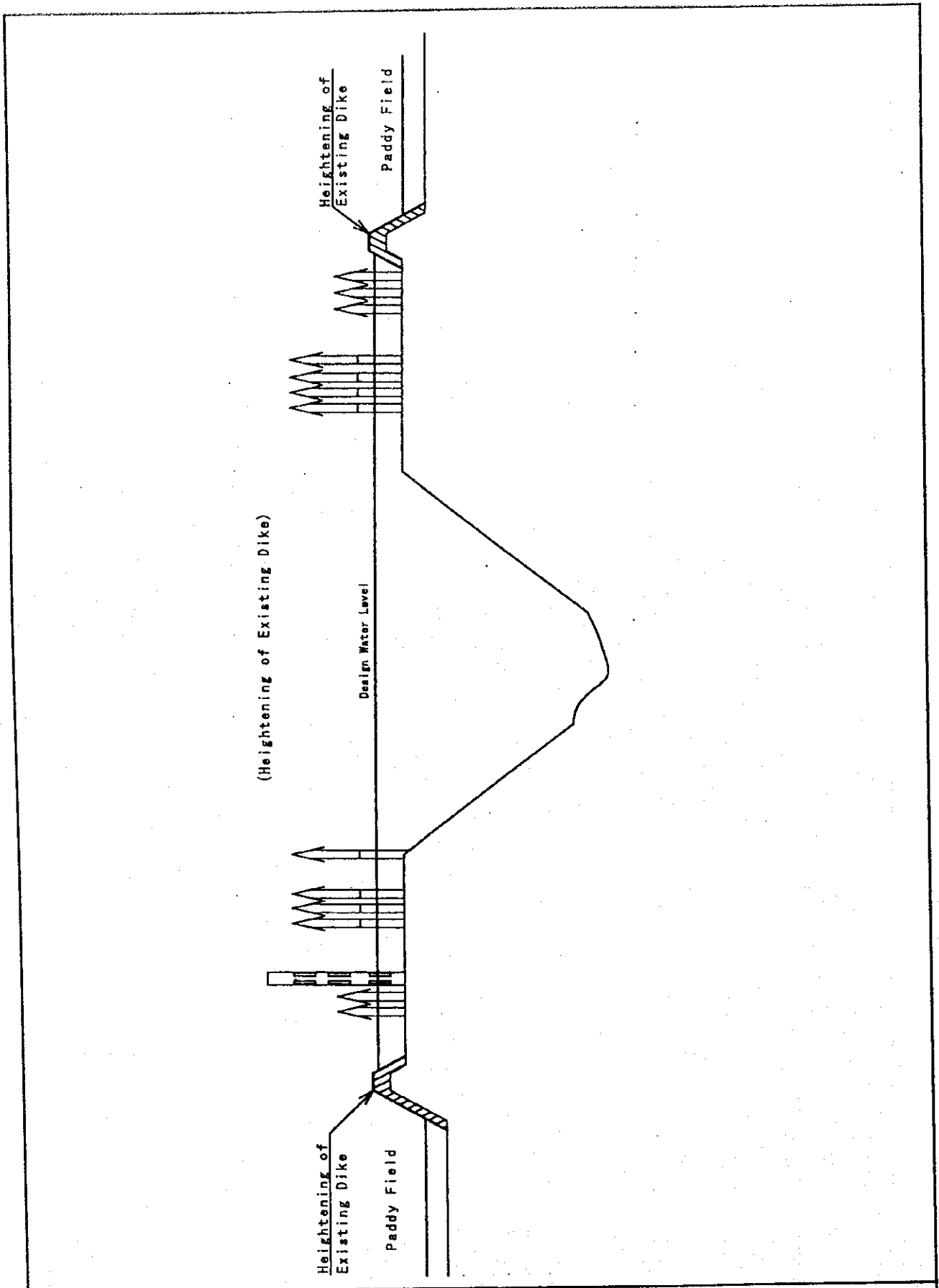


STUDY ON INTEGRATED PLAN FOR FLOOD MITIGATION IN CHAOPHRAYA RIVER BASIN

CTI ENGINEERING CO., LTD. AND INA CORPORATION

Fig. 4.6
PROPOSED ORGANIZATION CHART FOR RIVER BASIN COMMITTEE

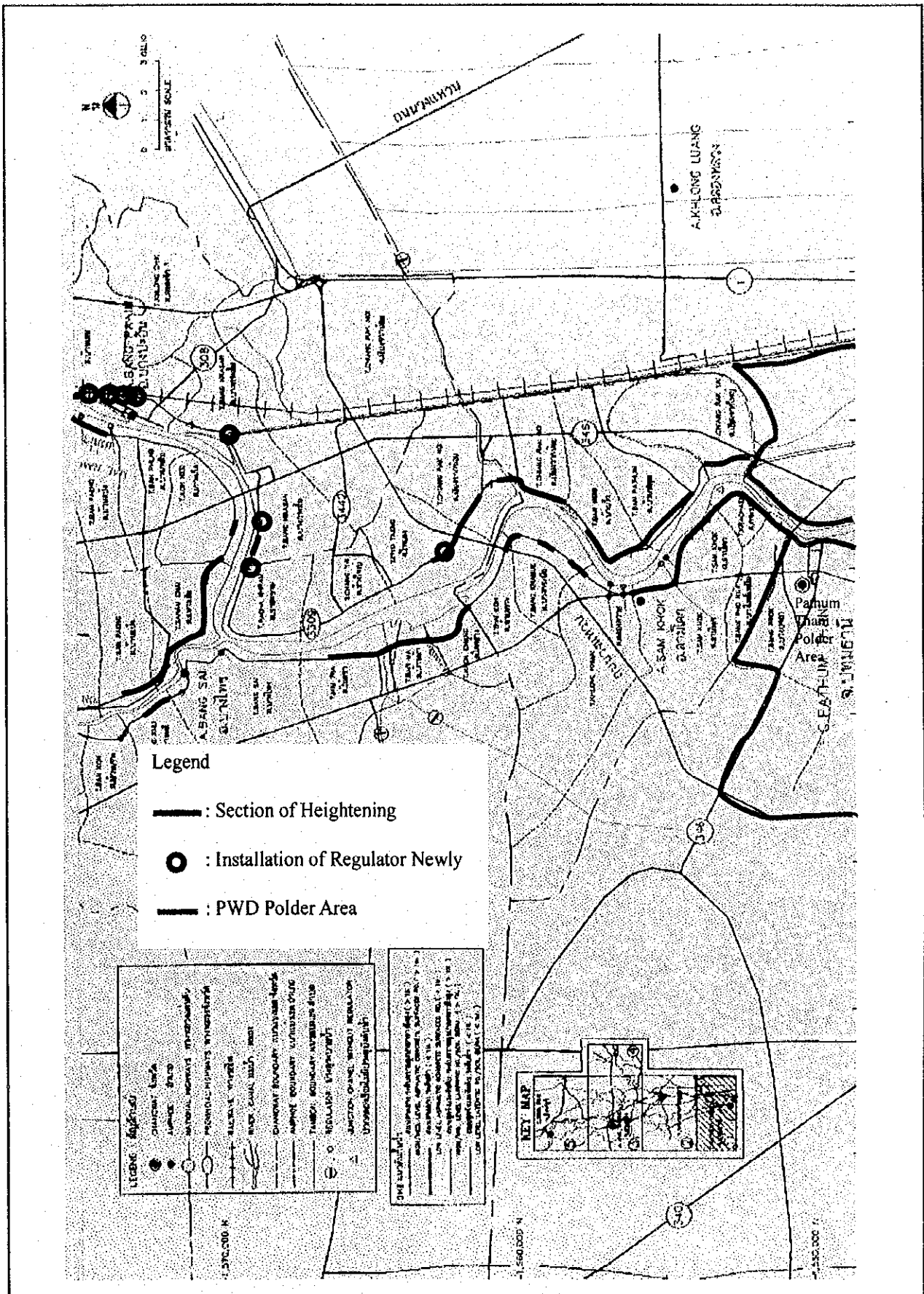




STUDY ON INTEGRATED PLAN FOR FLOOD
MITIGATION IN CHAO PHRAYA RIVER BASIN

CTI ENGINEERING CO., LTD AND INA CORPORATION

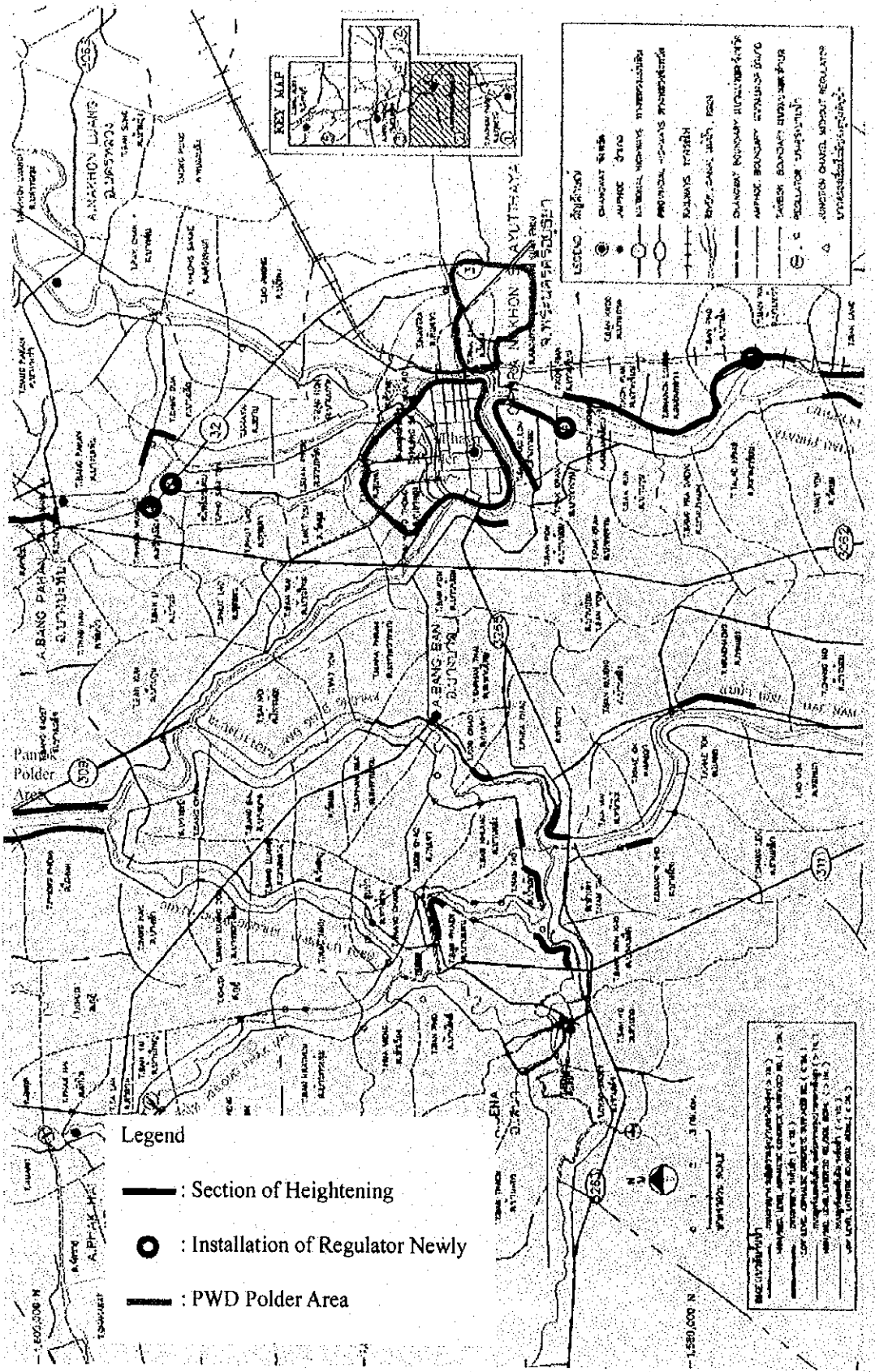
Fig. 4.8
TYPICAL CROSS SECTION OF RIVER
IMPROVEMENT



STUDY ON INTEGRATED PLAN FOR FLOOD MITIGATION IN CHAO PHRAYA RIVER BASIN

CTI ENGINEERING CO., LTD AND INA CORPORATION

Fig.4.9 (1/3)
ALIGNMENT OF RIVER IMPROVEMENT



STUDY ON INTEGRATED PLAN FOR FLOOD MITIGATION IN CHAO PHRAYA RIVER BASIN

CTI ENGINEERING CO., LTD AND INA CORPORATION

Fig.4.9 (2/3)
ALIGNMENT OF RIVER IMPROVEMENT



STUDY ON INTEGRATED PLAN FOR FLOOD MITIGATION IN CHAO PHRAYA RIVER BASIN

CTI ENGINEERING CO., LTD AND INA CORPORATION

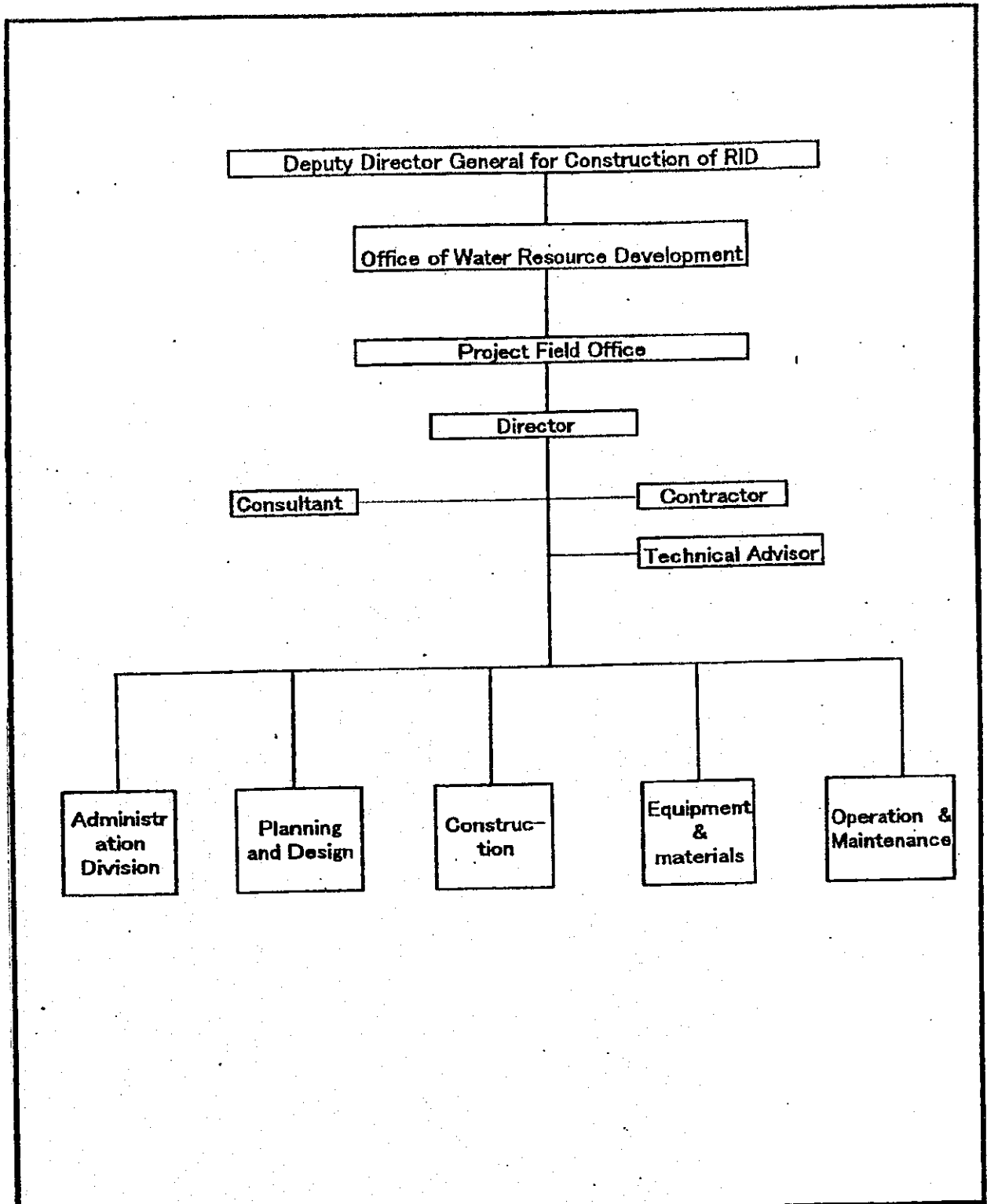
Fig.4.9 (3/3)
ALIGNMENT OF RIVER IMPROVEMENT

Project Components	1998	1999	2000	2001	2002	2003	2004	2005
Non-Structural Measure								
Control and Guidance of Land use	
Modification of Operation Rule	
Institution and Organization
Structural Measures								
River Improvement	

..... : Study Period
 : Construction
 - - - : Operation

STUDY ON INTEGRATED PLAN FOR FLOOD
 MITIGATION IN CHAO PHRAYA RIVER BAS.
 CTI ENGINEERING CO., LTD AND INA CORPORATION

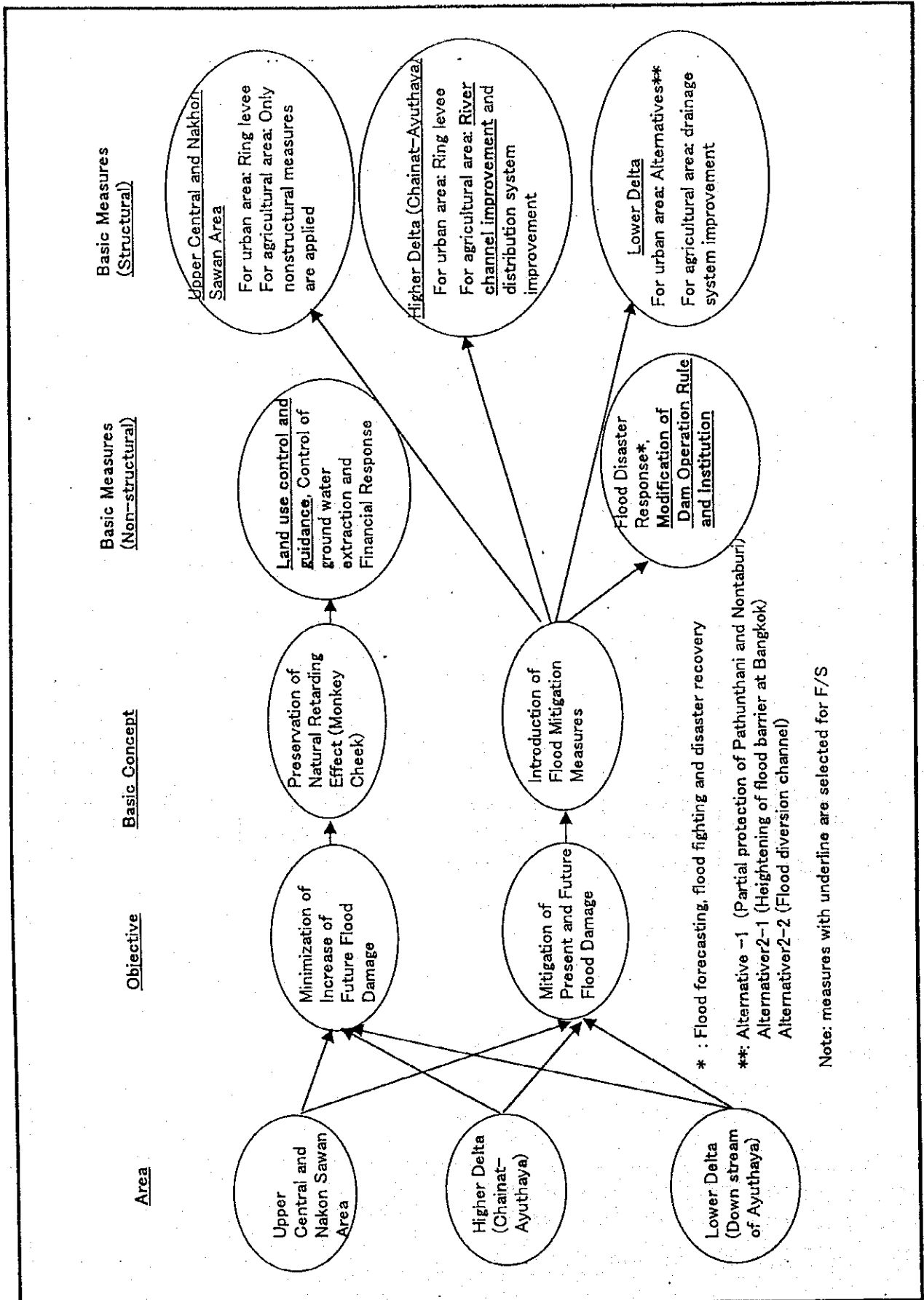
Fig. 4.10
 IMPLEMENTATION SCHEDULE OF
 THE URGENT PROJECT



STUDY ON INTEGRATED PLAN FOR FLOOD MITIGATION IN CHAO PHRAYA RIVER BASIN

CTI ENGINEERING CO., LTD AND INA CORPORATION

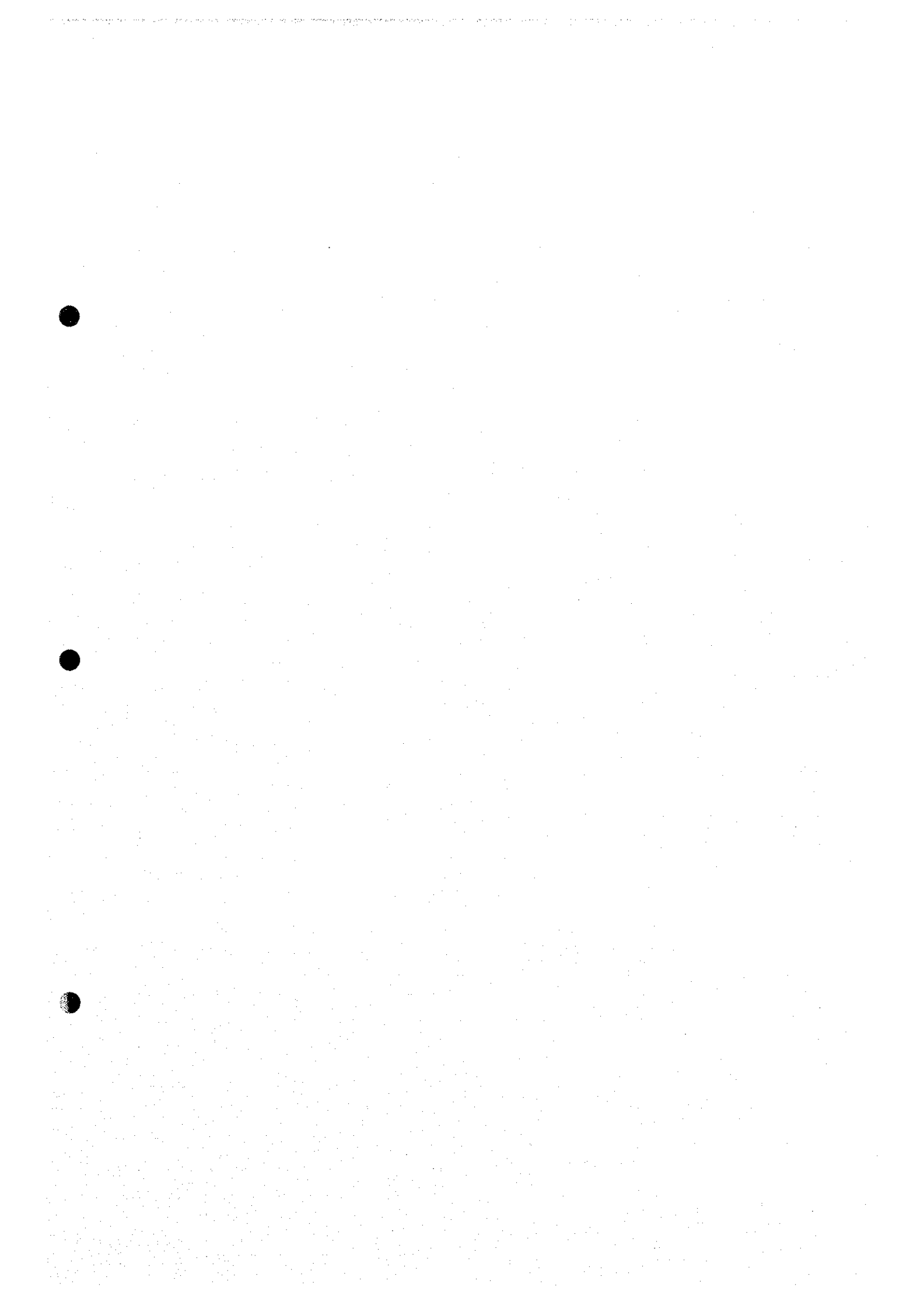
Fig. 4.11 ORGANIZATION FOR PROJECT IMPLEMENTATION (RIVER IMPROVEMENT)

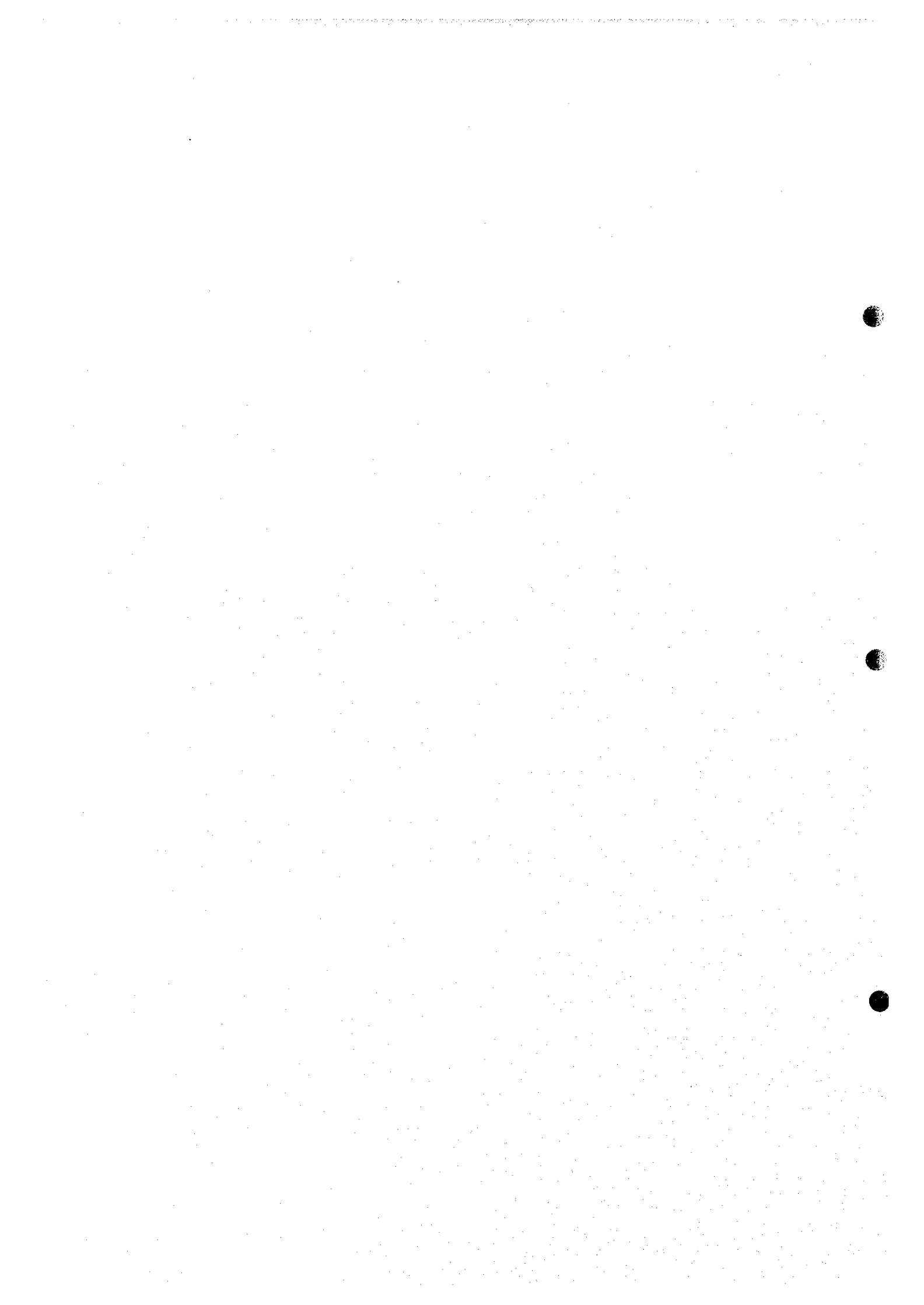


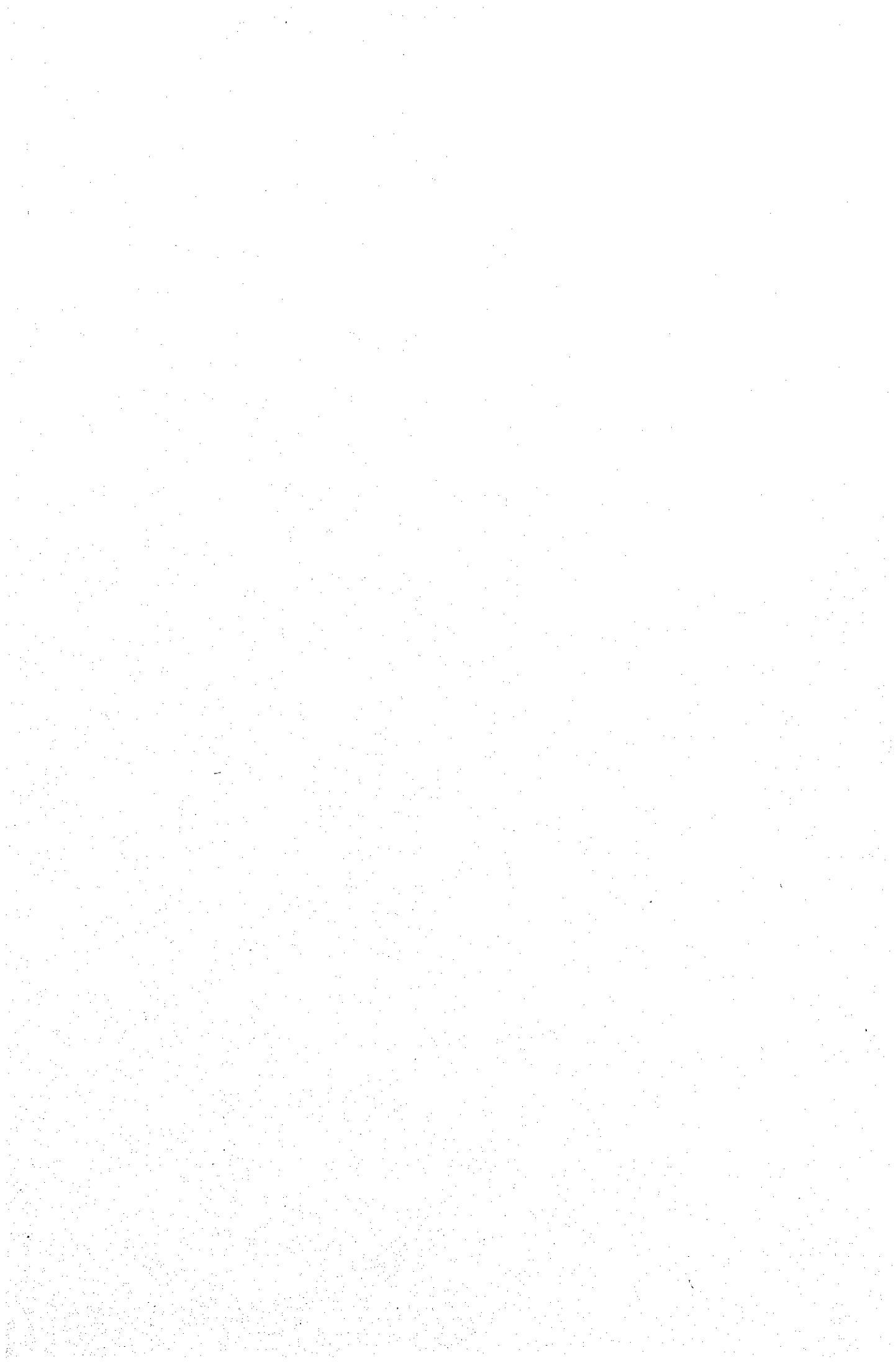
* : Flood forecasting, flood fighting and disaster recovery
 **: Alternative -1 (Partial protection of Pathunthani and Nontaburi)
 Alternativer2-1 (Heightening of flood barrier at Bangkok)
 Alternativer2-2 (Flood diversion channel)

Note: measures with underline are selected for F/S

Fig. 5.1
 OUTLINE OF THE MASTER PLAN







JICA